A STORIED-IDENTITY ANALYSIS APPROACH TO TEACHER CANDIDATES LEARNING TO TEACH IN AN URBAN SETTING

By

Amal Ibourk

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Curriculum, Teaching, and Educational Policy—Doctor of Philosophy

2015

ABSTRACT

A STORIED-IDENTITY ANALYSIS APPROACH TO TEACHER CANDIDATES LEARNING TO TEACH IN AN URBAN SETTING

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While many studies have investigated the relationship between teachers' identity work and their developing practices, few of these identity focused studies have honed in on teacher candidates' learning to teach in an urban setting. Drawing upon narrative inquiry methodology and a "storied identity" analytic framework, I examined how the storied identities of science learning and becoming a science teacher shape teacher candidates' developing practice. In particular, I examined the stories of three interns, Becky, David, and Ashley, and I tell about their own experiences as science learners, their transitions to science teachers, and the implications this has for the identity work they did as they navigated the challenges of learning to teach in high-needs schools. Initially, each of the interns highlighted a feeling of being an outsider, and having a difficult time becoming a fully valued member of their classroom community in their storied identities of becoming a science teacher in the beginning of their internship year. While the interns named specific challenges, such as limited lab materials and different math abilities, I present how they adapted their lesson plans to address these challenges while drawing from their storied identities of science learning. My study reveals that the storied identities of becoming a science teacher informed how they framed their initial experiences teaching in an urban context. In addition, my findings reveal that the more

their storied identities of science learning and becoming a science teacher overlapped, the more they leveraged their storied identity of science learning in order to implement teaching strategies that helped them make sense of the challenges that surfaced in their classroom contexts. Both Becky and Ashley leveraged their storied identities of science learning more than David did in their lesson planning and learning to teach. David's initial storied identity of becoming a science teacher revealed how he highlighted his struggle with navigating talkativeness in the class, but also his struggle being an authority figure in his classroom. At present, only Becky and Ashley pursued teaching in a high needs setting.

A storied identity analysis provided as well an insight into their storied strategies, or the teaching strategies shaped by the stories the interns told about how they made sense of the challenges they faced in their teaching practice. There were five teaching strategies the interns named that were important in supporting their learning to teach were (1) building relationships with their students, (2) being resourceful and creative when faced with limited lab materials, (3) making science relevant to their students, (4) scaffolding their students in their learning, and (5) having a network of people as resources in helping them be better teachers and helping their students learn. Out of these five teaching strategies, I called those they named and highlighted as helping them teach in ways they valued and that connected back to their storied identity of science learning their storied strategies.

Implications for further pushing storied identities as a tool for teacher educators to help pinpoint priorities that surface in teacher candidates' practice are discussed. An insight into the priorities that teacher candidates highlight in their practice as well as the storied strategies they name and use to deal with challenges that surface in their practice has potential in better helping teacher candidates navigate their developing practice.

To my parents:

To my mom and dad, whose love, kindness, resilience, humility, and dedication instilled in me the passion to pursue my goals and dreams.

ACKNOWLEDGMENTS

I have many people to thank and to be grateful for that have in some way or another helped me in this feat and journey of getting a PhD. I would like to start by thanking my advisor, Dr. Angie Calabrese Barton, whose continued feedback and support have been instrumental in guiding me structure my writing.

I would like to acknowledge with appreciation and admiration the continued support I have received from my doctoral committee, Dr. Amelia Gotwals, Dr. Corey Drake, and Dr. Gail Richmond. I would also like to extend my appreciation to Dr. Michelle Williams and Dr. Michael Sedlak for their support and mentorship.

To colleagues, staff, and friends at the College of Education

Thank you! You know who you are. Sue, Amy, Kristi, Terry, Sharon, Shawn, Patti, Tracy, Doug Campbell, and so many of you! Thank you!

To Sue: I will forever be grateful to you for your "pep talks", your kindness, and your infectious positive energy. Your "backbone pep talk" is forever ingrained in me.

To Amy: I will always be grateful to you for your genuine kindness. You are a gem.

To all my many friends all over the world

To Lorena: Thank you for being my writing buddy, friend, "Hermana del alma" and always staying "pa'delante!" I am here for you always!

To Sakeena, Dali, Sarah Riggs Stapleton, Bernadette, Bella, Natasha, Amber, Jihea, Abraham, Eddie, Gerardo, Stefanie, Christina, Zarin and so many of you. You have been an amazing support in your own way!

To Rachel, Dwi, Gio, Hyun, Emily, Sarah Roller, Bakar, Mani, and my extended cohort: You were there with me from the beginning. Thank you for the shared laughter and memories, the long writing nights, the readings together, and above all the encouragement and support.

To Mike: Thank you for being the compassionate listener and the mirror I needed during my difficult times. You have been a catalyst for me to seek more inward self-reflection and change. Your kindness and genuineness will always be appreciated.

To my participants, Becky, David, and Ashley: I would like to thank my participants in this study who graciously shared their stories of learning and teaching with me. I have learned so much from you as well.

To my family

To my siblings: Sumaya, Mohamed, Mouna, Omar and Myriem, you have been my biggest cheerleaders. You each have contributed in your own way to this dissertation.

To my sisters, I love you for sending those touching, funny, supportive group text messages and knowing that no matter the distance, I can always count on your constant and unconditional love, laughter, and support.

To Sumaya: You planted that seed in me to pursue my graduate studies. Your ongoing support and encouragement from the beginning were what kept me going. You started my PhD journey.

To Mouna: You have been an invaluable support and kindness to me these last years and I'm grateful to you for that!

To Myriem: You have made me laugh and smile throughout my journey! Thank you for your encouragement!

To my brothers, Mohamed and Omar: Thank you as always for the love, encouragement and support. To Mohamed: Your advice and encouragement have always been appreciated. I will always remember your encouraging words, “It gets better.”

To Simon and Dave: You have been a part of my journey as well. Your messages of encouragement and support have always been appreciated! To Dave: Thank you for coming to my graduation!

To my parents Driss Ibourk and Latifa Ajbaier:

You have been my rock and foundation. Your sacrifices to ensure that my siblings and I received the education you did not get have always kept me grounded. Your support has been unfaltering throughout, and I am proud to be the first to get a PhD in my family and the few to get it as a North African, Berber, Moroccan, and Arab female growing up in a patriarchal country.

To you, my parents, I dedicate this dissertation. Thank you for always believing in me and supporting me. I love you!

I end my acknowledgments piece with my favorite quote from Robert Frost, which I believe truly speaks to my journey:

“…Two roads diverged in a wood, and I—

I took the one less traveled by,

And that has made all the difference.”

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CHAPTER I

Introduction

I remember the first time I heard about "storied identities." My advisor introduced me to the idea of story telling and narratives, and to the power of how narratives can help individuals make sense of their lived experiences and culture (Bruner, 1991). The words "storied identities" became a lens for me as I looked back at my own personal accounts and decisions I made in pursuing my PhD in science education, and in leaning towards professional identity development and learning to teach.

Growing up in Tangier, Morocco, as an Arab female from a Berber background, I encountered discrimination based on my gender, ethnicity, and social class. This is largely because I grew up in a society where women are accorded a role inferior to that of men, and are discriminated against with regards to academic and career opportunities. In addition, my Berber background and my last name, both strong symbols of my identity, were another way that the Moroccan society I grew up in used as a "gateway" to accord academic and career opportunities. In the high school I attended, I was somewhat exposed to the "Western" world, and I learned at a very young age that although I respected my mother very much, I did not want to be a typical Moroccan female— restricted to a life of cooking, cleaning, and having children. Luckily for me, I was raised in a family that valued education. My parents, whose schooling stopped at the lower elementary grade level, went against the norm in my family. They believed in giving their four daughters the same opportunities for education as their two sons, and they pushed me to pursue my dream of attaining a PhD in Science Education. I have learned, throughout my experiences, that my stories and experiences of going against the norm and not conforming to the ideal

Moroccan female have shaped my identity and supported my journey as a science educator and scholar. Leveraging from these stories and experiences throughout my journey has allowed me to stay focused on the road I chose ahead. In the words of Robert Frost, "Two roads diverged in a wood, and I --I took the one less traveled by, And that has made all the difference."

My belief in how stories can help one make sense of their lives at different stages has led me to investigate how a narrative analysis approach supports new understandings of identity as storied constructions. As the professional development coordinator of the Noyce scholars, who are teacher candidates who receive a scholarship in return for teaching in high-needs settings, for the past four years, I have worked closely with beginning teachers, and I became intrigued about learning more about their learning to teach and their identity development. I began to explore the idea of identity, or being recognized by self or others as a certain "kind of person" (Gee, 2005), as formed by the narratives or stories one tells, and how stories can help us make sense of our lived experiences. I definitely identified with Brock's (1995) description of how we see life as storied. He believes that "our life narrative is the story we tell ourselves that knits together our recollected past with a wished-for future, thereby influencing our sense of self in the present" (p. 152).

I have these stories, or narratives, that these teacher candidates have told me, and I have noticed that they capture the roles that they attribute to themselves. So, in trying to bring a way of thinking about how these teacher candidates develop their professional identity and learn to teach, I believe that a storied-identity analysis can contribute to understanding the complexity of how identities are shaped by stories and life experiences, especially during teacher candidates' internship year, which is an important identity forming year because they are fully immersed in their classrooms and are navigating the different contexts and complexities of learning to teach in

a classroom that is not their own, with students that come from different backgrounds, and in school settings that are challenging and unsupportive at times (Banks et al., 2005; Ladson-Billings, 1999).

Purpose

The study of teachers' professional identities has grown in interest in the past decade. One of the primary reasons for this growth is the promising studies which indicate that novice teachers' professional identity influences their practice (Beauchamp & Thomas, 2009; Beijaard, Meijer, & Verloop, 2004; Connelly & Clandinin, 1999; Luehmann, 2007;Volkmann & Anderson, 1998) and, perhaps more importantly, that beginning teachers' instructional practices can change in relation to their changing professional identity (Bullough, 1992; Hodges, 2008; Lampert, 1985; Lampert, 2001). Despite these promising findings, few studies have investigated the ways in which beginning teachers' identity work takes shape, or why this might matter for teachers learning to teach in high need settings. I am particularly interested in how the stories that beginning science teachers tell about learning and teaching science inform us about how their professional identities develop, and the implications this has for their growth as teachers.

Thus my study was centered on science teacher candidates' learning to teach in urban settings and their professional identity development. I sought to look at how storied identities, or identities that are shaped by stories, give insight into teacher candidates' learning to teach science in an urban setting. As Drake, Spillane and Hufferd-Ackles (2001) suggested, "[stories] of identity are important, both as a means through which individuals come to 'know themselves' and as a framework for guiding action...[where] individuals interpret and make sense of their worlds"(p. 3). In particular, I investigated how teacher candidates leverage their storied identities towards developing their practice and in negotiating the challenges they encounter in learning to

teach.

In a pilot study (Ibourk, 2012), I explored the storied identities of three interns, Adele, Beatrice, and Danielle, based on their stories of learning science and becoming a science teacher. I also looked at how these storied identities informed and were informed by learning to teach. In other words, I sought to find out how their science teacher identities developed through the course of their yearlong student teaching experience, and how their storied identities shaped their beginning practice as teachers.

Initially, life-story history interviews were conducted during the beginning of the school year. These life history interviews served the purpose of identifying teacher candidates' beliefs about their learning science – while seeing them as interconnected and developing over time. Furthermore, they were used "as a way of understanding these teacher candidates' ways of constructing their personal and professional realities" (Drake et al., 2001). The interview questions focused on teacher candidates' experiences as science learners as well as their perceptions and understandings of urban education.

To gain direct evidence on how they interpreted their own practice and how they characterized themselves as teachers, I performed a semi-structured interview while the interns viewed four teaching episodes of their choice. To give the interns ownership in identifying moments where they want to be in their "storied identity, they watched their video-taped lessons of their lead teaching, and they selected four to five episodes, ranging from 30 seconds to 8 mins, that they believed achieved a goal related to their storied identity. I then analyzed their choice of the episode clips in their moment of teaching the lesson, and I examined how the clip reflected a storied identity and their vision of a science teacher.

In Adele's case, she valued mainly that her students learned and connected to the science content of her lessons. However, thinking about the particulars of teaching (classroom management, the organization of lessons, and the 'scripted curriculum') challenged her original idea of teaching as having her students make connections to science. She developed pedagogical strategies to counter these problems of practice by incorporating multiple resources, in order to reach out to different learners. Adele was worried that her teaching would be dry, and that she would not be able to support her students in developing the same love of science that she had. So, she purposefully worked hard on differentiating her instruction to support her students' varied needs, in order to allow science to remain interesting by incorporating different aspects of teaching – hands-on and video-clips. Part of this strategy involved repositioning herself so that she could notice her varied students' needs. Adele worked hard to shift her focus from "me and how I can change" to "how I can help my students change," which also supported her teacher learning.

Just like Adele, Beatrice also valued content as a priority in her practice. However, her level of focusing on the minutia of the science content that her students understood was more at a conceptual level. In Beatrice's case, her problem of practice was the difficulties she faced in getting her English language learner students to explain the content to her, due to their low English writing and speaking skills. So Beatrice drew from her own storied identity of knowing what it is like to be frustrated with hard science classes in her teaching. She tried to put herself in her students' shoes:

> Science is a whole new language so learning some of those science words is difficult, even for me. So I really try to show them how I think about it and how I remember the word. Thinking of crazy ways that maybe I remember something and maybe it will help

them.

She understood her students' frustration with difficult science content, as it was something she encountered herself in her college classes. Tapping into the frustration of her students, especially her English language learners that she felt with hard science words was the beginning of her pedagogical strategy. Part of this strategy also included differentiating her instruction and specifically " giving them choices for answers (in their written assessments) instead of expecting them to write all of the answers out."

Lastly, Danielle valued the importance of developing relationships with her students as her priority in her practice. She referred to students who are off-task and "who are talking in the back all the time" as one of her main problems of practice. Danielle did not take a deficit view to her students being off-task, but instead took it as her responsibility to get to know them. Danielle highlighted that how she related to her students made a difference in how they began to show more interest in her as a teacher and in her class. Danielle mainly drew from her own storied identity of how her own high school science teacher had a good teacher-student relationship. Her high school science teacher made himself approachable to her class and made science fun. When asked about what helped her grow as a teacher, she said,

> I think the biggest thing is forming the good relationships with students. I went to band concerts, choir concerts, basketball games, football games ... competitions, the musical – all of those things...And I think that had an enormous impact on how I dealt with students in class. I felt so much more comfortable with them. I could joke with them, I knew which kids I could be sarcastic with and which ones I couldn't and which ones I could make comments about the different activities that they're involved in. I think that's where

most of my growth came from – getting to know my students.

In other words, Danielle saw it as her job to draw her students in and to show them she cared about them by developing "good relationships" with them and showing them that she cared about what they did inside and outside of her classroom.

In this study, I found how using an identity approach provided valuable insights into what problems of practice these interns foregrounded as they learned to teach in an urban setting. The priorities they fixated on were delivering science content that was engaging, without watering down the curriculum; helping their struggling English Language Learners explicate the science content; and addressing their off-task and disengaged students. However, I was left wondering about the temporal development of their storied identities from the beginning of their internship year to the end of their internship year. My pilot study focused mostly on the storied identities that surfaced during their lead teaching, which is when the interns take over the responsibilities of the class from their mentor teacher for six weeks. My purpose was to look at what other challenges interns prioritize and how they might leverage from their own storied identities of science learning in their own practice to navigate these challenges.

Research Questions

My dissertation study focused on the following research questions:

1. What are the three interns' storied identities of learning science?
    a. What values do they highlight in their science learning story? How do they view themselves as science learners?

    b. Who do they highlight as important influences in their science learning story?

2. How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting?

    a. How do we see their storied identities expand in how they talk about their teaching practice?

3. How do we see their storied identities in how they talk about their professional identity development and their learning to teach during their internship year?

    a. What storied strategies do they identify as helping them navigate their learning to teach?

Thus, the purpose of my study was to investigate how the three interns' storied identities of learning science and becoming a science teacher developed across their year-long internship. I first looked at how they came to view themselves as science learners; how they chose to become a science teacher through the stories and narratives they told before their internship year; and how these narratives took shape over the course of their internship. Specifically, I sought to find out how they viewed themselves as science learners and how that shaped their identity as a science learner. I also looked at the people they identified as important in their science learning story and their choosing to become a teacher. These personal influences helped pinpoint who they saw as supporting them in their science learning story and in choosing to become a science teacher. I then looked at how their storied identities expanded and surfaced across their internship.

Overview of Methodology and Methods

In my dissertation research, I use a narrative inquiry methodology to examine how teacher candidates construct a teaching identity through their stories about their previous

experiences as science learners, and how they interpret their practice in teaching science that is engaging, inclusive, and authentic. By using narrative analysis, I was able to extrapolate the themes that emerged in their storied identities, and to make linkages to how they surfaced in their practice. Also, narrative analysis enabled me to contextualize the sense-making behind the storied-identities framework by focusing on the interns.

I conducted my study during the year 2012/2013 academic year and into the summer of 2013. During this academic year, I was the professional development coordinator of these three interns, who were recipients of a Noyce scholarship, which is a scholarship given in turn for one committing to teach in a high-needs setting. I also was their mentor, through which I coordinated professional development experiences for the three interns that ranged from field trips to visit urban schools to science teacher panels. I also followed their journey as an urban science teacher through their reflection journals during their internship year from their class, as well as their posts to discussion forums that centered on prompts around teaching in an urban setting.

I collected and analyzed different forms of narratives, which included life history interviews about their stories of becoming a science learner and science teacher, semi-structured interviews based on the lesson plans that they chose from their internship as well as two follow-up interviews, reflection journals they wrote during their internship year, and posts from discussion forums the interns engaged in on learning to teach prompts.

In telling their stories, I first provide a description of each intern's storied identity as a science learner and choosing to become a science teacher. Then I present their initial storied identities of becoming a science teacher during the first three months of their internship. I then

show how their storied identities of learning science showed up in their developing practice. In other words, I looked at how their stories about themselves as teachers and their teaching practice developed over the year in connection to their storied identities of science learning, and how their storied identities took form as they gained new experiences in the high school classrooms they were in. I analyzed their narratives surrounding two lesson plans- one at the beginning of their lead teaching, and the other lesson close to the end of their lead teaching. The purpose was to see how their professional identity, or their view of themselves as a science urban teacher, developed, and how they leveraged their storied identities in their own teaching.

Significance

The literature on teacher candidates' learning (Putnam & Borko, 2000) states that teacher education programs are the primary influence on who these teacher candidates become and what they become. What the literature does not acknowledge is the potential of using a storied identities lens in mapping their learning and in negotiating how they develop as teachers.

This study puts in the frontline the importance of considering identity work a central focus for researchers and teacher preparation programs, and situating the notion of storied identities in the larger context of teacher learning in order better to understand what shapes teacher candidates' learning to teach journey.

Ultimately, what should be of interest to teacher preparation programs is how and why a storied identities lens may help teacher educators better pinpoint the areas that teacher candidates highlight as priorities in their practice. Thus, what this study suggests is the possible need for teacher preparation programs to understand where these teacher candidates are coming from through their storied identities, and what values they highlight in their teaching, in order possibly to develop a tool that calls out to these priorities. An insight into the priorities that teacher

candidates highlight in their practice, as well as the teaching strategies they use to deal with problems that surface in their practice, could be used by other teacher candidates to reflect on their own learning experiences, as well as serve as a continuum to inform and orient other beginning teachers.

CHAPTER II

Literature Review and Conceptual Framework

In the first part of this chapter, I argue for why an identity lens matters in learning to teach. In the remainder of this review, I use a sociocultural perspective on identity to build an argument for why examining the identity work that new teachers do is an important way to make sense of their development. I first look at how examining new teacher identity development is an important way to understand how new teachers negotiate the tensions they experience as they begin teaching. Then, I try to show how their identity work shapes the practice they work to build.

Then, in the second part of this chapter, I draw upon the sociocultural view of identity to develop a storied identity lay out of the conceptual framework I used in my study. Drawing from how individual stories and narratives allow for a deeper understanding of an individual's lived experiences, I argue that there seems to be a link between storied identities and how they can inform beginning teachers' practices and learning to teach. Using a storied identity allowed me to theorize a linkage between the interns' storied identities and the pedagogical moves they made in their practice, as well as in how they talked about their teacher professional identity development.

Why Identity Matters

Broadly speaking, from a sociocultural perspective (Lave & Wenger, 1991), identity has been framed as an important way to understand learning. While there are many nuanced views of identity from a sociocultural perspective, my purpose here is to highlight why we should care about identity, specifically storied identities, as a central component of teacher learning and

practice.

From a sociocultural perspective, learning is viewed as legitimate peripheral participation, throughout which new members are inducted into a community of practice as novices. To learn in that community means to become "a different person with respect to the possibilities enabled by these systems of relations" (Lave & Wenger, 1991, p. 53). While in their internship, beginning teachers are continually authoring identities and developing certain ways of being while engaging in activities and tasks in relation to their students, to their mentor teachers, and to their field instructors. They are developing these identities through participation in their communities of practice (Lave & Wenger, 1991) and learning to become a teacher and part of a community of practice is situated (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). Therefore, beginning teachers' identities is negotiated through social construct. These identities are related to who the teachers are and who they want to be. They are evident in what teachers do and what teachers say about their practice. Gee (2000) further defined identity as "being recognized as a certain 'kind of person' " (p. 99). How teachers are recognized by their mentors and their peers, and by their students, also plays an important role in their identity formation. In other words, the process of becoming within a community of practice, such as the science teaching community, is reflective of one's developing knowledge and practice within that community, how they see or talk about how that process happens, and how one is recognized by others for their developing expertise.

It has been argued in recent years that teacher development can be understood through the kinds of identity work that teacher candidates do. Learning to teach is often marked by a dilemma. As Volkmann and Anderson (1998), explained some of the challenges new teachers face often center on (1) seeing oneself still as a student while expected to act like a teacher, (2)

wanting to care for students and expected to be tough at the same time, and lastly (3) seeing oneself as lacking in her subject matter knowledge while being expected to act like an expert in class. How new teachers negotiate and reconcile these dilemmas is a part of building a sense of a self as a science teacher. Volkmann and Anderson (1998) described this process of professional identity development as a multifaceted and dynamic balance between one's self-image as a teacher and the teacher character one feels the need to be. Therefore in developing identities, teachers face the on-going tension of developing their self-image and responding to the teacher character they feel they need to be. This tension is manifested in the typical challenges that teachers face, such as the dilemmas Volkmann and Anderson (1998) alluded to. Enyedy, Goldberg, & Welsh, 2006; (Used the construct of identity to investigate how two veteran teachers navigate teaching dilemmas.)

In building on my previous point about the tensions that frame teacher's identity work, other studies point to how different situative contexts, such as teacher preparation courses and field experiences, shape different learning trajectories and professional identities. For instance, Peressini, Borko, Romagnano, Knuth and Willis (2004) described professional identity as a filter for teacher learning that allows teachers to accommodate to the conflicting tensions that arise from managing day to day classroom activities, as well as to deal with decision making and lesson enactment priorities. In their study, the authors attempted to explain the differences in the teacher learning trajectories of two novice math teachers by comparing their student teacher year to their first year of teaching. Their situative perspective take on professional identity development allowed them to explicate the inconsistent enactment of beginning teachers' conceptions of themselves as teachers, and to relate that to "incompatible sets of goals, values, and commitments or conflicting requirements for successful participation in [different] settings"

(Peressini et al., 2004, p. 81). In other words, they proposed that teachers' secondary math learning is better understood by focusing on the individuals and their contexts of practice as learning to teach is framed by varied situative contexts – from their teacher preparation courses to their field experiences.

Sometime the tensions that new teachers negotiate result from differences in how they view themselves and in how others view them. Here it is important to note that identity work includes not only how teachers think about themselves, but also how others view them (Lave & Wenger, 1991; Sfard & Prusak, 2005). In other words, identity is seen as constructed through one's interactions with others and how others shape one's identity. Many studies have looked at how identity can be seen as a set of narrative definitions (Hall, Johnson, Juzwik, Wortham, & Mosley, 2010; Juzwik, 2006; Sfard & Prusark, 2005). Richmond, Juzwick and Steele's (2011) take on this important point in their description of how the identity development of secondary science teacher candidates was shaped by a series of narratives by those that formed the professional communities around them, such as the school and university communities. They viewed identity as "constructed by a) narratives that persons tell about themselves (first-person identity), b) narratives told to the identified person (second-person identity), and c) narratives told about the identified person by a third party (third-person identity)" (Richmond et al., 2011, p. 6). Their approach explained the identity development of teacher candidates as a process constructed by different narratives told by university staff, mentor teachers, and teacher candidates themselves, and how these different narratives lead to conflict and the negotiation among first, second, and third-person narratives.

The identity work that teachers do is intimately tied to practice. Leuhman (2007) argued that developing a teacher professional identity for beginning science teachers entails becoming a

reform- minded science teacher. Moreover, the author stated that "professional identity development as a reform-minded science teacher not only requires opportunities to participate in relevant experiences and the discourse, but to have one's participation interpreted and recognized, as well as valued and accepted, by self and others" (Luehmann, 2007, p. 833). Her work showed that novice teachers have to learn the secondary discourse of teaching, which means taking up the attendant identities and practices. So, not only is identity work related to what teachers know and learn; teacher candidates are also asked to use these new discourses and practices that position them as particular kinds of teachers. In the end, she emphasized the need of teacher preparation programs to recognize that beginning science teachers have identities that run counter to the reform- based pedagogy that is needed for reform-minded science teachers.

In other studies, researchers have shown explicit connections between teaching practice and identity work. Enyeda, Goldberg and Welsh (2006) looked at the teaching dilemmas that two experienced middle school science teachers faced as they implemented an inquiry-based environmental science curriculum. Although both teachers were trained similarly in how to implement the curriculum, they each implemented the curriculum differently. Enyeda et al. (2006) argued that it was each teacher's multiple professional identities that mediated "what it [meant] to be a teacher and how decisions [were] made on the fly during teaching". (p. 16) Therefore, an identity development lens can be used to examine why teachers make certain decisions during their practice.

Other issues have been raised with respect to linking identity work to practice. Some scholars also have described the incompatible images of teaching that beginning teachers encounter in their school setting and in their teacher preparation programs (Zeichner and Tabachnick, 1981; Zeichner, Tabachnick and Densmore, 1987; Ensor, 2001). These conflicting

images of teaching constrain beginning teachers in how they describe and negotiate their teaching identity. Teacher candidates' identities or the beliefs and experiences they bring with them in the learning to teach process but also those identities that get constructed and reconstructed as they learn to teach are an important base that affects what they do in their classroom (Merseth, Sommer, & Dickstein, 2008). As Bullough, Knowles, and Crow (1992) suggested, "Teacher identity…is of vital concern to teacher education; it is the basis for meaning making and decision making…teacher education must begin, then, by exploring the teaching self" (p. 21) Yet teacher candidates still struggle to reconcile the different teacher identities that they encounter in their university methods courses and their school placements (Ronfeldt & Grossman, 2008) and they face teaching dilemmas that run counter to their different identities (Volkman & Anderson, 1998) . Therefore it is important to address teacher candidates' beliefs, their own learning theories, and most importantly the "uniqueness" of their professional identity development (Coldron & Smith, 1999) in order for teacher preparation programs to provide informed, thoughtful reasoning behind the specific teaching practices that these teacher candidates recreate.

How does the urban education context matter.There have been many different definitions for what an urban education context looks like for teacher candidates. The term "urban education" has problematically been used as a proxy for high poverty and minority, often associated with negative schooling outcomes and expectations. For the purposes of my study, I will use Milner's (2012) definition of urban education as learning to teach in an *urban intensive* and *urban emergent* school. Milner (2012) uses the term *urban intensive* for schools that are located in large, densely populated cities such as New York. As a result of this dense population, urban intensive schools suffer from limited resources, and "the broader environments, outside of

school factors such as housing, poverty, and transportation are directly connected to what happens inside of the school" (Milner, 2012, p. 559). On the other hand, *urban emergent* schools are located in not as densely populated cities but nonetheless "do encounter some of the same scarcity of resource problems, but on a smaller scale" (Milner, 2012, p. 559). In this way, to be clear about how I conceptualize urban education, I will limit my definition of urban schools to those that are urban intensive and urban emergent.

Challenges in teacher preparation for urban settings. Although showing higher levels of commitment to teaching in the beginning, new teachers are the ones who are more likely to exit the teaching profession than the veteran teachers (NCATF, 2003). Moreover, the report of the AERA panel (2005) on Research and Teacher Education stated that novice or beginning teachers are " more likely to find their first jobs in hard to staff, low performing, rural and central city schools with higher proportions of minority and low-income students" (p. 6). Yet schools serving high-poverty urban communities are the ones with the highest rate of teacher attrition. As studies have shown, it is usually the new inexperienced teachers, who are not from urban settings and have different cultural backgrounds and experiences than their students, who end up in the most under-resourced schools (Boe, et al., 1997; Darling-Hammond & Sclan, 1996; Chapman and Green, 1986; Lortie, 1975). Moreover, these new teachers in under-resourced schools face more stressful conditions, such as larger class-sizes and few resources (e.g. textbooks and supplies) (Zeichner, 2003, NCATF, 2003). Faced with these challenges and differences, it is no wonder they struggle and consider leaving the teaching field.

Importance of preparing teachers for urban settings. Before becoming successful urban teachers, teacher candidates must develop a base of field experiences in urban schools because most of them come from suburban schools or are not exposed to many urban field

experiences. Teacher preparation programs should consider preparing teachers for how to deal with the "urban cultural shock" because most of the teacher candidates are not from urban settings, and they "live, participate in, and represent different social worlds from the students they teach"(Ladson-Billings, 1999). Additionally, the cultural gap will be an issue for teacher candidates, especially when they represent cultural and social worlds different from their own students (Ladson-Billings, 1999).

Findings have shown an increasing disparity between White, monocultural, and monolingual teachers and their diverse students (Sleeter, 2001; Zeichner, 2003). In addressing the variation of race, for example, teacher candidates might learn to examine their biases and what it means to teach "other people's children" (Delpit, 1995). According to Ladson Billings (1995), one way would be by infusing an equity stance and urban knowledge across the methods courses through culturally relevant and responsive teaching resources that would expose teacher candidates to the premise of culturally relevant pedagogy. These resources might include specific readings that touch on teaching across diversity. Furthermore, teacher preparation programs could push on the importance of complementary field experiences in classrooms that are culturally diverse (Pagano, et al., 1995) as well as the importance of collaborating and shadowing effective teachers of diverse students. By doing their field experiences in diverse classrooms, teacher candidates are thus exposed to much richer experiences and more equipped to teach in diverse classrooms themselves. Not exposing teacher candidates to ways of working effectively with students, and particularly with the instructionally relevant variations among their students, possibly sets them up for failure and for not staying in the field of teaching.

Linking urban context to experience and identity. It is not easy for teacher candidates to negotiate their identities in specific settings and contexts. Agee (2004) and Gomez and Black

(2007) provided examples of two beginning teachers portraying two different approaches to identity. Agee (2004) gave the example of Tina, an African American beginning teacher of multicultural literature, who was beaten by her constraints in the classroom. Agee (2004) mentioned how,

> [Tina] wanted to become a change maker, but had to examine the costs. She explained [however] that she would be perceived by the White faculty as an outsider if she persisted in taking a different path. (Agee, 2004, p.771)

Agee (2004) concluded that Tina was unable to find a safe space to develop her imagined character as an African American teacher. Gomez and Black (2007) presented us the example of Allison, a White secondary science prospective teacher. In Allison's case, her mentor or collaborating teacher helped her think about her teaching as student-centered, thus connecting in this way more to her students. As the authors mentioned, Alison's journey of becoming an 'ideological science teacher' was one that was fluid and critically reflexive. What both Allison and Tina needed were ways of unpacking their identities as beginning teachers. Allison had the support of her collaborating teacher, but Tina ultimately regressed in her reflective trajectory because of the peer pressure from her colleagues. Tina set out initially to be a reflective and inclusive teacher, but she fell victim to the constraint of standard testing. Gomez and Black (2007) rightfully stated the importance of creating

> [opportunities for beginning teachers] to interrogate their practices and to understand how these are meeting or failing students' needs. And, importantly, they need safe spaces with thoughtful and listening group leaders who can help them consider how their racial and cultural identities are implicated in curriculum planning and instruction. (Gomez, 2007, p.2132)

Both Tina and Allison needed better reflective opportunities and settings to understand their own identity, and to be cognizant of it, as they created ways for students to learn. So, it is important for beginning teachers to examine their own identity development and experiences as they learn to teach.

Along the same lines, Ronfeldt and Grossman (2008) reported in their study that student teachers find difficulties in "reconciling the identities they are being encouraged to take on at the university, with the realities of the [urban] schools in which they're placed"(p.5) Most of these teacher candidates are trying to fulfill the identity of a teacher in an urban context and physical space they are not familiar with. As Ronfeldt and Grossman (2008) claim, teacher candidates struggle with navigating different selves or identities in their own classroom, as they are placed in their mentor teacher's classroom, as they learn to teach. Teacher candidates who are placed in urban schools are faced with not only navigating different selves and identities but also of making sense of what it means to be an urban teacher. As they learn to teach in an urban setting, they are faced with navigating challenges such as limited resources and support, but also making sense of a cultural divide between then and their students (Ladson-Billings, 1999).

The studies described thus far all point to the need of examining further teacher development through an identity development lens. There is a need for research about the negotiations and tensions that teacher candidates undergo and how they make sense of these tensions and relate them to their identities and practice.

Conceptual Framing: Storied Identities

In order better to comprehend the process of professional identity development that teacher candidates undergo and its relationship to their instructional practice, I draw from Drake et al's. (2001) construct of storied identities. The authors suggested that "[stories] of identity are

important, both as a means through which individuals come to 'know themselves' and as a framework for guiding action…[where] individuals interpret and make sense of their worlds"(p. 3). Storied identities, therefore, provide a way to understand which parts of their stories as science learners and teachers get expanded, which ones shrink, and how their developing identities take shape. This construct gives insight into the aspects of teaching on which new teachers focus, and it helps to describe the choices they make in teaching their science inquiry lesson. The storied identity framework is instrumental in illuminating how teacher candidates explain and reconstruct their choices of practice in relation to their science teacher storied identity.

The first word, "storied," draws upon the idea and importance of stories or narratives. As Connelly and Clandinin (1990) argued, "Humans are storytelling organisms who, individually and socially, lead storied lives" (p.2). These stories help members make meaning of their culture. They also can help them make sense of their lives at different stages, as well as explain their actions. As Sfard and Prusak (2005) argued, "[narratives] that constitute one's identity, being an important factor in shaping [a] person's actions, will be useful in research even if they communicate one's experiences only as well as human words can tell" (p.14). Therefore, stories are powerful in that they tell the "specifics" behind the history of the lives of people and what shaped their journey.

Kang (2011) defined storied identities as shaped by the different narratives of multiple people that highlight significant "aspect(s) about a [teacher] candidate and his/her practices" (Kang, 2011, p.9). My study aligned more with Drake et al. (2001) and looked at using the storied identities, or the significant stories and narratives of science learning and becoming a

science teacher, from the lens of the teacher candidates to better understand how and why they ascribe meanings to their experiences of learning to teach.

The second word, "identity," refers to the conception of teacher professional identity as discussed earlier (Luehmann, 2007). Professional identities are shaped by not only what teachers know and learn but also by new discourses and practices in different settings that position teacher candidates as particular kinds of teachers. Richmond et al., (2010) viewed teacher candidates' professional identity as including their values ("personal needs and felt obligations that drive their priorities") and positioning ("with respect to communities of practice, that is, school professionals, and the TE program"(p. 27.)

Lastly, linked to the two constructs of stories and identity is learning to teach, where "like teaching itself- is always the process of becoming; a time of formation and transformation, of scrutiny into what one is doing, and who one can become" (Britzman, 1991, p. 8). The process of learning to teach, thus, involves developing a teacher professional identity or, in other words, "being recognized by self or others as a certain kind of teacher" (Luehmann, 2007, p.827). My research is a study of learning to teach, where the focus is on the strategies that help becoming a teacher. I thus conceptualize learning to teach as the process of developing a professional identity and honing in on the tools (including the stories that teachers tell) that new teachers leverage in their teacher learning.

CHAPTER III

Research Design

In this chapter, I discuss the narrative qualitative methodology that I chose as well as the different methods that I used for data collection. I describe the storied identities lens that informed my data analysis. I continue to provide a description of my study participants and the different contexts where I conducted my research. I also explain my roles in the study and discuss issues of subjectivity and trustworthiness. Lastly, I discuss the study's limitations.

Methodology

A Narrative Inquiry Methodology

I used qualitative methodology for my study because much of what teachers do in classrooms follows their beliefs and teacher professional identity, which we can best capture by qualitative methods (Connelly & Clandinin, 1999; Kennedy, 2005; Enyedy, Goldberg & Welsh, 2006). Teaching is highly contextual; therefore, to understand teachers' stories and teachers' thinking and the relationships between them, researchers have to consider teachers' perspectives on the experiences and influences that make them perform in particular ways.

In my study, narrative inquiry was the form of qualitative research that was most useful in understanding the three interns' learning to teach journey in their urban placements. As Connelly and Clandinin (1990) maintained, "[T]he principal attraction of narrative as method is its capacity to render life experiences, both personal and social, in relevant and meaningful ways" (p.10). As a research approach, it served my purpose of understanding how interns constructed events (Reissman, 1993). It provided an in-depth personal view of each intern's thoughts and lived experiences. To achieve this effect, the narrative inquiry research

methodology permitted the use of techniques such as life-history interviews and unstructured interviews to make possible better insight into the interconnectedness of the interns' stories with their contexts and identity developments. Moreover, narrative inquiry allowed capturing the local and particular narratives (Geertz, 1983), as well as the contextual complexity of their stories. Last, their narratives were used as a way to find meaning in their storied identities.

Methods

In my study, when referring to narrative inquiry methods, I mean the use of life history and unstructured interviews with the interns during their internship. Life history interviews and unstructured interviews align with the narrative inquiry methodology because they are based on narratives and stories. These stories provide a holistic approach to gathering a deeper understanding behind the meanings constructed around the experiences of the interns' science learning and becoming a science teacher. Both life history interviews and unstructured interviews as narrative methods allowed me to get insight into the storied identities that shaped their learning to teach science journey. In doing so, the theory of their storied identities was further highlighted, as a tool and lens for explaining the interns' instructional practices, specifically their lesson planning, as well as framing their learning to teach in an urban setting, all of which was originally developed in my pilot study (Ibourk, 2012).

By focusing in-depth on this small number of teacher candidates, I was able to get detailed descriptions of the three interns' nuanced storied identities about their experiences in science learning and teaching, and their relation to their practice. Narrative inquiry enabled me to illuminate the complexities behind their storied identities, as informed by interviews and journal reflections, and it helped answer my explanatory research question about their storied identities.

Participants and Settings

Overview of the program. The Secondary Science Education Internship is part of the five-year teacher preparation program at Great Lakes University. It is a nine-month internship program, from September until May, during which teacher candidates are student teaching for nine months, while taking four professional development courses, three of which they can count towards their masters' degree. The internship counts as their fifth year in their teacher preparation program. Prior to becoming interns, teacher candidates at Great Lakes University have their first field experience during their senior year, or their fourth year. During their senior year, they are placed in a partner school of the University with a high school science mentor teacher, and they have four hours of weekly observation in their mentor teacher's school. As interns, however, their field experiences increase to five days a week, but with a different mentor teacher than their senior year. They prepare lesson plans, design unit plans, and assess students, and they perform all the activities that their mentor teacher asks them to do, from teaching to grading. Apart from their mentor teacher, a field instructor supports the interns, by visiting them at least five times during the semester, and by giving them feedback on their teaching, in the form of five meetings with the intern and the mentor teacher during the year.

Participant selection. My participants were part of the cohort of Noyce scholars that I worked closely with as coordinator of professional development experiences for them. These experiences ranged from science teacher panels to field trips to urban high schools, to observe first year and veteran teachers. The cohort contained three seniors and four interns. I selected three out of the four interns, mainly because they were all secondary science education interns with different backgrounds and experiences (Patton, 1990), while the fourth intern was in elementary education. This purposeful sampling around secondary education interns allowed for

"information-rich-cases" (Patton, 1990, p. 169), while keeping the education year program constant across my participants.

Study participants. The three participants in my study were David, Becky, and Ashley. They all graduated in May 2012 with a biology degree in the secondary science teacher education program, and with an integrated science endorsement, which means that they could also teach chemistry, physics, and environmental science. Moreover, all three interns were also recipients of a Noyce scholarship, funded by the National Science Foundation and given in return for teaching in a high-needs school district. For each year of scholarship received, the student intern commits to teaching two years. A high-needs school district is defined in one of the following ways:

- 50% or more of the enrolled students are eligible for participation in the free and reduced price lunch program.
- More than 34% of the academic classroom teachers at the secondary level do not have an undergraduate degree with a major or minor in the academic field in which they teach the largest percentage of their classes; or more than 34% of the teachers in two of the academic departments do not have an undergraduate degree with a major or minor in the academic field in which the teach the largest percentage of their classes.
- A school system whose teacher attrition rate has been 15% or more over the last three school years.

This is a direct link to the website describing the Noyce program: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5733.

The following is a brief biographical description of each. Table 3.1 below offers a summary of the interns' profiles.

David was a White male teacher candidate. He graduated with a minor in Chemistry. Before joining the teacher preparation program, he worked for three years as a research assistant in a plant biology lab. He enjoyed his work, but felt the need to promote science literacy to the general public; hence his interest in science teaching. He believed that education has helped him become the person he is, and science in particular has helped him to become a critical thinker. During my study, it was in his first year as a Noyce scholar.

Becky was a White female teacher candidate. Similar to David, she also had a minor in Chemistry. She passed three AP exams, including biology and calculus, and she graduated with Magna Cum Laude honors from her high school. These successes ultimately led her to choose a career in education, so that she could offer students similar experiences and similar successes as hers. Her passion for education was epitomized in her favorite phrase: "If you feed a man a fish you feed him for a day, but if you teach a man to fish you feed him for his life." During my study, she was in her third year as a Noyce scholar.

Ashley was a female teacher candidate with a Native American ethnic background. She graduated from Great Lakes University with honors, carrying a 4.0 GPA. She also was a volunteer tutor of an eighth grade student in math for a year, as well as chemistry and physics, at a local High School. She wanted to be an educator remembered for mastering content, but more importantly for innovative teaching techniques and compassion. She wanted science to be more than just facts to her students; she wanted it to inspire inquiry, discussion, and discovery, and

ultimately to be a tool utilized in everyday life. During my study, she was in her first year as a Noyce scholar.

Schools and classrooms. Each of the participants worked at a different high school during their internship year, and each taught four classes.

David did his internship at Western High School, which is located in a large urban Midwestern city. Western High School had 1490 students, of whom 47% were Black, 28% were White, 15% were Hispanic, 8% were Asian, and 1% were Native American. Also, the minority enrollment was 72% of the student body. In addition, about 61% of the students were eligible for free lunch, and 9% were eligible for reduced lunch. Lastly, Western High School had a 60% graduation rate, which was lower than the state average of 76%.

David's main class, was his English as a Second Language (ESL) biology class composed mainly of 9th and 10th graders. The other three classes that he taught were ESL biology (9th/10th grade) , biology (9th grade), and physics (10th/11th/12th).

For her internship year, Becky was placed at Central High School, which is located in a major metropolitan Midwestern city. Central High School had 893 students, of whom 96% were Black, 2% were Asian, 1% were Hispanic, and 1% were White. The minority enrollment was 99% of the student body, which was the highest among the other high schools, Western and Southern. Moreover, 60% of the students were eligible for free lunch, and 14% were eligible for reduced lunch. Lastly, the school's graduation rate of 61% was lower than the state average of 88%.

Becky's focus class was her 9th grade biology class. She also taught another 9th grade biology class and two hours of 10th grade chemistry.

Lastly, Ashley did her internship at Southern High School, which is located in a major urban struggling city that used to be the hub of the auto industry. Southern High School had 1,004 students, of whom 60% were Black, 36% were White, 2% were Asian, 1% were Hispanic, and 1% were White. The minority enrollment was 64% of the student body, which was the lowest among the other high schools, Western and Southern. In addition, 47% of the students were eligible for free lunch, and 9% were eligible for reduced lunch. Lastly, the school's graduation rate of 93% was more than the state average of 76%.

Table 3.1 Profile of the Interns

Intern	High School Placement	Major	Focus Class
David	Western High School	Biology	English as a Second Language (ESL) biology class (9^{th}/10^{th} graders)
Becky	Central High School	Biology	9th grade biology
Ashley	Southern High School	Biology	Honors biology 10^{th} grade

Methods of Data Collection

I collected data from multiple sources for my study. A summary of the data sources is provided in the research design matrix of the study in Table 3.2, and the summary of the data sources is in Table 3.3. Table 3.2 aligns my research questions with the data sources I used and how they helped answer my research questions. Table 3.3 provides a more in depth summary of my data sources and the frequency of data collection, as well as the context behind the data sources and the dates they were collected. I will now describe in detail my data sources.

Participants' reflection journals. As part of their internship experience, the interns were required to write a weekly journal reflection and email it to their field instructor, who read it and

gave them feedback. These wide open reflections revolved around their learning to teach experiences during their internship; they wrote about concerns, issues, or events that happened in their school placement. These reflections allowed me to look at the learning that happened across their internship year, but also at what surfaced as influences and priorities they chose to focus on in their practice. I collected all their weekly reflection journals at the end of each semester.

Written participation in the online discussion forums. As part of their requirement as Noyce scholars, the interns posted a response to a prompt that I, the Noyce coordinator, gave them once a month, surrounding issues about learning to teach in an urban setting. Some examples included: 1) What does it mean for you to develop as an urban science teacher? (Give examples from your field or non-field experiences). 2) What are "tools" or "strategies" that you perceive as supportive in your teacher learning and development? (Give examples from your own field or non-field experiences). The interns were then required to end their response with questions to the other Noyce scholars, and to respond to at least two of their peers. These posts provided me with insights into their concerns and their thoughts about learning to teach in an urban setting. They also allowed me to see how their professional identity and their learning to teach developed from their first posts in September to their last posts in May. I collected all the monthly discussion forums at the end of each semester. In total, I looked at eight discussion forums, but I focused mostly on the first discussion forum, in September, 2012, and their last discussion forum, in April, 2013 around how they viewed themselves developing as an urban teacher.

Interviews. I conducted four narrative style interviews. These interviews were spread out across their internship and included one life history interview, one unstructured interview, one follow-up interview to the unstructured interview, and an exit interview about their thoughts and

stories after their internship experience. All interviews were audio-recorded and transcribed, and they varied in length from 45 minutes to 90 minutes. The life history interviews were conducted in December, 2012, and they focused on the interns' experiences as science learners as well as their perceptions and understandings of urban education. Furthermore, they were used "as a way of understanding [their] ways of constructing their personal and professional realities" (Drake et al., 2001).

The unstructured interviews were performed after their lead teaching in mid-May, 2013. The questions revolved around their thoughts about their two self-chosen lesson plans, one from the beginning of their lead teaching in February, 2013, and one towards the end of their lead teaching in April, 2013, to see what growth or development happened in their lesson planning and teaching. In their selection of lesson plans, the interns were also asked to choose those two lesson plans they felt best represented them as an urban science teacher.

Some of the open-ended questions I asked them were " Why did you select this lesson plan? "or "In what ways do these lesson plans represent you as an urban teacher?" This second round of interviews with the interns allowed gathering data on how they interpreted certain things in their practice, how those things helped in seeing what they thought was important, and ultimately how the things gave insight into how they viewed themselves as urban science teachers.

The follow-up interviews to the unstructured interviews were performed a month after the unstructured interviews, in early June, 2013. They involved asking the interns to elucidate, and, my checking with them any questions that arose from my initial analysis of the unstructured interviews.

Lastly, the exit interviews were also performed in June, 2013, along with the follow-up interviews, due to the interns' availability. These exit interviews were open-ended and unstructured, and I asked them mainly about what their thoughts were after the internship and what experiences they highlighted as important in their learning to teach. (See Table 3.4 for the timeline for the interviews conducted)

Self-chosen lesson plans from their lead teaching. The interns were asked to select two lesson plans that they believed represented them best as urban science teachers. The analysis of these lesson plans provided me with evidence on what aspects of their storied identities they focused on. Moreover, it allowed the interns to share stories behind the development of their lesson plans, the challenges they faced during their creation and implementation, and how they modified their lesson plans to navigate the challenges they identified.

Written reflections on why they chose their lesson plans. The participants were asked to write a one paragraph reflection about how they saw each lesson plan they chose as relevant in representing them as an urban science teacher. Their written reflections gave me an initial idea of their professional identity as an urban science teacher, but it also got at their beliefs about their learning-to- teach experience during lead teaching.

Table 3.2 Research Design Matrix

Research Questions: What do I need to know?	**Why do I need to know this?**	**What kinds of data will answer the questions?**
1. What are the three interns' storied identities of learning science? a. What values do they highlight in their science learning story? How do they view t	To get an insight into teacher candidates' identity development, specifically their professional identity development and how it connects to their developing practice.	1. Weekly reflection journals. 2. Written participation in the online discussion forum. 3. Interviews a. 1 Life history interview. b. 1 Exit interview

Table 3.2 (Cont'd)

themselves as science learners? b. Who do they highlight as important influences in their science learning story?		at the end of their internship year.
2. How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting? a. How do we see their storied identities expand in how they talk about their teaching practice?	To gain an insight into how their storied identities surfaced in their developing practice and informed their professional identity development.	1. One unstructured interview about their self- chosen lesson plans from their lead teaching. 2. Their two self-chosen lesson plans relating to their development as an urban science teacher. 3. The written reflections on why they chose their lesson plans as artifacts for urban teaching. 4. One follow-up interview on their reflections on their lesson.
3. How do we see their storied identities in how they talk about their professional identity development and their learning to teach during their internship year? a. What storied strategies do they name as helping them navigate their learning to teach?		

Table 3. 3 Summary of Data Sources

Method	Context	Format of Data collected & Description	Dates	Frequency and Sampling (Collecting all or a portion)
Reflection journals	Weekly written reflections were emailed to their field instructors from the beginning (September 2012) until the end of their internship (May 2013).	Participants kept weekly journal reflections on their teaching experiences. Handwritten or digital journals	*Fall Semester 2012*: August 2012 to December 2012 *Spring Semester 2013*: January 2013 to April 2013	I collected all their reflection journals from both the fall 2012 and spring 2013
Written participation in an online discussion forum		Participants posted responses to prompts given to them once a month in a discussion forum. These prompts were under the theme of urban teaching. Weblog (online discussion forum)	*Fall Semester 2012*: August 2012 to December 2012 *Spring Semester 2013*: January 2013 to April 2013	I collected all their posts that they participated in, both fall 2012 and spring 2013. In fall 2012, they participated in 3 discussion forums and in spring 2013, they participated in 3 discussion forums.
Interviews	Life history interview	Data for all interviews were audiotaped and then transcribed.	*Fall Semester 2012:* October 2012	I conducted only one life history interview in fall 2012
	Unstructured interview	Data for all interviews were audiotaped and then transcribed.	*Spring Semester 2013:* Mid-May 2013	I conducted one unstructured interview based on their two lesson plans that they chose from their lead teaching that they believed

	Table 3.3 (Cont'd)			represented them as a science urban teacher.
	Follow-up interviews	Data for all interviews were audiotaped and then transcribed.	*Spring Semester 2013:* Early June 2013	I conducted one follow-up interview to the unstructured interview to further check any initial analysis of the unstructured interviews.
	Exit interviews	Data for all interviews were audiotaped and then transcribed.	*Spring Semester 2013:* Late June 2013	I conducted one exit interview asking the interns mainly questions about what their thoughts were after the internship and what experiences they highlighted as important in their learning to teach.
Lesson plans	Part of the science unit plans they used during their lead teaching	Participants designed several science unit plans during their 10-week lead teaching.	*Spring Semester 2013:* May 2013	I collected two of their self-chosen lesson plans from their lead teaching that they deemed represented them as an urban teacher and showed their development as an urban science teacher.
Written reflections on why they chose their lesson plans.		Emailed as a written document.	*Spring Semester 2013:* May 2013	

Data Analysis

I transcribed the life history interviews and generated substantive categories (Maxwell, 2005) to code responses for them based on open and closed coding (Strauss & Corbin, 1998). These substantive categories were inductive and descriptive in nature, and they were reduced as they were analyzed for themes and patterns. (See Coding Tree Figures below.) That is, narrative analysis contextualized the sense-making process by focusing on the person, rather than on a set of themes.

I followed the same analytical procedures I used in my practicum (Ibourk, 2012), which were adapted from Drake, et al. (2001). There were two phases to the data analysis. Phase I data analysis was based on the life history interviews and was referred to as their initial storied identities, since they took place before their lead teaching. For each of the three interns, an in-depth portrait and a case-by-case analysis was drawn based on the eight critical events, the greatest challenge, the positive/negative influences, and the positive/negative alternative futures as science teachers they envisioned that related to their science learning and to becoming a science teacher story. During this phase, I developed initial themes to describe the participants' storied identities. These themes were centered around the main influences on their story as a science learner and becoming a science teacher that seemed to repeat and were salient in each intern's initial storied identity, as well as based on the title they gave their life story. In addition, I looked at the priorities they highlighted in their stories of learning science and becoming a science teacher.

On the other hand, phase II data analysis was based on the unstructured interviews and was referred to as their storied identities after lead teaching. Using Glaser and Strauss's (1967) explicit coding and analysis procedures, I first read the unstructured interview transcripts and

noted what common themes and examples about their teaching experience were connected to their initial storied identities. I also looked at the influences and priorities they highlighted in their lead teaching from the lesson plans, and I looked at how they connected to their storied identities. In addition, I looked at their professional identity, and I and teased out the words they used to describe themselves as teachers when talking about their enactment of their lesson plans. Then, I analyzed the development of their storied identities by looking at (1) the connections that surfaced to their initial storied identities, (2) the influences and challenges that surfaced in their practice that they fixated on during their lead teaching, and (3) their sense-making of these influences on and challenges to their practice and how they connected to their storied identities. Using Strauss and Corbin's (1997) theoretical sampling, I looked for concepts showing the "proven theoretical relevance to (an) evolving theory" (p. 176) of storied strategies.

As part of my analysis, I also referred to their written participation in the monthly online discussion forum, their self-chosen lesson plans from lead teaching, and their weekly journal reflections as narrative texts of their science story as a beginning teacher learning to teach in an urban setting. From these texts, I teased out instances in which their storied identities showed up, and I compared them with the storied identities that emerged in their life history interview and the unstructured interview after their lead teaching. (See Table 3.5 for a break down of the research questions and the plan for data analysis.)

Figure 3.1 Phase I Analysis: Initial Storied Identities before Lead Teaching

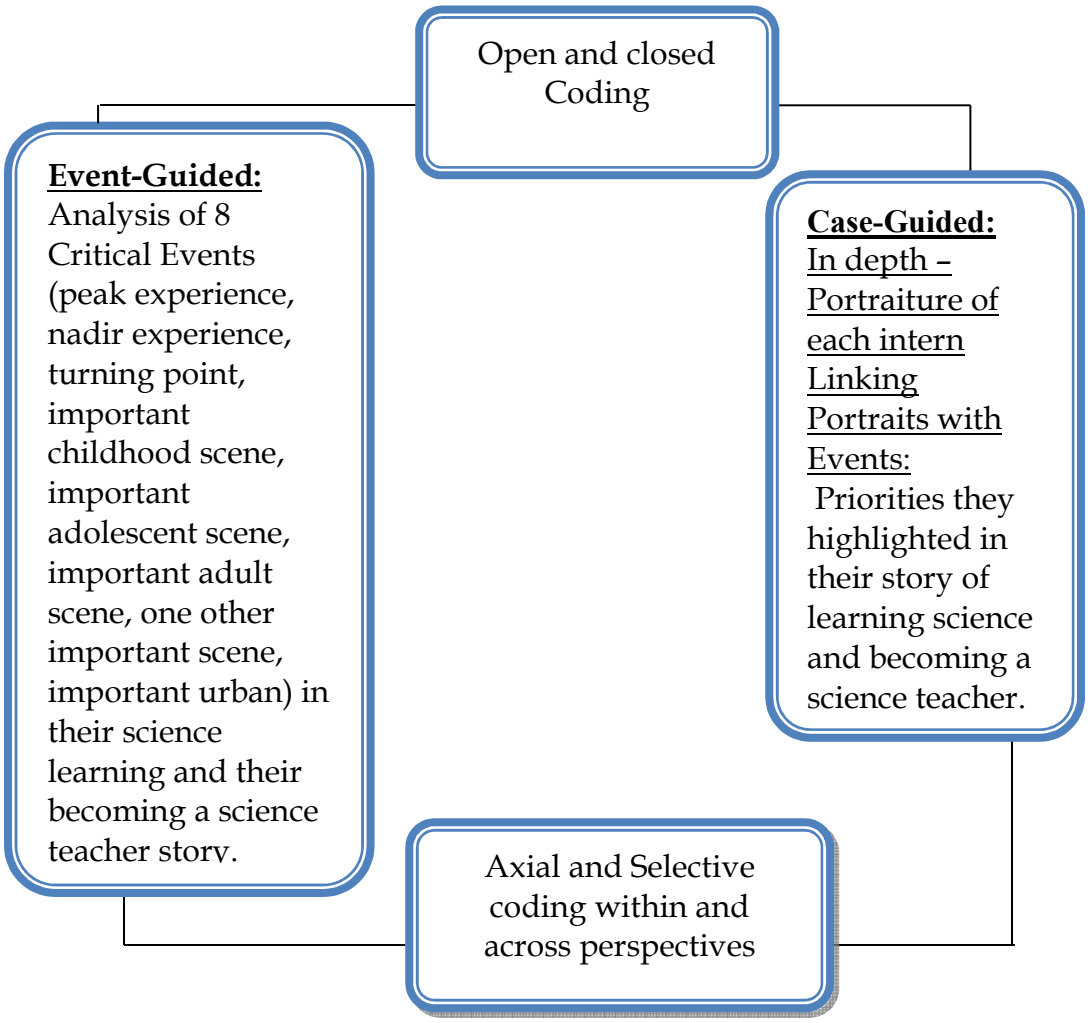


Figure 3.2 Phase II Analysis: Storied Identities after Lead Teaching

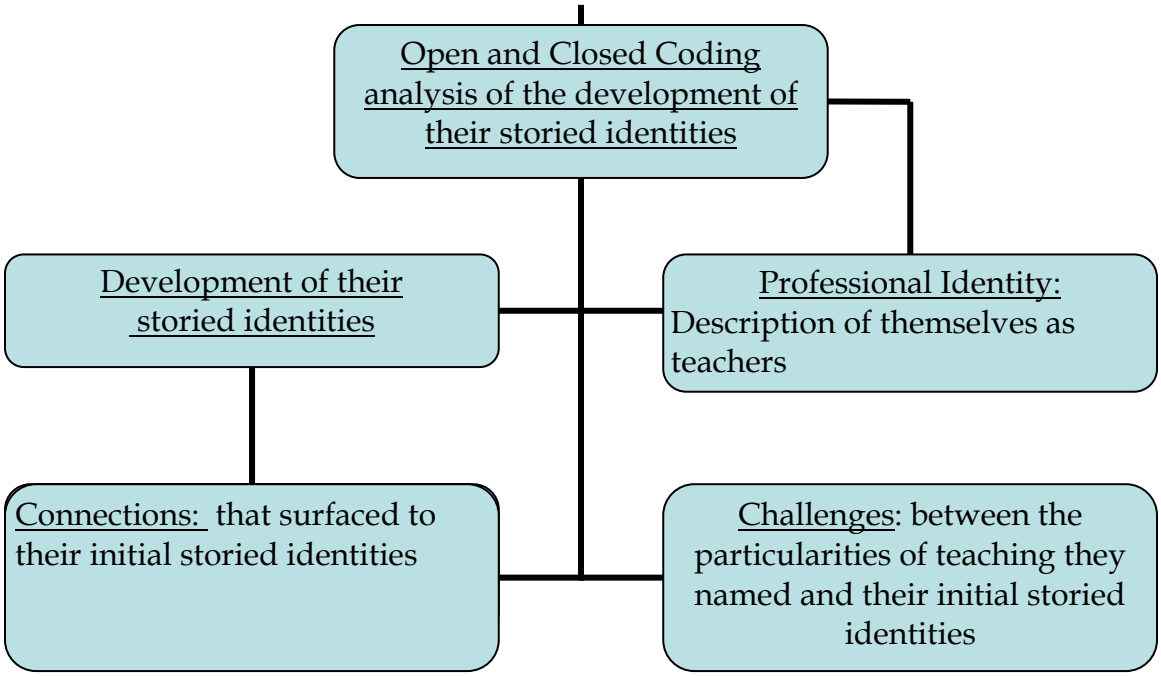


Table 3.4 Timeline for Data Sources: Interviews

Timeline	**Data source**
Fall 2012: December 2012	I. Phase I Data Collection: Life History Interviews based on what they highlighted as: (a) The 8 critical events (peak experience, nadir experience, turning point, important childhood scene, important adolescent scene, important adult scene, one other important scene, important urban education scene) in their science learning and their becoming a science teacher story. (b) The greatest challenge they faced in their science learning and becoming a science teacher story. (c) Positive and negative influences on their science learning and becoming a science teacher story. (d) Alternative futures for their life story (positive future; negative future).
<u>*Spring 2013*</u> 1.) May 2013, after the interns' ten-week lead teaching, which begins at the end of January and finishes in early April. 2.) June 2013	II. <u>Phase II Data Collection Part 1:</u> 1. 1 Unstructured Interview after lead teaching based on their 2 chosen lesson plans from their lead teaching. 2. 1 follow-up interview on the unstructured interview **<u>Lead Teaching</u>**: During a 10-week period, between the end of January and the beginning of April, the interns taught and performed everything a practicing teacher would do, from planning and instructing to grading.

Table 3.4 (Cont'd)

1.) End of June 2013	1. <u>Phase II Data Collection Part 2:</u> 1. 1 Exit interview at the end of their internship year to get at their thoughts and experiences on their internship program and about their learning to teach journey.

Table 3.5 Research Questions and Plan for Data Analysis

Research Questions	Types of Data	How will the data be analyzed? How does the data answer the questions?
1. What are the three interns' storied identities of learning science? a. What values do they highlight in their science learning story? How do they view themselves as science learners? b. Who do they highlight as important influences in their science learning story?	1. Weekly reflection journals 2. Written participation in the online discussion forum 3. Interviews a. One life history interview b. One exit interview at the end of their internship year.	Using storied identities as a lens, the data was coded for: 1. Priorities that they highlighted in their story of learning science. 2. Priorities in their teaching that they highlighted in their story of becoming a science teacher. 3. Names they gave their story as a science learner and beginning teacher. 4. What their storied identity revolved around based on the 8 critical events (peak experience, nadir experience, turning point, important childhood scene, important adolescent scene, important adult scene, one other important scene, important urban) in their science learning and becoming a science

Table 3.5 (Cont'd)

		teacher story education scene.
2. How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting? a. How do we see their storied identities expand in how they talk about their teaching practice? 3. How do we see their storied identities in how they talk about their professional identity development and their learning to teach during their internship year? a. What storied strategies do they name as helping them navigate their learning to teach?	1. One unstructured interview about their 2 self- chosen lesson plans from their lead teaching 2. Their two lesson plans from their lead teaching 3. One follow-up interview to the unstructured interview.	Looking for examples of how their storied identities showed up in their practice. Specifically, I looked for: 1. Storied strategies that connected back to their storied identities that they enacted to make sense of the challenges that surfaced during their lead teaching. 2. Challenges that they fixated on in their lead teaching. 3. Instances of where their storied identities surfaced in the unstructured interview about their two self-chosen lesson plans.

Role of the Researcher and Subjectivities

I addressed my personal subjectivities as a researcher by clarifying from the outset where I stood in terms of my study and my participants. I worked closely with my participants in that I was involved in creating professional development experiences for them that ranged from teacher panels and conflict resolution workshops to fieldtrips to observe different urban schools. I had known and worked with Becky for three years, since she was a junior. The other participants, Ashley and David, I had worked with and known them for a little less than a year. I felt that with Becky, I had a closer relationship, and that she saw me as a mentor; and she sought my advice via email about issues that came up in her school placement.

All my participants were given a consent form and were aware that data was being collected for a study about teacher identities and teacher learning. As they told me their storied-identities, I got to know them a lot more. At all times, I remained a legitimate listener to their stories and collector of data. There were times, however, when I did offer them advice about classroom management when they asked. So, this closeness to my participants required that I pay attention to my personal subjectivities in my analysis of their development as beginning teachers. In order to increase the validity of my study, I made sure to address my personal biases by engaging in member checking with my participants and in peer review, or sharing my thoughts and findings with my advisor, committee members, and the participants themselves. This is where I will turn my attention next.

Validity. Maxwell (2005) provided a checklist of eight strategies that helped test the validity of my conclusions. Out of the eight strategies, I used four, which I explain as follows.

Triangulation. I used multiple sources of data, which included interviews, journal reflections, and discussion posts. I repeatedly compared and cross-examined these data to help me reach my results.

Searching for discrepant evidence and negative cases. As mentioned before, I periodically solicited feedback on my analyses and findings from my advisor and members of my dissertation committee, in order to get an outsider's perspective on the interpretation of my findings. I used a comparative analysis method (Corbin & Strauss, 1994) that enabled me to compare the multiple sources of narrative data across the three interns. By doing so, I was able to address any negative and disconfirming evidence against my working hypothesis.

Respondent validation or member checks. After my first final round of analysis, I asked my participants their views and their thoughts about my analysis, to validate my interpretations further.

"Rich" data. The life history interviews and the unstructured interviews provided rich data. I describe in detail my participants' narratives and storied identities in the following chapter.

Limitations

Having three participants limited the scope of this study to those teacher candidates who were Noyce scholars and committed to teach in a high needs setting. Therefore, this study is not generalizable to the larger teacher candidates' population. It aims at examining how they moved from being a learner to being a teacher. Their stories of identity offer a deep insight into their awareness of how their identity developed as they transitioned from learner to teacher, and how it transferred into their practice.

Another possible limitation of the study is the possibility that the interns might have limited what they revealed to me in the unstructured interviews due to my dual role in being coordinator of their professional development experiences and in developing a closer personal relationship with them. In my role as coordinator, I interacted and worked with one of their teacher preparation program instructors, which might have limited what they chose to reveal to me during the interviews. In order to address this issue, I made sure I let the interns know that the goal of the interviews was to share mainly their stories, thoughts, and experiences about how they became science learners and teachers, and how their internship year might have been shaped by their storied identities.

Lastly, another limitation of this study was a methodological one. My study explored the interns' developing practice, focusing mostly on the learning to teach done during their 10-week lead teaching. This stance emphasized the individual teacher's growth within the spaces, experiences, and places that teachers develop for their learning over time. I was aware that that was a short period of time that limited my study to their practices that happened mostly during that time and was limited to their school placement.

Ethical Issues

Ethical issues in this study were minimal. Pseudonyms were used and participants were given the choice not to answer questions and to withdraw from the study at any time, without any penalty. There was a risk of a loss of privacy inherent in participating in the research, because students and faculty in the Department of Teacher Education might figure out their identity. While the direct benefits of participation might not be recognizable, allowing teacher candidates to reflect on their experiences, perceptions, and understandings of professional identity

development as a science urban teacher can be of great personal satisfaction and might offer strategies for enhancing a continuum that would positively inform all the Noyce scholars.

CHAPTER IV

Getting to Know Becky, David, and Ashley

In this chapter, I share the interns' narratives about learning science and choosing to become a science teacher. As I share their stories, I use a "supportive" voice, which brings the interns' "voice into the limelight (...) creating a self-reflective and respectful distance between [my researcher voice and their voices as narrators]" (Chase, 2005, p.665). As I listened to their stories, I found that there were salient themes about their learning science and how they talked about themselves learning science. These themes became their storied-identities because they were what they honed in on and what they repeated in their stories of science learning. These storied identities revolved around how they made sense of what it meant for them to do science, and how that played out for them in how they related it to learning science.

I begin by looking at their science learner story, and I focus on the identities that were shaped by these stories. Through telling these stories, I hope to show how these stories portray each intern's identity as a science learner. In addition to these stories, I point out the people that the interns highlighted as personal influences in their storied identity as a science learner. These people were important in their identity development as science learners, because their identity was shaped by people they highlighted in their lives as helping them recognize themselves as the kind of science learner they identified with (Gee, 2000). Lastly, I talk about their stories of choosing to become a science teacher in an urban setting. Ultimately, their storied identities helped in explaining how and why each intern's connections to science grew over time, because their stories delved into the meanings and feelings they ascribed to their experiences.

Becky's Portrait

Storied Identity of Learning Science: Valuing Ideas and Scientific Ways of Doing Things

Becky's storied identity of learning science centered on her valuing "doing science" that helped her connect the scientific ideas she learned with the world around her. For Becky, part of "doing science" was being part of hands on experiences that afforded her opportunities to link scientific concepts to the world around her. As she engaged in the "doing of science," Becky learned the importance of problem solving, or starting with a prompt or a problem that would make science learning more meaningful to her.

Becky grew up in a White rural "safe" area in the Mid-West. Her parents divorced when she was five years old. When she went to elementary school, her family was the only divorced family at her parochial, Lutheran school. Feeling left out, Becky vividly remembered how she told her classmates in her second grade class that divorce was "cool," and that everyone should get one. Thinking back, she laughed about it because her teachers must have thought "that little blue-eyed spitfire needed a lot of therapy back then."

When Becky talked about her mom, I remember how her blue-eyes lit up with love, pride, and joy as she described her as "really hardworking, really determined." Her mom raised her while going to school to get a pharmacy degree, and she was able to help Becky with many of her math and science classes. With her mom's background in science, Becky remembered that she felt supported, which made science easier for her in school. With her mom's help in science, Becky had positive experiences in science, and she did well in her classes, which reinforced her belief that she enjoyed science more than any other subject, and it became this "cool class" for her to study.

She described that it was at the tender age of eight when her inquisitive nature and interest in science was spurred, when her mom involved her in planting their garden. Becky fondly remembered how she and her mom took one part of their garden that summer and used it to grow vegetable plants. She loved watching her mom tend to the garden, and she was interested in helping her out. That summer, she and her mom patched out a part of the garden to plant vegetables. Becky was excited because she got to pick what kind of seeds to plant, and she was able to water them and to make sure they got the right amount of sunlight. She loved that experience because it meant she could spend the time with her mom, but also participate in a hands-on experience of using science to understand the world around her. Becky remembered,

> I wasn't sure how these plants are going to turn out and how they were going to grow. But you know kind of got to experiment a little bit and see what things grew where in the yard and I just found it to be really exciting and…it was kind of a responsibility…that I had undertaken and I would make sure every couple of days to go out and weed it. And check on them. But after doing that for a summer I think like in the fall I must of had like a science fair or something…it was something like studying the effects of photosynthesis not at an advanced level obviously…I was able to reduplicate the plants under certain conditions and talk about it a little bit. I really got a lot of enjoyment out of it. It was just…I like doing that more than say reading my social science textbook or something.

For Becky, being able to interact with the plants growing in her garden helped her develop the scientific knowledge she needed to understand what were the best conditions for her plants to grow. Becky was excited to be able to choose the seeds she wanted to plant, to figure how much water the plants needed, and to make sure she removed the weeds every couple of days. The garden became her responsibility. Becky was not sure how her plants would turn out, and that in

itself for her was a scientific experiment. After being accountable for the garden all summer, she was able to apply her garden experience to her third grade science fair, where she chose to study the plants' ability to do photosynthesis. She loved her science fair project, for she was able to grow the same plants under certain conditions, see the outcomes, and share what she learned about them as well with her classmates and teacher.

Becky's love and enjoyment of "doing science" and connecting a scientific perspective to her everyday life showed up in her high school extracurricular experiences. At that time in high school, she wanted to be a veterinarian because she loved animals. When she was in ninth grade, she was the team varsity captain of the equestrian team. There was a time that year when her horse hurt one of its hooves. Her horse had stepped on something sharp, and it got infected. This is when Becky turned to science to understand more about her horse's infection and how she could use scientific knowledge to help her horse heal. She remembered,

> I was really sad for my horse. I didn't want it to be hurt but I liked…to go out there and soak up the foot in different solutions and I would read on different things and read books on what to do what kind of antibiotics to give it. [Call] the vet, talk to the vet about different things…I really liked this experience for me was more science related because I was…thinking more along the lines of… medicine and…healing…but eventually my horse did get better and again I just thought…a sense of accomplishment and I got to go out to the barn and everything. Check on it; give it the right amount of antibiotics and…I just thought that was really cool. I like seeing the cause and effect. You know you do this and then this happens and you know maybe that you try this and it doesn't work. But either way you are working to getting a solution and I really liked that part of it. But since that point, I probably decided not to become a vet.

Becky really enjoyed taking care of her horse, and it became a "science –related" project as she found herself soaking her horse's foot in medicinal solutions that she would further investigate. She wanted to be a veterinarian at that point, and being part of her horse's healing made her seek out ways that would help her understand how best to help her horse. She also got more involved in her horse's healing by reading books on the different antibiotics that would help her horse heal faster. Becky loved experimenting with using different solutions on her horse and waiting to see the healing effect it might have. She felt a sense of accomplishment when the scientific ideas she sought out from her reading and experimenting with scientific healing ideas worked on her horse.

Another story she told about wanting and loving to use science to understand and link it to the world around her was when she went through physical therapy for her own injured foot. Becky was very active in high school. Not only was she the team varsity captain on her equestrian team, but she was also the team varsity captain on her soccer team. She recalled how she injured her foot one time, and she tore a couple of ligaments in her ankle when she was a senior in high school:

> After I had this injury, I went to different doctors and…for different reasons, one would take an X-ray, one did like help me wrapping and stabilizing my foot. And in physical therapy, they get the motion back and those things, but …I was really happy that I [got] to see all these professionals working these different fields to…help me get better. And I thought it was so cool because all of them had… also studied science and they were just knowledgeable and experts on different things. And…even after getting their college degrees… and training... hey could really apply it to help me get better and I thought that was so useful and so important. So...I don't know for some reason I…hold science on a

> high pedestal. So I just feel like there is just so much you can do with more knowledge and more technology…But I just really enjoyed seeing all the different technologies out there and…Just learning from different people how the body works and heals and things like that and that was pretty cool.

Becky was fascinated in seeing how science was interconnected with her life and how it helped her not only understand how her foot healed, but also was at the heart of her healing. It was science that was behind her physical therapy for her injured foot, which made her feel more enjoyment in learning more about science. She thought it was "cool" that it was the doctors' science knowledge that contributed to her healing, but it also added to her finding more enjoyment in learning science.

Becky described that her " turning point" of learning science was when she took physics as a senior in high school and learned science by engaging in solving a physics problem. Becky remembered how her physics teacher would mostly prompt labs around a problem or a question that needed to be solved. Then Becky would engage in figuring out the solution to this problem in as many ways as possible, by using the formulas she learned in her physics class:

> [Every] Friday we had to do these experiments kind of mini labs and she would prompt…some sort of problem and give us some sort of materials and …we would… come up with a way on our own to… solve this physics problem and the first couple Fridays we had this, I couldn't find the creative ability in myself to solve the problems but. There was one lab maybe like four five weeks in the school year that me and my partners were able to… really think through the problems and …I just remembered looking at all my items and trying the range in a certain way to… get through the answer…. We ended up doing really well but…that was a turning point in science for me

> because I realized that up until that point a lot of my science classes had been [about] memorize this piece of information and then regurgitate it on the test but this point I was… realizing that… it's a lot of problem solving. And I really liked the challenge of you know looking at a problem and trying to come up with a solution.

During her physics class, she enjoyed starting with a prompt or problem because that got her engaged in solving it. Starting with a problem and understanding the problem also became an authentic motivator for Becky to learn more about science. Her physics class was a turning point for Becky in her science learning experiences, because she came to realize that a lot of her science classes had been structured so that her learning would be assessed as "regurgitating facts" on a test, instead of finding a solution to a problem by applying the science formulas she was learning in her physics class.

People who Influenced Her Science Learning Story

Helping her appreciate even more learning science as "doing science" and engaging in problem solving were her science education college professor and her physics high school teacher. She credited her professor with teaching her that you "learn science best by doing science." The class that she took with her professor was about ways of teaching science labs in secondary schools. Her professor's style of teaching her science left a huge impression on her. Becky remembered,

> You would go into class and do a lab that you could potentially do with your students as a high school teacher. And then there were a lot of opportunities for us to develop our own experiments, investigations, revise her experiments that she had us do. So it was really hands on. [She] taught me that you learn science best by doing science. I loved her class. It was very hands on. After leaving her class I thought, "This is how I want to teach."

So Becky definitely recognized how her class helped her learn so much more about learning science as "doing science" and how to teach science that was centered around inquiry and labs. She felt that she learned more about science in her class than she did in her other science college classes, where professors would make "zero real world connections" when teaching the content.

Becky's physics teacher structured her class in a way that Becky felt she could learn science and was supported in her learning with experiences such as labs, tutoring, and extra practice for solving physics problems. She remembered,

> She had us do labs and you learned through, like, she did after school tutoring with us at a local coffee shop. And her lessons were all really engaging and interesting. I learned so much in that class. Because when I got to college, I was extremely prepared. I didn't take AP physics in high school, this was regular physics. But when I got to college physics, I was really familiar with what we were doing. It was challenging but I was way more prepared than a lot of my peers and I was really thankful to her. I was like, "Wow, I really understand this stuff because of you. You really structured your class in a way that we were really learning."

Becky's high school physics teacher pushed her to appreciate the scientific ways of doing things, by helping her view science learning as a way of solving a problem, and that is where her learning could be truly assessed. See Table 4. 1 for Becky's salient points in her storied identity of learning science.

Table 4.1 Becky's Salient Points in Her Storied Identity of Learning Science

Aspects of Her Storied Identity	Salient Points in Becky's Story of Learning Science
Valuing "doing science" that helped her connect the scientific ideas she learned with the world around her	Doing science that was interconnected with her life: • Planting the garden with her mom. • Helping her horse in his healing. • Understanding the injury and the science behind the healing of her own foot.
Learning science by solving a problem	Her AP Physics teacher made her recognize that learning science for Becky was also being able to solve a problem using physics formulas she learned and not just "regurgitating facts."
People who influenced her science learning story	Becky's AP Physics teacher, her mom, and her Science Education professor in college.

Choosing to Become a Science Teacher in a High Needs Setting

Motivated by her love of engaging in scientific ways of doing things and in problem-solving- based science learning from her physics teacher, Becky decided to pursue science as her major in college. She had started out as a premed student, and her humanitarian ideals of helping those less fortunate made her look into the health care system. Yet, the more she investigated the health care system, the more of a "bad taste" it left in her. She was disapointed by how the health care system was more about making profits than providing people with the health care they need. She said,

> I feel like I saw too many of my friends going to health care to make money and not to help people and I didn't like that. I think that's a service field you should be there to help people. So the more I kind of got to thinking I thought well umm I want to teach because I think if you provide a good education to people you can't take that from someone.

Becky's belief that everyone should have the same opportunity to get to a certain place of success and a way of life was what made her choose to become a science teacher in a high-needs setting. She considered herself to have been successful academically. She had passed three AP exams, including biology and calculus, and she had graduated Magna Cum Laude. These academic successes led her also to choose a career in education so that she could offer students similar positive science learning experiences.

Becky grew up in a city of predominantly White people that was mostly rural. In middle school and high school, Becky's school played sports against different schools in the neighboring cities. She remembered seeing the blatant differences between the facilities as well as the teachers. She felt that a lot of the teachers in her school were younger and more motivated, while the teachers in the urban schools she played against "seemed older, frustrated and tired." For

Becky, it was "unfair" that she was getting these better opportunities and more experiences just because of the school she went to. It was this "reality-check" that was really upsetting for her and that became the "emotional draw" to wanting to make a difference.

People Who Influenced Her in Choosing to Become a Science Teacher in a High-Needs Setting

Becky highlighted two people as influencing her in choosing to become a science teacher. Her high school physics teacher was not only an important influence in her science learner story but also in her choosing to become a science teacher. Becky had named her physics teacher as someone she aspired to be a lot like, and as her "role model" in what a good teacher would look like for her.

> I can think back to a really great teacher I had in high school, my physics teacher. She was organized, she was strict, her class was challenging, she really pushed us, you couldn't ever turn in homework late. Like, her rules and expectations were really high. Her tests were very challenging. But they weren't impossible – I mean, she didn't set us up for failure, either. She didn't write a test that we couldn't do well on, it was just a test we would have had to put in considerable time and effort to learn the material…She was definitely, when I decided to go into teaching, she was always the person I thought back to, like I want to be like that.

Becky also named one of her instructors in a Teacher Education class as the other person who influenced her in choosing to become a science teacher. When Becky switched majors from Premed to Secondary Science Education, she took a required Teacher Education class about how social inequality affects schooling and how schooling affects social inequality. Becky described how her instructor "opened her eyes" to social inequalities in school that she had not considered

before, and that she had not experienced growing up in a rural predominantly White setting. Becky went on to say,

> So…after I took that class I was like, "Okay, I have to go into teaching now." I'm so grateful to [my diverse university and class]. I never could have known when I was in high school and choosing to come [to this university], but it was the best decision I've ever made.

See Table 4. 2 for Becky's main points for choosing to become a science teacher.

Table 4.2 Becky's Main Points for Choosing to Become a Science Teacher

Choosing to Become a Science Teacher	Main Points
Turning point of becoming a science teacher	When she took a Teacher Education class about the social inequalities in education.
Turning point of becoming a science teacher in a high-needs setting.	When she took a Teacher Education class on the social inequalities found in school settings.
People who influenced her in choosing to become a science teacher in a high-needs setting.	Her physics high school teacher and her instructor in her Teacher Education class about Social Inequalities in Education.

David's Portrait

Storied Identity of Learning Science: Being Scientifically Curious and Valuing Scientific Argumentation and the Relevancy of Science in His Everyday Life

David's storied identity of learning science revolved around his being scientifically curious and valuing the relevancy of science in answering questions pertaining to his everyday life. At the heart of this, he believed in being a critical thinker by engaging in scientific argumentation or reasoning and using research, as well as scientific claims, to answer these questions until it "made sense" to him.

I remember the first time I met David. As he walked into the room, his towering height and his pronounced long red beard made him stand out easily, and made me think of an existential philosopher. He struck me as the quiet introvert type, and later on, in our many conversations, he would describe himself to me as someone who had a "tendency to fade into the background in an uncomfortable situation."

David grew up in a Mormon family and lived most of his life in a suburban area in the Mid-West. His dad was a salesman, and his mom had various odd jobs. He remembered, "The closest job to science she had was a dental assistant for a little bit." He spoke little of his parents, and I would later find out why. By the time he was in high school, they both had passed away.

When he was in second grade, David's curiosity about how and why things worked was sparked. During that summer, he and his dad were interested in aircraft, and they "built a model together of a P-38, which is a fighter plane from WWII." They would go to airshows together, and David would be fascinated as he observed the contrails, or the clouds that come behind the plane during the air show. When he asked his dad about them, his dad was using science words

like “gas.” For a second grader at the time, David thought that gas meant gasoline, and that it was a stream of gasoline falling out of the plane. He did not realize that his dad was describing a form of a state of matter. David described this experience to me as his “first experience of seeing things [that piqued his scientific interest] and explaining something that happens in the world scientifically.”

Part of being scientifically curious and a critical thinker was systematically trying to figure out things out. For David, “what always kept [him] curious in science [were] the things that kind of blow your mind.” He talked about using the scientific method as one way of figuring out scientific concepts in a systematic way. For David, the process of the scientific method involved starting with a question and using scientific claims to answer this question. One story that stood out to David was his first introduction to the concept of gravity as a ninth grader. He had a teacher who said that if you were to take a bullet and hold it next to a gun and then fire an identical bullet at the same time, that both bullets would hit the ground at exactly the same time. David was skeptical at first. He was not convinced and, he questioned the how behind it. He recalled that

> I'm not sure exactly when I finally became convinced of that fact, but she explained how gravity is still pulling down on the bullet the same, whether it's being fired off or dropped. That's one of those moments where you learn something that isn't intuitive. For some reason, people intuitively think that the bullet that's being fired would fall at a different time. But, through using a scientific method and doing experiments or really studying a system, you can actually figure out something that is not common sense.

This story represented to David what he really liked about learning science – when he had these experiences of someone saying something and it “just completely blows [his] mind.” It made

him scientifically curious, to want to investigate more and to find out the answer until it "made sense" to him. David was impressed by how basic level physics that may not seem "common sense" explained how gravity was the driving force behind the two bullets being pulled down the same time. He had initially and intuitively thought that a bullet that is being fired would fall at a different time. Through studying more about gravity and doing experiments in his class, it "made sense" to him that an abstract concept that is not necessarily intuitive could be explained through the science explanations he researched in his class.

While he took an English class as an eleventh grader, David found himself resorting to using scientific argumentation and explanations to prove a point in a paper he wrote about evolution and creationism. By scientific argumentation, David meant using scientific evidence and logic in his debate about evolution and creationism. It also further made him value how science can be relevant in helping answer questions in his other non-science classes, such as his English class.

What further sealed his view of science as instrumental in explaining arguments was reading a book for his philosophy senior class that gave an argument against the existence of free will. The book struck a chord with him, but it made sense to him only because he was able to bring in what he learned from his chemistry and biology classes. He remembered that

> It was actually really shocking that I was sitting there and thinking about it and all of a sudden I was like, "Whoa!" It kind of startled me when the logic of it kind of stuck in my head. That was important because it was a philosophical argument, but it relied heavily on science to explain.

By the end of high school, David realized then that he went "from learning science as a lot of facts to actually learning the process that goes into making scientific claims and the process that goes into scientific discovery." For him, learning science was grounded in a process that relied on using scientific evidence-based explanations to answer empirical questions until it "made sense" to him.

For David, learning science became also about using scientific knowledge and critically analyzing it, and the relevancy of that scientific knowledge to his life. He remembered how he had gone to see a doctor who diagnosed him with Marfan Syndrome:

> It's basically a problem where you have a defect in a gene called fibrulin 1, which goes for the protein fibrulin. And it strengthens your connective tissues. So people with this condition have joints that are really flexible, they tend to be really tall – I don't know exactly why – but they also have terrible heart conditions because all of your body has connective tissues that are holding it together. So the big problem is that your heart, the mitral valve in your heart, can have an aneurysm by the age of 25.

So David had previous knowledge of Marfan Sndrome because he had taken a genetics class, and they had talked about it in that class. He also spent the whole summer researching it. Because David was scientifically curious about his own condition and had a lot of knowledge about biology, he was able to see the relevancy of this knowledge in understanding what his doctor was talking about. David, though, did not agree with the doctor and knew that he did not have Marfan syndrome. He had regular checkups from the pediatrician up to the age of 12, and it was never detected. So, he felt "empowered to think critically about [the] diagnosis [his doctor] was trying to make" about his own health because of his science knowledge. He appreciated how he was

able to leverage the scientific knowledge about biology and genetics and make it relevant to his own health condition in helping him understand his symptoms.

By the end of his college science learning experiences, David firmly believed that science was relevant to everyday life occurences and can be used to help solve problems in society. He remembered how one of the students he was teaching as an intern questioned him why she was forced to learn biology when she was not going to be a doctor.

> I had a student on Thursday – she wants to be a journalist and she's like, "I'm not going to be a doctor, I'm not going to teach biology, why do I want to learn this?" And I tried to explain to her, "Are you a living person? What we're learning, even though it seems really weird, is what is going on inside of you. This has a practical implication in your life." I tried to say, "Do you know what cancer is?" Because we're learning mitosis right now. And she's like, "It's an illness." And I said, "Do you know what kind of illness it is? The reason it's happening? It's when your cells just divide out of control. If you get cancer, the drugs that they're going to give you are interrupting the process of division. So if you remember back to ninth grade biology and what I was trying to teach you, it might help you make medical decisions."

He tried to explain to her how science has a "practical" implication in her life, and he pushed her to think deeper about what she was learning about the process of mitosis.

So, David's own science-learning experiences influenced how he viewed science. He had learned science mostly by blending different methods from reading about how gravity pulls down a bullet to actually applying the concept behind the idea. For David, the important science experiences were "when you actually do inquiry and apply the knowledge."

Learning Science as a Trial of Errors

It was not until he worked in a plant biology research lab for three years during his college years that David learned how "the scientific method isn't a straight linear shot." As much as his work in the lab added to his science learning experiences, there were times when he felt "unsupported," because the "objectives and[his] purpose in the lab were not spelled out." That is, David realized that his frustration stemmed from how he was not explicitly told that science experiments may go through many trials and errors before they succeed. As a result, the many times he failed doing the experiments taught him the "importance of sticking with something." In fact, David was so resilient that he stayed working in the lab for three years, until he became the primary person on the research project. By being in the lab, David also learned how scientists "do research, [and] how a lot of it is structured around developing arguments and finding evidence for [these] arguments." His lab experience gave David a deeper personal appreciation and a more practical connection into the process of constructing scientific knowedge.

People Who Influenced His Science Learning Story and Choosing to Becoming a Science Teacher

Initially, David only spoke of his dad as the one person who was a personal influence in his science learning story. His professor was also another person, other than his dad, that David highlighted as influencing his science learning story, but also his reason for choosing to become a science teacher. Working in the lab in college, David had admired the dedication that his professor, who also was his academic advisor, had in his work. It transferred to him a sense that he wanted to look for something that he could get that excited about; he realized it was teaching.

> He generally has good enthusiasm for what he does. And I appreciate that…I could see how he does it and how encouraged he is by his own love for the subject and for the stuff that he does…And it transferred to me in a sense that I decided to look for something that I could get that enthusiastic about. And it doesn't necessarily have to be computational biology; it could be teaching biology. That would still be a worthwhile thing to do.

David admired how his professor would get so encouraged by his own love for the subject, and David aspired to have that kind of passion and dedication in his teaching. So, David's professor was a major influence in David's decision to teach biology. See Table 4. 3 for David's salient points in his storied identity of learning science.

Table 4.3. David's Salient Points in His Storied Identity of Learning Science

Aspects of his Storied Identity	**Salient Points in David's Story of Learning Science**
Scientifically curious & critical thinker	He liked to question how things work around him. Using empirical observations of the world around him and evidence-based explanations to build scientific knowledge that made sense to him.
Valued engaging in scientific argumentation	Engaging in the scientific method. Using the step-by-step process that goes into making scientific claims. Using knowledge learned and critically analyzing it.
Relevancy of science to his life in answering questions around him	He believed that science was relevant in everyday life and can be used to explain why things are the way they are.
People who Influenced his science learning story	David's dad. David's professor in the lab he worked for three years.

Choosing to Become a Science Teacher in a High-Needs Setting

David's views of science learning percolated into what he highlighted in his own practice as a science teacher. His journey of becoming a science teacher started at the end of his freshman year in college. David had started out thinking that he was either going to be an anthropology or a philosophy major, because he felt that he was not going to do well in math classes and hard science classes. It was not until he took an interdisciplinary science biology (ISB) class and an interdisciplinary science physics class (ISP) during his freshman year that he "developed an understanding that [he enjoys] science a lot more than [he enjoys] the other subjects." So David studied Plant Biology, intending to become a research scientist. His position as a technician in a research lab for three years had given him opportunities to work with scientists and to participate in science research at its various stages of development- from collecting data to conducting experiements.

It was not until he took a Teacher Education class as one of his classes that he had his first teaching experience in an after-school tutoring program in an urban school. He was struck at the time to see how he was paired with a student from Burma to teach him formal logic for a geometry class, when this student was still struggling to learn English. He then decided to become a science teacher in a high-needs setting because not many people want to teach in high needs settings, and because everybody has " the right to have a good science education" no matter what their background is. Another reason why David wanted to get involved in education was because he wanted to help students that struggled in their learning. He talked about why he wanted to teach in a high-needs setting:

> On a personal level, when I was growing up, my family did not have a lot of money. I was on free lunch in school, and my family was usually on some form of welfare,

> unemployment, or social security. Eventually, my nuclear family disintegrated. I ended up living with an aunt and uncle, my sister moved out on her own, my mom and dad divorced, and they both died alone…I have lived an experience that has convinced me that the lives of high-needs students can be improved with a good education. I would like to teach in a high-needs school so I can be there for people as others have been there for me.

At one point in high school, David switched from Special Education to General Education, so gravitating towards helping struggling students hit home for him. He believed that these students, as was his case, just need some more guidance. His priorities as a science teacher were to teach and deliver content to his students, but also "to translate [his] experiences from working in the laboratory into the classroom."

David saw his commitment to working in an urban school as a commitment to a way of spreading science learning to all diverse learners and a reflection of his character as someone who "likes to stick to things," no matter the challenges encountered. Yet, in order to do that, he believed he would have to get his students engaged in the content, but also to teach them critical thinking and problem solving skills that would help them analyze the content. See Table 4.4 for David's main points for becoming a science teacher.

Table 4.4 David's Main Points for Becoming a Science Teacher

Becoming a Science Teacher	Main Points
Turning point of becoming a science teacher	Marked by an interdisciplinary science biology class and interdisciplinary physics class that he took as a freshman ear where he realized he enjoyed teaching and that he could see himself teaching science.
Turning point of becoming a science teacher in a high-needs setting	He decided to become a science teacher in a high needs setting because of his belief that everybody has a right to have a good science education.
People who influenced him in choosing to become a science teacher	David's professor and academic advisor, with whom he worked in a research lab for three years.

Ashley's Portrait

Storied Identity of Learning Science: Engaging in Authentic Science Experiences That Made Her Think and Feel Like a Real Scientist

Ashley's storied identity of learning science centered on her love of engaging in authentic science experiences that made her think and feel like a "real scientist." Part of thinking and feeling like a "real scientist" was being able to problem solve, to interpret data, and to apply data that she analyzed in her every day life.

Ashley grew up in a suburban part of the Mid-West. She spoke affectionately of her tight-knit family, and the positive support they provided her in her learning and in her life experiences. Her sister, who was pursuing medical school and doing her rotations, was the only one in the science field in her close family. Her mom was into urban planning, and her dad was an accountant. What stood out for me about Ashley was her genuine smile. It conveyed to me so much about her personality and character even before I came to know her better. She genuinely believed in giving back and being compassionate. Later on, she confirmed this by describing her life experiences as teaching her a lot about compassion. One example of these life experiences included an alternative Spring break to Appalachia, where she learned about poverty and helping those in need. Another example was the volunteer work she did as an educator for her peers through the sexual assault program on her college campus.

Throughout her high school experiences, Ashley did really well in her science classes. She described herself as "very grade oriented" and "had to get an A on everything." Yet Ashley realized in her high school classes that getting an A and knowing the science content by heart was not enough in her learning. This epiphany about her science learning happened after she

took her AP biology class.

Ashley "fell in love" with science the year she took AP biology and studied about vertebrates. Before her AP biology class, she had taken chemistry and earth science, and she found them to be "okay." But her AP biology class was her turning point in her learning science, and it drew her more in than the other science classes because of her interest in animals. Ashley described her AP biology as one of her first real challenges in school, but that she also walked out of it having learned a lot. She remembered how her AP biology teacher would engage her class in labs, experiments, activities, videos, and field trips. She particularly highlighted an activity in his class when she had to build a zoo and was doing "real life science." She also loved that she was able to do dissections as they studied vertebrates. She recounted that

> I loved [the zoo activity] because I got to be artistic but then bring in other aspects. We had to do different biomes and then tie in different organisms and why they had adapted to those biomes [An interconnected community of plants and animals in a specific region and a climate]. I thought that was great. And then in vertebrates, we got to do a lot of hands on dissections. So for me, it's the real life science that really motivates me. Getting to do those hands on, seeing it in action, versus just reading it out of the textbook. He was one of the first teachers that really made science like that for me. That made it more than just cookie cutter labs or more than reading a textbook and answering questions at the end.

For Ashley, learning science meant that she could engage in hands on activities that felt "real," but also where she was able not just to read about the activities but also actually to do them. She loved how her AP biology teacher helped her to see beyond the "cookie cutter" labs by allowing

her to bring in similar contexts, such as different biomes, into the scientific explanations she learned from her lab.

Ashley loved when she could do science that involved authentic experiences that would elucidate abstract science concepts by being actively engaged in hands on experiments and visuals. For example, during her high school physics class, Ashley described a story that involved a lab where she had to use a bowling ball and direct it through a maze, without having the bowling ball touch the sides of the maze. She loved the activity, and she felt that the teacher did a great job teaching her about the concept of forces in an authentic and fun way. She remembered that

> It was an introduction to forces and having to apply forces and change motion. We had to make observations of what we were doing to cause that change in motion. So I thought that was a fantastic way to make something that is really hard conceptually for students to understand into a very fun and tangible way of understanding. I thought he was a great teacher…[who] did a lot of hands on experiments and fun stuff, but that's definitely something I remember doing and really enjoying. I just remember, as a student, thinking it was really cool. But I remember what I learned from that activity and that was seven years ago.

Ashley felt that this lab was a very real way to figure out how forces and change in motion worked. Ashley remembered how she had to make observations of what she was doing to cause that change in motion, and to use those observations to build explanations. What Ashley enjoyed the most was that the lab let her partake in hands on experiences that she enjoyed, and that she believed went hand in hand with doing real science.

By the end of high school, science became more than knowing content for her. She started valuing the intrinsic value of engaging in experiences as opposed to the extrinsic motivation of getting an A. She understood that

> It's not the end of the world if I don't remember all the states of glycolysis. But it does hurt me if I don't know how to think like a scientist. If I don't know how to problem solve in my everyday life. If I don't know how to interpret data. And I think being able to read a passage and pull out data and what does this mean and what evidence do I have – that can apply to reading a document for signing a house and being able to understand it.

She realized that knowing content without being able to problem solve and interpret data by engaging in authentic experiences would undermine her skills of thinking "like a scientist." Ashley valued being part of experiences that afforded her opportunities to engage in true science thinking and to get into the action of experimenting.

Another story Ashley remembered in which she valued authentic experiences but which also helped her see herself as a real scientist was a semester project she did in her college ecology class. During this class, she was given the opportunity to work with three other people and be a "real scientist." This entailed designing a proposal for an experiment on crayfish behavior: coming up with a question, collecting data, running the experiment, and reporting the data:

> So we got to design it and then we had to get our waders and go out and find crayfish out in the …river. For the first time in my life, I felt like a real scientist – like I was really doing something and I was going to find information that wasn't in a book and wasn't being handed to me. It was a lot of work because it was an entire semester project.

For Ashley, the whole process felt authentic, from designing it to putting on the waders. For example, she and her group found out that crayfish would display aggressive behavior if they were left together too long, and they would actually kill the other crayfish. The experiment also gave her ownership about her own science learning, as she and her group were working with real data:

> Then, at the end we actually got real data about aggression versus crayfish based on their size and the fact that larger crayfish are more aggressive than smaller crayfish, but they're only more aggressive when paired with other larger crayfish. I distinctly remember that and thinking it was really cool because it was ours and we figured something out.

Ashley felt that she was able to figure things out when she was able to engage in a real experiment, take her data, interpret it, and figure out patterns and scientific explanations, but also get into the action of experimenting. In the end, having this opportunity to be involved in a real authentic experience, where she and her group were accountable for designing and reporting their own data, made her feel like a "real scientist."

Learning Science as Empowering

According to Ashley, science had an important part in her life because she was able to use her science problem solving skills in her everyday life. She talked about how she would find herself using her science thinking problem solving skills in different moments in her life. For example, she remembered how she would use them to help her dad fix the sink by looking at evidence from the broken sink and being able to figure out what the problem was and how to tackle it. She reiterated the importance of science in her everyday life by saying that

> So it's moments where I see science in every day application – even though it's not in a science classroom and I'm not talking about evolution or cellular respiration, but it's still science. And it allows me to be a better functioning member of society. It allows me to save money. It allows me to feel proud that I know this and I can figure things out. Having that capability is freeing. I don't feel helpless.

Another example she remembered that made her feel empowered about learning science was how science helped her to understand her body better when it was getting sick. She could think back to her immunology college class, know what was happening in her body, and how much "power knowledge gives you."

People Who Influenced Her Science Learning Story

Ashley's storied identity of learning science shows that her pathway into science was strongly supported by both her mother and her AP Biology teacher. Both Ashley's mom and her AP biology teacher influenced her science learning story because they provided opportunities for her to value and engage in doing authentic science experiences.

Ashley's stories talked about how her mom instilled in her a sense of value in learning, growing, and understanding the world around her. Ashley remembered that when she would want to give up as a kid in her science classes because she found them hard, her mom kept pushing her by telling her, "This is why [learning science] is important to you." For Ashley, that mentality of adding value to learning "stemmed over into [her own] learning." Ashley's mom was also a support for her in her classes, and she remembered that even though she would not know the answer to a science question, her mom would still go online and look up answers with Ashley.

> There were a lot of times where she couldn't [help me] – she didn't know the content, but she could help me find an answer because she knew, as an adult, how to find answers and how to look for things and how to research.

Ashley singled out how her mom instilled caring about her own education and what it can get her in life. Her mom was a positive reinforcement in building that intrinsic value for education, but also for developing and expressing herself as the kind of science learner and scientist who loved engaging in real experiences, problem-solving, and applying knowledge to the real world.

Recall how Ashley remembered how it was not until she took her AP biology class in high school that she "fell in love" with science. Her AP biology class stood out for her because her teacher used a varied repertoire of teaching practices that ranged from doing labs, experiments, and activities to doing field trips and dissecting vertebrates, which allowed her to engage in the "real science" she loved. He would also bring in outside experiences as well as their experiences and relate them to what they were learning in science:

> [I]t's the real life science that really motivates me. He was one of the first teachers that really made science like that for me. That made it more than just cookie cutter labs or more than reading a textbook and answering questions at the end.

Ashley credited her AP biology teacher for exposing her to doing hands on science and seeing science "in action," as well as experiencing "real life science." He was instrumental in shaping how she viewed being herself engaging in real science as more of doing authentic experiences. He also had such an influence on her that she came to see him as her role model. His "charismatic " and caring nature pushed her to challenge herself and love biology even more. She remembered that

> He was so in tune to me as a student that it made me love biology that much more. Because I knew he cared about me. There was a day after my back surgery where I came in and he pulled me out into the hallway and he was like, "I'm going to send you home. I can tell that you're in pain." None of my other teachers were able to read that.

Ashley went all the way to name him as the most influential person in her life in her school, and she recognized him as such in her Scholar Dinner, which was a dinner given in honor of students with a high GPA in her school who were given a chance to invite a high school teacher they wanted to honor. She loved that he just did not give her class content and a study guide full of answers before tests. Instead, his tests challenged her with thinking questions, with which she was able to explore and discover, do labs, and be a "real scientist."

The following Table 4.5 summarizes the main points in Ashley's storied identity of learning science.

Table 4.5 Ashley's Salient Points in Her Storied Identity of Learning Science

Aspects of Her Storied Identity as Engaging in Authentic Experiences	**Salient Points in Ashley's Story of Learning Science**
Engaging in authentic experiences	Figuring out things in more systematic ways, included engaging in experiments, taking your data, interpreting it, and figuring out anything that might have gone wrong but also getting into the action of experimenting.
Being a real scientist	Engaging in hands on labs and applying science concepts to practical experiences in her high school and college classes, where she was able to problem-solve, engage in inquiry, and do labs.

Table 4.5 (Cont'd)

Being able to problem solve in her everyday life	Using her science thinking problem solving skills in different moments in her life and feeling empowered that she can apply her science knowledge to figure things out around her everyday life. (Eg. Fixing a broken sink)
People who influenced her science learning story	Ashley's mom, her dad, and her AP Biology teacher.

Choosing to Become a Science Teacher in a High-Needs Setting

Ashley's views of science and doing science showed up in why she chose to become a science teacher. Although Ashley had started out wanting to be a pre-vet, she changed her mind during her freshman year in college when she realized that being a vet was her childhood dream, and it "wasn't what she really wanted to do." She yearned to share the same kind of love for science that her AP biology teacher had shared with her. She wanted to help other students see themselves as capable of doing "real science." Her teaching experiences started way before college, when she was involved in tutoring, and she did National Honor Society in high school. She enrolled in a Teacher Education class one semester during which she started tutoring a middle school boy and tutored him in science and math. In the Teacher Education class she took, she recalled that

> [I loved] knowing the way the brain works and how people learn so that definitely drew me in. And then working with that one young boy and seeing him grow and improve and start to understand things and then do better in school. I was having this impact and it was amazing. Yes, that's kind of the picture perfect experience because it worked out really well and I didn't have behavioral management issues that you see in the real teaching

> world. But it was heartwarming and it felt right. For the first time, I finally felt a little less anxious, like, "Maybe this is what I'm meant to do."

For Ashley, seeing how she was helping her student grow, improve in math and science, and start to understand concepts was powerful and "heartwarming." She was overcome with the feeling that this is "what I'm meant to do."

But Ashley said that the moment that "sold her on teaching" was when she started doing her twice a week teaching in an urban classroom as a college senior. Being in the classroom and doing experiments with the students, Ashley remembered how she realized how much fun it was watching them enjoy doing experiments. For her, teaching them science felt like she was sharing content with them, but also experiencing their enjoyment of science with them. She realized then that what sold her on teaching was realizing "how easy it was to care about [her students]."

Ashley was determined to share her science knowledge in high-needs settings, where she saw the greatest need and where many students are not given the opportunities she had. She believed that these students "should not be 'lucky' to have compassionate teachers, a good education system, or a supportive home life; [that] it is what they deserve." She felt that these were settings where students "need a lot of understanding" from their teachers in order to succeed in school. So Ashley chose to become a science teacher in a high-needs setting, where she believed she would be able to make a difference with the "kids that really need it" and have the greatest impact.

People Who Influenced her in Becoming a Science Teacher

Ashley remembered how while growing up, her mom would always tell her that the "greatest gifts are the ones that can be shared with others." It did not make sense to her then, but

she realized that her mom planted in her the idea that sharing her education is one of those amazing gifts and that becoming a secondary science teacher is her opportunity to give back**.** The following Table 4.6 summarizes Ashley's main points of choosing to become a science teacher.

Table 4.6 Ashley's Main Points for Choosing to Become a Science Teacher

Choosing to Become a Science Teacher	**Main Points**
Turning point of choosing to become a science teacher	Marked by phenomenal science high school teachers, and especially her AP Biology teacher.
Turning point of choosing to become a science teacher in a high-needs Setting.	Engaging in tutoring a middle school student in an urban and seeing the impact she had on her student's learning made her realize that teaching was what she wanted to do. During her senior year in college, doing her field teaching in an urban school and seeing how she enjoyed her students loved doing experiments and learning and that she cared for their learning.
People who influenced her in choosing to become a science teacher	Her mom

Cross- Case Analysis of Three Interns

Each one of these storied identities tells us about how each of these interns viewed themselves in connection to science. Looking across the cases, we can also see how a storied identity lens helps to explain how their stories shaped their identities as science learners, and how their stories delved into the meanings they ascribed to their experiences and the important people there. It also helps to foreground the pivotal moments that fostered those deepening connections. In particular, cutting across their storied identities, we can see how cross-cutting themes in terms of the meanings they give to their experiences are 1) resilience or "sticking with it," as David called it; 2) the cross-cutting pathways of learning science; (and 3) the agency they have to recognize what connects them to science and why this is empowering. These themes are what I identified as standpoints that shaped their storied identities and which speak to aspects of doing the kind of science they valued and to making a change in their own learning. I discuss each below.

Resilience

The interns' storied identities all show resilience as being an important aspect of their becoming in science. Resilience means recovering from difficulty quickly and not giving up in their science learning experiences. Each intern shared stories of feeling challenged or having difficulty in science, but each told stories about how experiences doing science in authentic ways provided a context in which it made it worth overcoming the challenges.

Both Ashley and Becky credited their moms' resilience for their own. Their moms were a model of resilience for them that they referred to in their stories of learning science. Recall in their stories above how Ashley credited her mom for instilling "a sense of value in learning and in growing and in understanding the world around" her. When Ashley would want to give up as a

kid, her mom kept pushing her forward to find answers and to dig deeper in her science classes. From a young age, her mom instilled in her a strong value for education that went hand-in-hand with resilience. Ashley had learned that hard work and dedication were required to reach her goals of science learning and being the real scientist engaged in authentic experiences that she came to view herself as, while being an honor's college student carrying a 4.0 GPA. Similarly, Becky credited her mom's resilience as helping her become the kind of interactive science learner who made it a point to find real world connections with the scientific ideas she learned. She saw her mom as the biggest positive influence in her becoming in science, because her mom's hard work and determination of "putting herself through school to get a pharmacy degree" became a source of inspiration. She said, "I just wanted to be a lot like her. So it was kind of easy for me to kind of like you know follow along her footsteps. Like I wanted to be a lot like her so."

After years spent in high school marked by positive learning experiences in science, Becky encountered a setback when she took an advanced chemistry class in college. Her college professor lectured mostly using slides, and would not gauge the class for informal assessment. To her frustration, she struggled understanding the material, and her schedule did not allow her to make the office hours or to find time to get help. For her first exam, Becky could only do one problem out of the four critical solving problems she had come to love in high school. She remembered:

> I felt really upset because I felt like I had done everything I could on my own to prepare but I wasn't. I didn't have enough resources or opportunities to do well. And…I just remember sitting through those like fifteen minutes kind of panicking because…I felt like the teacher had failed me. Like not giving me all I needed to do well on the test and

> reflect on what we should have known...And I just was upset and I ended up dropping the class and retaking it but…that was just really frustrating because I felt like…I wanted to do well and I couldn't…

Part of Becky's challenge with her chemistry class was that she was very much a visual learner. So she struggled "to comprehend things that [she can't see for [herself]" and to accept that atoms, for example, are "real." Although she struggled in the advanced chemistry class, Becky was not deterred by her setback and was resilient in her efforts to persevere in her science learning experiences. She still retook the class and the experience proved to her empowering and kept her moving towards her goal of gaining more science knowledge.

David called his resilience "sticking with it." It was not until his college years, however, that David became frustrated with his science learning experiences and learned how "the scientific method isn't a straight linear shot." As discussed in his stories of learning science, David was working in a plant biology research lab that centered around him helping in research projects as a freshman. This is where "science was no longer easy for him," because he would have to go through many trials of experimenting before getting the experiment to work.

> I learned …the importance of sticking with something. Because I stayed in that lab for three years. Just because I have really strong loyalty I just stuck with it. As I stuck with it, I got more and more responsibilities and eventually I was the primary person on the project.

David was so resilient, he stayed working in the lab for three years until he became the main person on the research project. By being in the lab, David also learned how scientists "do research, [and] how a lot of it is structured around developing arguments and finding evidence

for [these] arguments." His lab experience gave David a deeper personal appreciation and a more practical connection into the process of constructing scientific knowedge.

Cross-cutting Pathways of Learning Science

The interns' storied identities all show that these different authentic real science learning experiences they told were shaped by crosscutting pathways. In these cross-cutting pathways, two salient points emerged. First, there were other settings or spaces for learning - not just the classroom- where learning can be marked by multiple trials. Second, the interns acknowledged that there were other people in their lives that shaped their stories of learning. I discuss each below.

Most of the interns named different settings or spaces of learning science outside of the classroom. Becky highlighted multiple settings of learning science outside of the clasroom. The first setting for learning science she talked about took place in her garden. She also refererd to learning about science when she was taking care of her horse outside of the classroom, or learning science when she investigated ways to help her own foot heal when she was injured. David credited a lot of the science learning as happening mostly in the research lab he was working at in college for three years. Similarly, Becky referred to her science education college class as a setting where a lot of science learning happened for her by "doing science."

Both David and Ashley had many learning experiences in a lab environment outside their classroom. They remembered how their experiences were shaped by "failed experiments." As David said before, working in the lab made him aware of how the scientific method is not a "straight linear one shot." In other words, David came to understand that just because he used the scientific method while doing experiments in the lab did not guarantee results everytime.

Ashley's story about her middle school science fair captures this point of learning science in a different environment and how she reflected about it. Ashley referred to this experience as her "first shot at being a scientist." For her sixth grade science fair project, Ashley explained that she wanted to do a lab on the iron content in cereal and share her results. She explained, however, that the experiment did not go as planned. She said that "the food labels" and the "amount of iron" were "off in the lab results." Her results initially led her to believe that she had completely "blotched the lab." She was disappointed when she received what she stated was "last place" in the science fair. Her "last place" in the fair triggered the thought that she was "bad at science." She thought that because she failed to match the amount of iron from her lab to the food label she was not good at science. She also felt that the science fair led her to be recognized for being "last place" rather than for trying to be part of the science fair. But while reflecting about it, Ashley said,

> [Now] that I've gotten older and I've really learned about what true science is, it's learning from your mistakes. It's taking your data and interpreting it and figuring out what maybe went wrong. It felt like such a failure at that point in time. But now that I really understand science, I realize that it wasn't a failure, but a learning experience. Yeah, something may have been off in the way I ran the experiment, but I was in sixth grade. It would have been great if I had had someone there to help me kind of reflect on that and not feel like I got last place because I was bad at it. But part of the scientific process is that sometimes you don't realize that there are outside variables that can affect your experiment. So that sticks out in my mind because I remember thinking, "I'm bad at science!" Now I wish that I would have had someone to talk to about it afterward.

In other words, Ashley recognized that her path to learning science happened in settings such as science fairs, but also was shaped by how people recognized her as doing science. As a sixth grader, then, Ashely was led to believe that her science project failing meant that she was "bad at science." But part of her storied identity as a science learner was shaped by the different perspectives and views that shaped her learning, namely her AP biology teacher and her mom, who made her see learning science and doing science as engaging in authentic experiences.

Both Ashely and David talked about their science learning experiences taking place after the multiple trials of experimenting they went through to get the desired results in an experiment. Also, part of David's learning happened when his scientific curiosity was piqued and he had his "Wow" moment that pushed him to learn more about the scientific concept, such as gravity, and investigate about it until he reached an "Aha" moment where it made sense to him.

All three interns recognized other people in their lives as supporting them in their pathway of learning science and furthering their storied identity as science learners. As mentioned before, Ashley and Becky saw their moms not only as models of resilience but also as positive influences in their storied identity of learning science. Ashley's mom was a positive influence in that she helped her recognize the value of engaging in science to do "real science" and pushed Ashley to seek out opportunities that would get her to engage in authentic science experiences that made her feel like a "real scientist." Becky's mom, on the other hand, helped Becky shape her storied-identity of engaging her in "science-related experiments" such as the gardening experience and being supportive in helping her understand science and supporting Becky in her enjoyment of learning science. In addition, Ashley and Becky highlighted their high school teacher as another personal influence in their storied identities of science learning, while David highlighted his professor in college. Among the three interns, David was the one who

stood out as not referencing as much the people in his life as supporting him in his storied identity of science learning.

Agency

Lastly, the interns' storied identities all show agency, or taking action and engaging in science learning experiences they valued, as being an important aspect of their becoming in science. The defining stories the interns told, which shaped their storied identities, all showed them to have some kind of agency in their own science learning. These many science experiences they named and valued, such as problem solving and doing "real science," were the ones that positioned them as having agency and doing the kind of science they valued and making a change in their own learning.

For example, Ashley's connection to science was related to how she viewed doing "real science." Throughout her stories of learning science and being a scientist, it was partaking in authentic science activities or experiences that made her see herself as a "real scientist."

Similarly, Becky's connection to science was tied to how she saw herself "doing science." Becky recognized that "doing science" was connecting the scientific ideas she was learning or learned to the world around her. She understood that memorizing content did not make her a scientist, and that it was only when she made "real world connections" to science that she was learning science.

On the other hand, David's connection to science started with his engaging categorically in the scientific process and the scientific method. In other words, he was doing science when he was engaging in the scholarly scientific thought process of science first. But, David soon realized as he worked in a lab and performed experiments, that the scientific process and scientific method were not linear processes. His trials and errors in his experiments in the lab made him

see that part of learning science meant also learning from experiments and applying the scientific knowledge to other experiments as well. In other words, his view of himself as a scientist came to include using the critical thinking skills involved in the scientific process of science to solving problems and constructing knowledge. He also recognized that part of him learning a new concept in science would happen when it "made sense" to him or when he had his "Wow" that would lead to his "A-ha" moments.

This chapter illustrates how the interns' storied identities give insight into how their different lived experiences and events helped them shape how they saw themselves as science learners. These storied identities in the end provide a lens in that they highlight how these interns viewed themselves as science learners and what it meant for them to be recognized as doing science. Table 4.7 provides a summary of the three interns storied identities of learning science.

Table 4.7 Summary of Interns' Storied Identities of Learning Science

Storied Identity of Learning Science	**Becky**	**David**	**Ashley**
Their sense making of their science learning	Valuing "doing science" that helped her connect the scientific ideas she learned with the world around her, and also applying her science knowledge to understanding near and far contexts.	Being scientifically curious, a critical thinker, and valuing scientific argumentation and the relevancy of science in his everyday life.	Engaging in authentic science experiences that made her think and feel like a real scientist.

CHAPTER V

Storied Identities of Becoming an Urban Science Teacher

In the previous chapter, I discussed the storied identities of learning science of Becky, David, and Ashley. In this chapter, I look at how their storied identities of becoming a science teacher began to take shape as part of their learning to teach in different urban contexts. This chapter focuses mostly on the stories they told in their journal reflections about their beginning as a teacher and their developing practice from September 2012 to December 2012, before they started their lead teaching in January 2013. The stories they wrote varied in consistency. Becky and David reflected up to five times a week in their journals, while Ashley reflected up to three times a week. Their journal reflections were narratives that they wrote about their experiences in their classroom contexts, and they provided insight into what they highlighted in their stories of learning to teach. The stories gravitated towards a central theme, which defined what the interns in the end identified as important to them. Those themes in their stories of becoming a science teacher defined what shaped their identity as a novice teacher. I argue that a storied identities lens is instrumental in exploring these stories of practice, and in illuminating how the interns explained their thoughts about what they fixated on, as they learned to teach in an urban setting. Thus, this chapter focuses on my first and second research questions:

- How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting?

- How do we see their storied identities expand in how they talk about their teaching practice?

Becky's Storied Identity of Becoming a Science Teacher in an Urban Setting

Becky's storied identity of becoming a science teacher revolved around how she made sense of multiple identities- her racial and teaching identities- and how she came to terms with them, in order to fit in her classroom community. As she became part of the classroom community, she leveraged her storied identity of science learning to teach content in an engaging way that helped her students learn science by "doing science."

Becky taught in Central High School, a high school with a predominantly Black student population, located in a large metropolitan city in the Midwest. Her high school background was mostly rural, White, farm kids, where 20% of the students go to a 4-year university. Becky's focus class was her 9th grade biology class, but she also taught chemistry classes. She had two mentor teachers, Ms. Yang and Ms. Berry. Ms. Yang taught chemistry classes, while Ms. Berry taught biology classes. According to Becky, Ms. Yang was the more organized and stricter mentor teacher, and she had excellent classroom management. It was Ms. Yang's third year of teaching, and she was not tenured yet. On the other hand, Ms. Berry was tenured and had been teaching for eight years. Becky described her as the more relaxed teacher and more open to simulations, labs, and hands-on group work.

Making Sense of Multiple Identities

Being White in a Black school. Becky's first day of teaching was a memorable lesson about fitting in and reflecting on her own different racial identity as a White person in a predominantly African-American high school. She remembered how the first thing her mentor teacher, Ms. Yang, did during the first period was give out a pop quiz to the students. Becky sat in the back and observed how those students who were late were denied the pop quiz, and how Ms. Yang was firm about her classroom policy of no quiz or exam if the student is late. Once

everyone was seated, Becky recalled how Ms. Yang then addressed the class with a "Welcome to Chemistry," and went about introducing herself and how that played out in the first period class:

> All right, well before we get started, who am I? I am…a high school chemistry teacher. A pescatarian. A middle child. A graduate of WY."[a predominantly all black, competitive, selective enrollment urban high school] Please do not EVER ask me what I am again. If you would like to know my nationality, I am American…what is my race?" A few students responded, "Asian." She replied, "No, I'M BLACK!" The students roared with laughter. "What?!" They exclaimed, 'you're not Black?!" She said, "Yes I am! I think like a Black person, I act like a Black person, so I'm Black! What are racial groups anyway? They are manmade groups that people place others into. No one in the rest of the world understands the term 'Hispanic' but Americans. 'Hispanic' means of Spanish origin. Most of the people that are Mexican are descendants…people who were indigenous to Mexico, not Spain. So therefore, I am black."

As she reflected on it, Becky was shocked and did not expect the introduction nor the roar of laughter from the students as they looked at Ms. Yang with adoring eyes, for she had described herself as part of their community. Becky wrote in her journal how she found herself sulking back into the classroom, because she felt uncomfortable making the same claim that she was "Black," as her mentor just did. Becky reflected about her years growing up and her own racial identity:

> All of my years in school and in the Noyce program learning about issues of race had taught me that it is best to be yourself and own up to your cultural identity while being open to hearing and learning about others from their own cultural identities. I felt

excluded. How could I fit in this classroom community if the students understand me to be someone different? Someone not Black. Someone who doesn't understand them. Becky remembered then how her mentor teacher went on to explain to the students the syllabus, the future class projects, and a science fair that the students would be participating in. According to Becky, the students were not enthusiastic about the science fair, and they groaned. Becky's mentor teacher stopped them right away, and Becky remembered again how her mentor teacher got the students motivated by bringing up how it was important that they do well to " show the White people that Black people can do science!" Her mentor teacher motivated the students by telling them that they could use the money for college, too.

Becky recalled how her heart was racing and was "churning in knots." She started thinking about how she had spent years thinking about race issues and wanting "equal opportunity for everyone," and challenging herself by moving to this large urban city, where she felt that she was "still nothing but a 'White' person. This is [her] identity. For now, in this classroom." Becky remembered how, as she introduced herself to the classroom, she stood tall and thought ahead, about how this year in learning how to teach in Chicago was going to be quite the challenge, because she was there to deepen her "understanding of socioeconomic issues prevailing in the nation," and that was what she realized she was going to get.

In her reflection journal, Becky wrote about what surprised her the most about her mentor teacher was how she spoke so easily about racial and ethnic groups. For Becky, "as a person growing up in a homogenous White community, it's taken [her] a few days to be more comfortable with her [mentor's] blatant responses to race and ethnicity."

In Becky's Chemistry class, the focus initially in her journals was about her racial identity as a White person, and then it shifted to her teaching content to her students in an

engaging way. For Becky, what it meant to be racialized in a Black community became about easing herself into her classroom community and being seen by her students as a "supportive and passionate" teacher. She went beyond the racialization of her identity by foregrounding what was important to her- building relationships with her students and caring about their education. She wrote, "If they can see my efforts to invest in their classroom, maybe I don't have to explicitly prove to them that I a 'White person' [and that I] am wholeheartedly invested in their education and future success."

The only other time that Becky brought up her racial identity was about three weeks into her student teaching. It was the day that she taught a lesson on chemical and physical change. Becky had made it a point to get to know her students, and to teach them content in an engaging and interactive way. She remembered how in that lesson she was "happy" to be teaching chemistry, and she was enjoying interacting with all her students.

> I don't want to pretend that I'm not White anymore than I want to pretend that I am Black. I am who I am, and I want my students to judge and evaluate me as such throughout the year.

Becky believed that she would foreground building relationships with her students and making her lessons fun, engaging, and interactive, rather than her racial identity as a White person. She shifted her focus from accepting her identity as different, to not seeing it as an impediment to teaching and connecting to her students.

Figuring out how to use her authority as a teacher. The following stories she wrote in her journal reflections portray how she saw her "soft-spoken" teaching identity (Søreide, 2006) shift to become more of the "tough" teaching identity she adopted, which allowed her to use her authority as a teacher in the class. Becky's stories also tell how she made sense of her "tough"

teaching identity in relation to her students, and how she figured out how to use her authority as a teacher to gain her students' respect.

First time yelling at a class. Becky wrote about the first time she yelled at a class. It was almost a month into her student teaching, and her students knew that they were expected to write their homework down at the beginning of the class period. However, Becky noticed that her students were not sitting down in their seats and were strolling around talking to their peers. Although she continued to prompt her students to sit down, Becky found that the classroom was still loud and that most of her students were not listening and were still being disrespectful. She remembered yelling "SIT DOWN!" at a volume she had never matched before in a classroom. The students quieted down almost instantly. Becky then heard a student say, "Oooooh! Ms. is maaad!" She lectured her class by saying:

> Everyday, I greet you and talk to you all kindly before the bell rings because I want to have an enjoyable, productive class period with you all. But I can't accomplish everything I want us to accomplish when you are all being so rude... The bellringer worksheet is at your lab tables. I'll give you a few minutes to complete them, but you need to work diligently because I will be collecting them. Also, today YOU WILL get through everything 2nd and 3rd period got through. I don't care how late we have to stay after class.

After delivering that speech to her students, Becky remembered how the class was quiet and "under-control." Her students worked on their bellringer worksheets and finished all their work on time. After class, Becky felt "kind of bad" that she had yelled at her students, for she had

never yelled at her students before. Becky's mentor teacher, Ms. Yang, though, commended her by saying:

> You were such a Beast! I was waiting for this to happen! You know, it's so weird. The kids actually like it when you yell at them. They like the structure. They would rather see you yell at them and keep the class under control than let it get out of hand.

Becky described how she thought it was interesting what her mentor teacher shared with her about how yelling at the students helped in managing the class, which in turn set a precedent about what was unacceptable behavior in her class, and gave students a sense of structure. She tried to remember what it was like for her when her teachers yelled at her in high school, and she remembered a feeling of "shame." But as she thought back, she also remembered how some of her peers in high school were "out of line," and how she liked it when her teacher would yell at them to "correct" their behavior. Becky wrote that she had never considered this before, and that because she did not like being yelled at by a teacher, she did not want to be the kind of teacher who yelled at her students. However, Becky saw how yelling at her students was necessary to manage the class, or otherwise she felt that there would be limited progress in her teaching content, and she would find herself constantly trying to quiet the class. Becky also would find out from her mentor teacher that more than half of her students came from single-mother households, and that "a lot of [these mothers tend] to be really aggressive by quickly yelling at [her students, who thus were] used to being talked to that [way]." So, Becky saw the yelling as a way of managing her students' behavior, but also of gaining their respect. That one time yelling at her class had helped her establish a clear classroom expectation with her students.

Enforcing lateness policy. The second story Becky wrote about in describing how she adopted her "tough" teaching identity was when she found herself enforcing her mentor teacher's

lateness policy with her students. Becky was giving a chemistry quiz, and it was her turn to teach chemistry, which meant that she had to enforce Ms. Yang's expectations of no quiz after the second bell. She talked about the day she was "torn" about enforcing the lateness policy, especially when Tammy, one of her good students, walks in late to class:

> *Ding. Ding. Dinggg.* It's now second period, and any student who walks in the room after the bell -- even if they walk in a second after the bell -- are late. And when you're late in Ms. Yang's class you don't get to turn in your homework, or take a quiz if there is one that day. That's the rule, and it's been the rule since the first day of school. No exceptions. Ruh-roh. I brace myself for what is about to happen. I really enjoy [Tammy] in class. She is very sweet, and very enthusiastic about the material. I don't want to make her upset or cause her any harm, but I have to enforce this rule. The students say, "Oooooooh! Tammy is late! She doesn't get to take the quiz." If I didn't know before that I need to enforce [Ms. Yang's] policies-- I know now that my students are watching to see if I am a pushover or if I stick to the principles outlined in the beginning of the semester.

Becky felt bad about Tammy, one of her top participators in the class, who forgot her calculator and ran to get it from her locker. Becky remembered how when Tammy walked in a few minutes into the quiz, she gave her attention to the students taking the quiz, and she told Tammy that she did not get to do the quiz because she was not in the classroom before the second bell rang. Becky used this incident as a way to show consistency and to enforce the lateness policy, but also to give the class a lesson on being on time. She had to be "tough" throughout the lesson, because Becky recalled that when she glanced at Tammy's side from time to time, "[her] heart sank as she saw her looking hurt or wounded through the entire hour." But, Becky stuck with it,

and she showed her students that she was not a "pushover" and was a "tough" teacher. "Rules were rules" and Becky had made her point about enforcing the lateness policy for everyone. Becky wrote about how although Tammy seemed upset the entire hour that day, she was much happier and back to her normal self the next day.

The day she caught her students cheating. The third story Becky remembered and wrote about her taking the position of the "tough" teacher was the time she caught her students cheating. She described how her heart was pounding as she clearly could see that her students wrote down the answer from the wrong quiz onto their paper. She was surprised to see that her students would be capable of cheating:

> I looked at the student's name at the top of the page. Ali?! He's so quiet, and he's one of the few individuals I haven't had the chance to speak with one-on-one yet this year. I felt like a deer in headlights. I know the 0/10 is coming, that I have no choice but to give him that grade, and as I freeze at the thought of disciplining him it hits me as my mentor [Ms. Yang] confirms, "Yeah. Give him a zero."

Becky recalled how she sat down with her mentor teacher, and they worked out a script of what she should say. Becky could foresee that it would be a rough 8th period for her, but she had to "grit her teeth" and do it. So once her students were seated, Becky took "the stage" in front of the class to "discipline" her students for cheating:

> All right, 8th period. I've got some good news for you and some bad news. What would you prefer to have first?" "Bad news first, obviously!" (As I expected). All right, well I graded your quizzes over the weekend...."Nooooo we all failed!" "No. You did not all fail. But..." My face flushed red and my voice started to shake as I started to communicate my disappointment. "But, I realized that when I was grading your quizzes

that a few individuals from this hour cheated on part of their quiz." The class went silent. "You all know that more than anything I want to see you all do well and improve in this course over this year. But I will not tolerate cheating. It's not fair to you, and it's certainly not fair to your peers. Therefore, I will adhere to our classroom policy that any form of cheating will result in a 0 on that assignment. To those individuals who received a 0 on this assignment, I'm sorry -- but what kind of teacher would I be if I allowed cheating to occur in this class?" I paused. "But the good news is that if those individuals did not cheat, the class average on the quiz would have been the highest out of all 3 hours. So I'm very proud of all of you and this tells me that I'm working with a very bright bunch of individuals.

After delivering her speech, Becky had her students start to work on their lab while she passed back the quizzes. She quietly pulled the first student who cheated into the hall. At first, Becky did not say anything to the student but just pointed to his answer. "Where do you see temperature in this question?" The student was silent. Becky kept saying, "Temperature was the answer to quiz B. I know you are a bright kid, and you're better than this. Don't think that your peers know more about the answers than you do. I'm going to have to put this on [your file] and call home." Her student denied his cheating meekly as he looked away. Becky was not deterred: "Don't lie. Own up to your mistake and tell me this will never happen again. I expect more from you. If you're struggling in the future please come see me before the quiz so I can help explain the information to you." Becky's student was quiet the whole time. After that quick exchange, they walked back into the classroom, and Becky repeated almost the exact same line to the second student who cheated.

When the bell rang, Becky remembered that she was "relieved" that the class was over. She felt just as bad, "if not worse," than her students did. But her mentor teacher came to her after class and reassured he that she did the "right" thing by being "tough" and "firm" with the students:

> Wow, you really got the class with what you said at the beginning. Hopefully, it starts to sink in for them." "Yeah, I hope so." And then my mentor finished and said, "You think to yourself, how dare they?! But, oh yeah. They will dare. And they will dare to do a lot more too. You just have to be firm with them.

Becky felt that she had to be not only consistent in enforcing policy but also firm about it. She followed with calling the parents of the two students who cheated. She realized that her students could possibly be angry at how she handled the situation, but she was hopeful that it would help them respect her more and see her as an authority in the classroom as well.

"Oh no you didn't!" The day her students skipped their homework for Halloween.

Last, Becky talked about how she showed once again her "tough" teaching identity to her students when she chastised them for skipping their homework for Halloween. Becky had planned a lab on "Identifying Food Nutrients" with her class, to wrap up their unit on macromolecules. For Becky, the lab was pretty straightforward. It would serve the purpose of a final wrap-up, in which students were to test for the presence of macromolecules in different solutions. She would provide her students with indicators that change color in the presence of specific macromolecules. For example, she was going to use Lugol's iodine solution as an indicator. The solution is normally an amber color, but in the presence of starch it turns a deep purple color.

Becky believed that the lab would be enjoyable for her students, because they would be actively participating in a lab that would allow them to test different solutions and products, and to see the results within a few minutes. Becky remembered how a lot went into the setup and preparation of the lab, and that the materials were quite expensive. Before the lab, she gave her students the laboratory procedures, and for their homework she asked them to write out the purpose for doing each step in the lab. Becky believed that this way, when they came into the lab on Friday, they would know exactly what to do and why they would be doing it.

The assignment was given on Halloween, and Becky found out the next day that the students decided not to do the homework, because they had decided to go out trick-or-treating. Becky was frustrated with her students after so much planning for the lab. She believed that learning should not stop on account of Halloween, even if that made her not a very "fun" or "nice" teacher. So, Becky found herself telling her focus biology class:

> All right listen up. I know you all wanted to go out and have fun last night, but you still should have made time to complete your homework. This is a very expensive lab that requires hours of preparation on my part. So, before we do this lab in class, you must write out your responses to each step in the procedure. If you did not complete the assignment you will receive a 0 in the grade book. If you do not complete the assignment tonight, you will receive a 0 for the lab grade because Ms. Berry and I will not allow you to do the experiment in class.

Becky remembered that was all the lecturing she had to do. The next day, all of the students had the purpose for each step in the procedure completed. Becky was able to proceed with the lab with her students. As much as it "broke her heart" being "tough" on the students, she believed that sometimes you have to put your foot down and be firm with them to get results.

Teaching Content in Ways That Were Engaging, Fun, and Allowed for "Doing Science"

Becky wrote stories in her journal about the ways she made her lessons engaging, interactive, and fun. Her own storied identity of learning science was about valuing "doing science" that relates to the world around her. As we see in the following stories, Becky prioritized having her students engaged in "doing science" by making her students actively engaged in the lesson through discussions, hands-on-activities, and presentations.

Chemical/physical change lesson. One story in which she made her lesson engaging was a lesson she taught on chemical and physical changes. Becky recalled asking her students to use their own words to explain what a physical change was. One of her students said, "Whatever stuff you start with is the stuff you end with." Becky kept prompting her students to add more specificity to the definition given, and she asked them to think about what she meant by identity. She asked them to think about what makes them the way they are, and she used one of the students as an example. She went on to describe how she engaged her students in the discussion about physical and chemical change:

> Becky: What makes you you? For example, if Tyler changes outfits getting ready for class does his identity change?
> [The class replied a collective" No"]
> Becky: Right, so changing clothes is a physical change…now, who can tell me in their own words what is a chemical change?
>
> Her students replied: What you get out of the reaction, is different than what you put into the reaction…The identity of the reactant differs from the identity of the product. [Becky in the meantime is writing down these examples under chemical change]
>
> Becky: Have any of you seen those movies where something magical happens and people wake up to find they have switched bodies? Even though that isn't real, the identity of the person in the body at first is different from the identity of the body at the end, so in a way this is kind of like a chemical change. Okay, can anyone give me an example of a real-life chemical change?

Student: Gasoline burning.
Becky: Yes, very good. And why is gasoline burning a chemical change?
Student: Because after you burn gasoline there is no more left.
Becky: Well, who can tell me what happens when you burn gasoline?
Student: Fire is made!
Becky: Okay, so you see the fire during the chemical change. But what does the fire make?
Student: Smoke.
Becky: And who can tell me what is in the smoke?
Student: Carbon dioxide.
Becky: Yes, carbon dioxide and water vapor are produced in this chemical reaction.

After the lesson introduction with the definitions, Becky proceeded to ask them to distinguish between the reactions she would be demonstrating to the class. In one beaker, she had water, to which she added some red food coloring. In a second beaker, she mixed a weak NaOH solution and added some clear phenolphthalein indicator. The second beaker turned pink. Becky let her students write down their observations. She surveyed the class, and she remembered how about 75% of the class guessed correctly that the first beaker was a physical change, while the second beaker was a chemical change. She then finished the lesson, leading the class into discussion about their guesses for the two beakers and asking them to explain and give their own examples. Becky was happy that the discussion was engaging, and that her students were "wide-awake" and "paying attention."

"Jig-saw on the fly" lesson. Becky wrote about the time she was "panicking" because her mentor teacher was not going to be there and would be on a field trip all day. So Becky was left having to write a lesson that was engaging enough to avoid as many "behavior issues" as possible, because her "freshmen [were] bored so easily by PowerPoint presentations and note-taking." She had written a quiz for the first ten minutes, but she had to figure out what to with the next forty minutes to keep her class engaged. She realized that if she lectured the whole time, she would have to be monitoring what all her students would be doing. She also did not "really enjoy

lectures all that much. [She enjoyed] more hands on learning." So she decided that the next day she would do a jigsaw activity with her students, or an activity that would engage her students in cooperative learning by working in groups with assigned goals and tasks.

Becky researched online three diets: the Atkins Diet, the vegetarian diet, and the vegan diet; she found eight different one-page articles. She gave each lab table a different article to read, and she gave them 15 minutes to find what macromolecules (proteins, carbohydrates, and lipids) the dieter consumes in excess, and which ones they are at risk for deficiency. She also had the class research what the symptoms are of macromolecule deficiency. At the end, each lab station was given 2 – 3 minutes to present their findings to the class on an overhead transparency, and their peers filled out a table that she created for all of the diets. Becky remembered:

> [My] students seemed to enjoy the activity, and the substitute teacher turned out to be a laid-off high school science teacher and…asked me to email her [the] lesson plan. So that was nice. I definitely would do things differently the next time I do a Jigsaw activity-- but it wasn't bad for a first try!

Becky was happy to see that her jigsaw activity kept her class engaged in learning. She felt that the lesson helped her teach content in a more interactive way, and that her students were actively participating and learning in a fun way.

"Campaigning for organelles" activity. Last, Becky highlighted an activity she taught her students that was not only engaging but also memorable and fun for her and her students. She planned an activity for two class periods, in which her students would learn about different cell organelles and do a project presentation on the second day. She decided to design a jigsaw activity, in which each lab station would research one cell organelle and then present their

findings to the class the next day. Becky felt that she needed to make some changes from her first jigsaw of the three diets her students researched and presented. This time, she was going to give her students some information about the cell organelle, and she would direct the students to a spot in the classroom with AP biology textbooks that they could use to obtain more information if they needed it. To make sure students understood the information from their peers, Becky also decided on having students create and present a poster. She felt that this way the poster would be a visual for them to refer back to. She also developed a table for the students to fill out information on each organelle as their peers presented.

Becky described how she incorporated intrinsic and extrinsic motivation to group work. According to Becky, the students' extrinsic motivation was the rubric/exit ticket she created. She had her students choose a specific role in their group, and she gave them a rubric to show them how each role would be evaluated. She went on to describe her grading system:

> Every group received the same project grade. This would motivate students to push each other in class. I also gave them an exit ticket where they could "assign" participation points based on how much each student contributed to the project. I said they all had 40 total points and they could distribute them among the 4 people (including themselves) based on how they participated. If everyone participated equally: 10 pts/person.

Becky went on to explain that she set out to motivate her students intrinsically by framing the activity into a "campaign." She described how she briefed the students with a scenario in which the cell factory had to lay off one worker, and it had to be voted on by the general body. So she foresaw that the posters the students created would have to have creative slogans, and that their presentations would have a lot of energy so that they could convince their peers not to vote them out. Becky remembered how she found her 3rd period to be the most vocal during the

presentations, which was "unforeseen" to her because they were normally very quiet. She recalled how the previous day, before the presentations, she had walked around and "secretly planted" information about which organelles were "talking crap" and which organelles they could bash during their three-minute presentation. Becky pointed out that her students did not go after individuals – they just "attacked" different organelles during their campaign ad to make sure their presentation was more compelling. She remembered,

> "Power to the People's Cells!" chanted lab station 2 at the start of 3rd period. Lab station 2 was campaigning to keep mitochondria in the cell factory mix. "We provide energy to the cells! You can't survive without us! We are so much better than the bossy nucleus!" They were doing everything they could to keep themselves in the mix. As I watched and took notes on their performance, I laughed with amusement at their enthusiasm. Wow, this is unusual! Normally the students are so sleepy during 3rd period, but today they are very much awake. I was so happy, all of the students were frantically taking notes during the presentations, and the students themselves far exceeded my expectations with creativity in their campaign slogans and artwork on the posters. And what was so great about all of this was, that the students were providing correct information to each other and I just had to sit back and watch the process unfold…Love, love, that!

Becky felt very pleased with her students that day, for not only doing all of the work but also all of the thinking. She could see how her students were not only invested in their project and "campaigning" hard not to get "booted out" by convincing their peers how valuable they were to the cell, but they were also really enjoying the lesson and being engaged. The best thing that Becky also remembered about the activity was that the average on the entire rubric (poster, presentation, content of research, and creative slogan) was 92%. She believed that their "A" was

not because it was an "easy" assignment, or that her expectations were lower than normal. She realized that it was because she had given her students clear directions about how they would be critiqued, but also because they were really invested in the project.

Last Teaching Reflection: December 2012

Becky ended her journal reflections for the month of December and the semester by talking about what it was like for her to navigate the tensions of having two mentor teachers with two different teaching styles. As mentioned in the beginning, Becky interacted mostly with her chemistry teacher, Ms. Yang, but Becky did feel that having two mentors was challenging for her at times. Her biology mentor teacher, Ms. Berry, had Becky "stressed out" sometimes, because she would not know what the class would be doing until the night before, when she would be given a "topic." Becky, then, would be expected to develop an entire lesson from scratch. Becky added that the hardest part for her was all of the planning.

According to Becky, in Ms. Yang's class she became the more "no-nonsense" teacher and "just really strict," while in Ms. Berry's class, she felt that she was more herself because although Ms. Berry "was strict, she wasn't so serious." Becky was more able to lighten up with the students in Ms. Berry's class, and she believed that she actually had better relationships with the students in that class because she was more herself. She also felt that her students saw her more as a person that they could relate to, and they felt more comfortable approaching her. So she navigated the tensions vis-a-vis her two mentor teachers' teaching styles and perspectives by following their classroom expectations but foregrounding what was important to her- teaching her students science that was engaging and fun and building relationships with her students.

David's Storied Identity of Becoming a Science Teacher in an Urban Setting

David's storied identity of becoming a science teacher in an urban school revolved around how he navigated the challenges with behavioral issues in his classroom. The behavioral issues that surfaced mostly in his storied identity of becoming a science teacher were about his students' talkativeness in class. Part of navigating the challenge of talkativeness in his classroom was seeking ways better to know and to relate to his students, as well as positioning himself as an authority figure with his students.

David taught in Western High School, an urban high school that had a predominantly Black student population, which was very different from the suburban school he went to when he was in high school, where the student population was mostly White. The percentage of high school students on free and reduced lunch assistance was more than 60%, which was higher than the state average of 43%. David's mentor teacher, Ms. Edwards, had been teaching at the school for 12 years. She taught 9th grade Biology all 12 years at the school, but she also taught chemistry to mostly juniors and seniors. David taught in the biology classes. David also had another mentor teacher he added at the end of November 2012 to his internship. He wanted to have a mentor teacher in physics, and Mr. Smith became his physics mentor teacher. Mr. Smith had been teaching physics and AP physics for more than ten years in David's school.

Navigating the Challenge with Talkativeness in His Class

In his journal reflections, David wrote that the first thing he noticed on the first day of school in September was how two of his classes "were noisy during the whole class period." When Ms. Edwards, his biology mentor teacher, and David talked in front of the class, he noticed that there were several students who would be having side conversations, or would "blurt out" answers out of turn in class. David did remember his mentor teacher stopping several times

during that first day of school, to discuss the problem with the class. He did reflect in his journal that the talkativeness was a hard problem for him to work with:

> I noticed that I had a hard time working with [the talkativeness]. For example, I might be listening to one student give an answer to a question. At the same time, there were students talking on the other side of the room. The students would speak softly enough that I could tune them out, but I needed to get them to stop the side conversations. We asked them to stop talking, but they would usually start about a half a minute after you reminded them. I do not know how best to deal with the problem.

David later wrote more about why his students' talkativeness was a "problem" for him. He described himself as someone who does not do well "in a chaotic environment." If there is talking around him, David noted that he is someone who gets easily distracted and cannot focus. Furthermore, David added that if he cannot focus because of the talkativeness, he feels that he does "not give a good delivery of the lesson." He went on to equate having a quiet class as essential for him in being an "effective teacher."

Feeling inadequate as a teacher. About two weeks and a half into his student teaching, David wrote about how he was starting to feel "inadequate," and that he was "losing steam" in his class because of the talkativeness in his class. He was feeling down partly because of things not going as well as he would like in his classes, but also because of a financial situation he was having with his car breaking down. He was beginning to have doubts about his choice of career. He did recognize that it was too early in his student teaching for him to say this, and that he should give himself more time to get used to the school:

> I feel stuck in this career path because I am not sure what else I am able to do. I have quite a bit of work experience, but I never seem to be happy in what I am doing. Once

> again, it is a feeling of uncertainty that gets me down. Right now I am uncertain about my car. I am also uncertain about what I want to do when I "grow up"... That is not to say that I do not enjoy teaching. I enjoy it when it goes well. However, after every class I teach, I feel inadequate. I also feel afraid about talking to other teachers about how I am feeling because I get the sense that many of them feel that if you are not in love with being a teacher, then you are not cut out for the profession.

David was not feeling satisfied with how he was handling his classes. He felt "inadequate" and that things could be much better. The behavioral issue in his class was adding to his feeling of inadequacy, and to his feeling of not being an "effective" teacher. He was reluctant to voice his feeling of inadequacy, though, because he was afraid that he would be identified by other teachers as not in the right profession because he was not enamored enough with the idea of being a teacher.

Trying to relate to his students. To address the behavioral issue of talkativeness that came up in his class, David told stories about how he took the initiative to learn more about his students. A student David wrote a lot about was Mike. On the second day of school, Mike was being "unruly" and talkative in class. Ms. Edwards asked Mike to leave the class. David wrote about how he went out in the hall to talk to Mike about his behavior. David remembered that Mike's excuse for being loud in class was that it was just the way he was. But David found out later on from Ms. Edwards that Mike was having trouble with his mother, and that he had been living in his friend's home the last couple of days. Learning more about Mike's living circumstances made David reflect about the best ways to reach him, while still holding him accountable for his own behavior in class:

> I can empathize with students in rocky home situations. It is just hard for me to see what I should do. I will try to be caring, but that does not mean I am going to be a push over in this situation. I think when it comes to [Mike], I will try to show him that I think he is too smart to be acting foolish, but that I am still going to hold him to the same standard of conduct that I hold other students to.

David realized that as much as he empathized with Mike's situation, he wanted him to realize that he would not condone his talkative behavior. He would not accept Mike's behavior and talkativeness, and yet at the same time he would be sensitive to Mike's living situation.

During the second week of teaching, David wrote about how the talkativeness in his class took another form. Two students in his class started using American Sign Language (ASL) to communicate with each other while David was teaching. Other than Mike, David wrote a lot about another student, Juan, in his journal reflections. David had learned ASL spelling before, and decided to use it to stop the talkativeness. David remembered:

> I caught [Juan] talking to [Elsa], so I stood behind [Elsa] and spelled out "Pay Attention". [Juan] started spelling really quickly at me, faster than I can read. Instead of loosing face, I used the actual signs for "pay attention," which got him to be more focused. I think that this tactic is going to work for a little while, because…I think for [Juan], it may give me an opportunity to open up a relationship. He was signing words to me throughout class, and signing back may show him that I do care about his interests.

For David, communicating with Juan using ASL meant that he was able to reach out to him in class and get his attention. It also meant for David that he could show Juan that he did care about him knowing sign language, and that it was something he had in common with him.

David noted in his journal reflections that talkativeness was also prevalent among his English as a Second Language (ESL) biology students. Ms. Edwards and David decided to address the talkativeness among the ESL students by dividing the students up in their home language groups. David noted,

> The approach seemed to work well, especially for students that have very little knowledge of English. It also helped me to keep the class quiet when I talked, because I could tell them that they have already had a chance to talk. It is also easier to assess individual student progress when they work in groups throughout the lesson. While other students are working together, I can work with one or two, which keeps everybody occupied.

David pointed out that having them in groups afforded ESL students the opportunity to ask questions to people who spoke their language. David also added that it gave the ESL students a chance to talk during class, but also for him as a teacher to control the level of talkativeness and noise in the class.

Being reassuring to his students. David wrote about how he wanted to come across as "reassuring" to his students. He told the story of Cindy. She was a C+ student in his class, but David believed that she had potential and could participate more, and that she also needed to study more for her quizzes. During parent-teacher conferences, David found out that Cindy was living with foster parents and had switched from special education to general education. Cindy's situation was interesting to David, because he had been in a similar situation when he was in ninth grade. He was not in a foster home, but he had moved from living with his mom, after she passed away, to living with his aunt and uncle. He had also made the same switch as Cindy, from special education to general education. David remembered in his journal reflection:

> I told Cindy that as she is making this switch in her life, the most important thing she should keep in mind is to not get discouraged. I wanted to tell her about my own situation, but I did not know if that was appropriate. I did not want to lessen her situation, but I also wanted to let her know that just because she was in special education does not mean that she is doomed to being academically unsuccessful. This is how I felt when I was her age, and I want her to not feel the same.

For David, Cindy was not adding to the talkativeness of his class, but she was not actively participating in the classroom to her full potential. He did not want her to feel "academically unsuccessful" because of her switch from special education to general education. He had been there and remembered the feeling, and it was something he did not want one of his own students to go through. He wanted her to feel part of the classroom, and thus he took the time to reassure her that the most important thing for her was not to get discouraged about her switch, and that she could succeed academically.

Another story David told about trying to be "reassuring" to his students in order to relate to them, but also as a way to get them to feel part of the classroom community, was with his autistic student in his first hour class. David described this student as always getting upset in class and having a "defeatist" attitude about his work and grades. David remembered at times that the student would throw his head down on the desk and say that he was going to fail. What David did then was to try to reassure him and tell him that he just needs to "calm down." David had even consulted with the Study Skills Teacher in his school, to see if there was anything else he could do to relate to his student, but he found out that other than reassuring his student and offering him positive reinforcement, there was nothing else he could do.

Positioning himself as an authority figure. Although he went through feelings of

uncertainty and inadequacy, David did not give up on finding ways to work on the talkativeness in his class. David wrote in his journal reflection that he decided to be more willing "to be loud and demanding" when he asked students to be quiet. He was going to address the talkativeness by adopting a "position of authority" with his students. He said that he was not being "mean" but "firm," because he realized that students would keep talking if he remained "meek." David also decided on being more "willing at calling students out for talking with each other." So, he was going to adopt a different demeanor and a "firm" teaching identity in his class in order to address the talkativeness of his students.

After almost three months into his student teaching, David was starting to feel more "confident" as a teacher. Seeing himself as more of an "authority figure" and less as a peer to his students was a factor in his confidence. David realized that he needed to get used to the fact that in order for his classroom to run orderly, he needed to take the position of authority. David still had conflicting feelings about his "authoritarian" teaching identity:

> The hard thing that I have had with acting in authority is that I do not want to be authoritarian.That is to say, I do not want all of my students to get the impression that they must do as I say when I say it. I would rather have students take responsibility for their own actions, and foster a feeling in students that they are making choices for themselves. I feel like this is being an authority in the classroom without being authoritarian.

It was still hard for David to accept the position of authority, because it felt forced on him. He felt that he would rather have students take responsibility for their own actions, without him being there behind them, making sure they were making the right choices in class.

Another change that David believed helped his confidence as a teacher was focusing his

attention more on his students when he was talking. While teaching and explaining the lesson, David was trying to focus now more of his attention on the students, which he believed allowed him to do a better job monitoring student understanding and deterring students from talking too much in class.

A different perspective on his students' talkativeness. David also experienced a shift in how he viewed his students' talkativeness. He started to differentiate between students' "talkativeness" and their "willingness to participate " in class discussions. He told the story of a time when students during his third hour class were doing an activity where they were reading paragraphs about organelles, and then were discussing the function of the organelle. David noticed that students were calling out answers in class out of turn. Yet David remembered how Ms. Edwards pointed out to him that students' calling out answers in class was their way of "trying to participate, [and that he] should not be mean about the talking." So, David decided to scaffold his students, and he worked on explaining to them how they can participate in class to explain their answers. He gave the example of Jamal in his journal reflection:

> There was one point where [Jamal] was answering a question. He was struggling with the answer, so some of his peers were blurting out answers. I stopped the class at that point and explained to them that when I ask them to raise their hands, I only want to hear from the person that I called on. I said that I appreciate that people want to answer the questions, but I call on a single individual because the discussion gets chaotic otherwise.

Being explicit about how he expected students to participate and modeling it for them was his way of scaffolding them and teaching them "life skills." He did notice that after he told the students how he expected them to behave, there was less talkativeness. He even noticed that one of his students who had the most trouble with blurting out answers actually raised her hand when

David asked the students to call out an answer. By modeling to the students how to participate, David was able to address the talkativeness in his classes, which he believed in the ESL class had its root in the students' eagerness to participate.

Last Teaching Reflection: December 2012

At the end of the semester and after the students returned from Thanksgiving break, David's frustration with the students calling out of turn reappeared still at this point, even after almost three months into the school year. David wrote about how his focus class was starting to be "unruly" again, although they were "well- behaved " before Thanksgiving break, but now he noticed they were "off track":

> It has been a little shocking to see how the class won't be quite even after I have asked them to be quite repeatedly. I have been getting incredibly frustrated in the class, and it got to the point that I told the class to "shut up" today. This was disrespectful on my part. The words just slipped out of my mouth, which was more than a little shocking. I immediately apologized to the class.

David felt like he had lost his cool with his students. For him, it was not just one student that was causing a problem. The talkativeness had gone back from being one student calling out of turn, and other students following suit. He decided to start class the next day by letting his students know that he was disappointed with their recent behavior, but that he was very proud of them in previous weeks because they were much better behaved. He was also going to adopt a different measure with them, to hold them accountable for their talkativeness. David was going to tell them that every time he had to stop class to remind them to be quiet, he would remove a letter from the word "LUNCH" written on the board. Every letter after "N" is 30 seconds that he would hold them over after class. David's hope was that this would be a deterrent for his students

who normally did not talk, but were talking because everyone else was talking.

He grappled with the tension of adopting an "authoritarian" position with his class, because it went against what he believed about students "[taking] responsibility for their own actions." He was frustrated that he had to quiet the class and correct misbehaviors, even after trying different approaches with his students.

David also added in his last journal reflection for the semester that other than working on "correcting the misbehavior" of his students, he wanted to work on his own behavior in class. His frustration with his students' talkativeness led him to "lose his cool" in class, which was something he did not want to go through again. His hope was that the LUNCH system would allow him to pause during class, giving him the opportunity to calm down if he was getting too upset in the classroom. He valued having a classroom environment in which his students were respectful, and in which he showed them the "life skills" that he believed were needed for being respectful. He ended his journal reflection with his wanting to get back to saying "please" and "thank you" to his students more than he had to chastise them.

Ashley's Storied Identity of Becoming a Science Teacher in an Urban Setting

Ashley's storied identity of becoming a science teacher revolved around valuing her students' making deeper connections with the scientific concepts she taught. Part of helping her students make deeper connections with the content was delivering lessons that were real, fun, and relevant to her students. In addition, Ashley realized that she had to navigate through the minutia of the day-to-day lesson planning and to let go of "smooth and perfect" lesson planning, so that she could instead focus on the big picture of reaching her students' learning.

Ashley taught in Southern High School, an urban high school in a struggling city that used to be the hub of the Auto industry, with a predominantly Black student population. The

percentage of high school students on free and reduced lunch assistance was more than 55%, which was higher than the state average of 43%. Ashley's mentor teacher, Ms. Jones, was a veteran teacher at the school. She taught 9th grade Biology at the school, but she also taught chemistry and physics. Ashley taught in the biology classes.

Helping Her Students Make Deeper Connections to the Content

What stands out in Ashley's stories and what she prioritized most was finding ways to organize her lesson plans so that they connected to her students, but also so that she was able to reach her students. By reaching her students, Ashley meant making sure that they understood and learned the content in a way that was fun and relevant to them, but also that they saw that she cared about them learning as much as possible.

"**Mark and recapture" activity lesson**. For instance, Ashley wrote about a lesson she did when teaching a unit on ecology that focused on populations and relationships. In the lesson, she had the students do a "mark and recapture activity" with bags of beans. Ashley explained to the students that they would be learning about populations, and then she asked them to think about how ecologists would go about determining population sizes. She noted in her journal reflections that some students said ecologists could use counting, and other students knew of a grid technique. She then asked them what they would do with organisms that were on the move and had a very large population size. The students agreed that counting would not be feasible, so Ashley introduced the "mark and recapture" technique, which would help count the population through sampling rather than by counting.

Ashley remembered how her students did enjoy the activity, and she was glad they were able to practice a technique that applies to real ecology, but that also was relevant to them in terms of determining population size. Yet what Ashley wrote as she reflected on the lesson was

that she hoped she had given her students more explanations about the equation behind determining population size. She wanted to make sure that the thought process behind the equation "made sense" to her students, just as it made sense to her. Yet, she did believe that in the end, it was a good activity, and that for future reference, she would make sure to make the thought process behind equations connect more with her students.

Skits depicting relationships in ecology lessons. Another activity Ashley talked about that was not only fun but also relevant to her students was when she introduced the topic of relationships in ecology. To make it fun and relatable to her students, she wrote skits for the students to act out different relationships that occur between humans. She then gave her students notes on the actual terms, such as mutualism, that they had just acted, and a chart for identifying relationships, using the symbols +, -, and 0 for the effect the relationship has on each organism. As she went through the notes, she asked the students to look back to the notes that they had taken on the skits, and first determine which scenario fit which ecological relationship, then to write a quick explanation for why they thought this.

Ashley was impressed with how interactive her students were and the excitement level of the class. She was glad to see how her classroom depicted a "strong and supportive learning environment" from the skit activity, and how the students were laughing and learning at the same time. What Ashley highlighted, though, was the "real life" connection the students got out of engaging in the activity while learning terms in ecology:

> More importantly, [for me] when going through the student responses, it seemed that giving them that real life basis then going through the skits really helped them to make connections to what the terms mutualism and commensalism actually mean. Most students correctly identified which skit went with which relationship and good

explanation. I believe that this will help them when it comes to identifying these same relationships in organisms as well.

Although Ashley did remember that the activity took some time out of the class period, it was time "well spent." She believed that students needed to do something fun that also related to what they were learning. Furthermore, Ashley realized that the "atmosphere" of the classroom determined how well these activities would "work out." In the case of the skit, the "positive atmosphere" in the classroom contributed to the " positive supportive learning environment," and this is what Ashley hoped to build with all her classes.

Lesson on different monosaccharides. Another activity Ashley wrote about was when she taught organic compounds to her students. For Ashley, it was not enough to give pictures or show videos of the macro-molecules to her students for them really to make a connection to what they looked like. Instead, she went ahead and built a bunch of monosaccharides, using the molecule building blocks she had from a kit. She knew that her students did not have access to powerful microscopes that would enable them to make that deeper connection and see what they really looked like. So Ashley modeled for her students a 3-D structure of the monosaccharide organic compound, and she explained to them how different bonds affect the compound's properties. She then had her students build the 3-D models themselves, but of two different monosaccharides - a starch chain and fructose molecules. Then, Ashley had them do a taste test with apples and a potato. The students were able to make the connection that the apples had the fructose molecules, and that the potatoes had the starch, because of the different properties of taste and flavor. She felt that the lesson reached her students, and they were able to make the distinction between the two different monosaccharides in a way they could relate to.

Valuing Her Lesson Planning Running Smoothly

A lot of the stories Ashley told in her journal reflections were about how she focused on the minutia of the day-to-day lesson planning. Ashley would write about doing as much as possible to have her lessons go "right, perfect, and on track."

"Double-check, double-check" for a "perfect" lesson. A month into her student teaching, one story stood out in her journal reflections about how she valued her lesson and teaching being "right and perfect." She remembered it as the day she learned the importance of double-checking tests before handing them out. Ashley recalled how she had looked through the exam several times on her laptop. It seemed "fine" to her, so she printed it out at home and brought it the next day to school to make copies. However, Ashley noticed a few things after grading the tests:

> Turns out, after handing out the test and especially after grading the tests, that there are a few things that I need to work on. The first thing being that I should probably make copies of the test a couple days before administering the actual test. One of my diagrams on the test did not show up after copying and thus I had to scratch it out for my students because they weren't able to clearly see the food web connections they needed to be able to answer the associated question. Second of all, when writing questions, it is very important to think back and ask myself how well I covered the content. I had a question on the test in which I had mentioned the concept in a discussion, but the students definitely did not have notes on the topic. I assumed they would be able to answer the question since I touched on it, but for the future I should make sure all the important points are emphasized more carefully.

For Ashley, what frustrated her the most was that her mentor teacher decided the week before giving the students the test that she wanted her to rewrite the questions and make them harder for the class. Ashley noted that she realized then that she had spent the two weeks teaching to a simpler test and not giving the students enough practice on the "deep thinking questions" on which they needed to do well on the exam. After grading the tests, Ashley remembered that she had to cross out some questions, and the class test average ended up being 79%. Ashley felt "responsible to an extent" for the "low grade," because she felt that she could have changed the test setup before giving it to her students. What Ashley learned and reflected about, though, was the importance of printing out the test ahead of time and reading it out loud, to make sure she catches any errors in questions. Lastly, she added that she learned the importance of thinking back about what content she actually covered in class and how it aligned with what she tested her students on. In this way, Ashley felt that her test questions would be "fair" to her students, because they would be assessed on what they were exposed to in her class.

Details, details, details. Another story Ashley told about prioritizing her lesson planning going "smoothly" was the day she realized her students did not have their workbooks with them. It was Thanksgiving week, and Ashley was getting ready to be off on vacation, after she had anticipated her "lesson to go smoothly." However, that day the lesson did not go as smooth, and it made her aware of the importance of the little minute details. Her students did not all bring their workbooks, and thus were not able to participate in the activity of determining which type of questions, based on American College Testing (ACT) test data, that they were struggling with or doing well on. Ashley had looked through the ACT booklets the day before the activity, and she had taken notes on the students, but it did not occur to her to "actually go through and count the number of booklets." She had assumed they were all there, when in fact some were missing.

Although it was "[not] the end of the world," as Ashley wrote, each little "mistake" added to her "anxiety ten fold when teaching the lesson." What Ashley realized was how important it was for her to account for student work before doing an assignment. She also understood that for her own "peace of mind," it was crucial to do everything she could to avoid anxiety within a lesson. For Ashley, this meant working harder before class, in order to be fully prepared and have everything ready to go.

Not being too hard on herself. Another story Ashley told about honing in on the minutia of the day-to-day lesson planning was the day her mentor teacher went to a conference, and she was in charge of the classes for the entire day. It was an interesting day for Ashley, as she remembered rushing to get things ready, and she knew that she had to make all the decisions of the day by herself. She could not rely on her mentor teacher to validate her decisions, and she had to "trust her own instincts" as a teacher and not be too "hard" on herself. She noted:

> I have these moments where I separate myself as the intern, and Ms. Jones is the teacher. I think what I need to start doing is viewing myself as, yes an intern, but the teacher as well…However, I can't be so afraid to do the wrong thing, and I need to realize that for myself a lot of times that's where the best learning occurs. Especially in someone like me, I usually remember quite well the things that don't go right or as planned.

For Ashley, this meant that for her to be a better teacher, she believed she needed to trust herself, and that she was going to do what is best for her students. In other words, she believed that if she was making the lessons for her students and answering questions in ways that were most "beneficial" to them, then she was doing what was "right." What she also noted was that doing what was "right" for her students did not mean doing what was "perfect," and that was what she was working on, "one day at a time."

Embracing the "little things." Two months into her student teaching, Ashley told a story of how she learned to embrace the "little things" about becoming a science teacher. Ashley realized she had been "hard" on herself lately, to the point of worrying about not doing such a great job with her lessons. She admitted that she worried constantly that her students were not getting the "best education" because of the "little things that go awry" in her lesson plans. For Ashley, she wrote that today was about taking a step back and really listening to her students. She noted how she remembered how some of her students that day had told her they missed her when she was absent last Friday, which "warmed [her] heart." She went on to say about one of the students that came to see her:

> This same student I know is struggling in the class and is frustrated because I am challenging him. So for him to come up to me and say that really showed me that one, he cares, but, two, that he knows I care as well and that I must be doing something right.

To have one of her struggling students tell her that he missed her made her feel that he cared about her as a teacher and that she was able to reach him and make him care about his own learning. For Ashley, her student coming up to her validated for her that she was doing "something right."

Ashley was aware that day even more that the way she was teaching was not easy, since it was not "by the book," and a lot of the activities she gave her students challenged them to think deeper about the content they were learning. Ashley admitted that her students did express concerns about finding it hard initially to be challenged in their thinking, but they were showing her that they were learning in the activities, tests, and assignments that they did. She noted,

> I need to look at those students and really realize that I am getting through to them, they are learning, and growing. Even students who are getting C's in the class, that means they

have understood at least 70% of the material. Then the next step is how do I get them a little bit further.

What Ashley accepted that day was that as a teacher she did reach her students, and that they did not all have to have As in the class. She had built a "powerful relationship" with them because they knew she cared about their learning. Knowing that her students knew she cared about their learning, Ashley decided to make it a point to keep building those relationships with students who were struggling or were more reserved in the classroom.

Organized, organized, organized. For Ashley, part of incorporating authentic and real activities that connected to her students and helped them learn the content involved staying "organized" and "on track." She pointed out a time when she decided to have certain strategies in place to help her stay "on track." What Ashley did was create a checklist to fill out during her class, and she set alarms on her phone to help keep her "on track" to ensure that she did "all the little things in the day that need to get done in a lesson." For Ashley, her priority as a science teacher became "pushing through the content" required for that day and sticking to the plan. In the end, it was finding a system that worked for her and for her students, and having a "running checklist" and looking at her notes in class were what worked and got her results. Her mentor teacher had mentioned to Ashley that referencing her notes in class made her look "unprofessional." Ashley remembered:

> [Ms. Jones] has mentioned in the past that it looks unprofessional or unprepared if I have to reference my notes, but for right now it is just what I need to do in order to remember everything I need to get to in a lesson. For me it doesn't matter at this point how prepared I am before the lesson, if I'm really anxious while teaching I will forget to do the little things if I don't have a running checklist to follow. At this point I am willing to sacrifice

> looking a little unprepared in order to make sure I'm getting everything out to the students that I need to be…right now I have to figure out a schedule that works for me and even more important my students.

Ashley believed that being prepared as much as possible would help ease her anxiety. She was willing to look "unprofessional" if that meant using notes or a list, but she felt she had to do what she did.

Last Teaching Reflection: December 2012

By the end of the semester, Ashley ended her journal reflections by talking about her positioning in regards to her students, but also about her frustration with their behavior after Thanksgiving break. For Ashley, her point of tension was trying to reconcile dealing with everyday lesson planning and delivering as much content as possible to her students in authentic and engaging ways, while also being the caring teacher who tried to reach all her students. Yet reaching all her students while being "understanding" did not work with her students. There were times, she admitted, she was "too nice and understanding " to her students and reasoned with her students, explaining to them why they were being disciplined for their loud behavior and disruptiveness. She was disappointed to see that they were not "respecting her" as a teacher. She wrote,

> I can't keep letting the students in my class getting away with being disrespectful to me and to their peers by being loud and disruptive. It is clear that the students do not respect me. When my mentor teacher is in front of the room the kids are much more quiet and attentive. They actually do their work. As soon as I step in front of the room it is a whole different ball game.

Ashley realized that her students did not recognize the same authority in her as they did with her mentor teacher, which in turn led them to be disruptive in her class. She saw that she could not compare how she was as a science student to her own students. She felt that she could not reason with them, and she had to step back from being the "understanding" teacher she had positioned herself to be. She remembered how growing up in her own high school, being sent the office was a "huge deal." But in her class, her students thought it was "cool" to get sent out, or they would defy her as a teacher to "save face" and thus stay respected by their peers. She noted,

> I thought reasoning with them would work perfectly but it doesn't work a lot [with] these kids. Because they take that as an opportunity to be combative. A lot of them are that way at home, though. That's what my mentor said- a lot of times, their home lives, that's how they communicate. And they don't view it as disrespectful as I do.

Ashley then concluded that what was "best for her students" was not to position herself as their "friend." She believed that she needed to show them some "tough love." She saw her position now as a teacher of content, but also as a teacher of "life skills," showing them how to be respectful in and outside of the classroom.

Cross-Case Analysis of the Three Interns' Beginning Practice

The stories the interns told about their beginning practice during the first three months of student teaching suggested that they felt much more like outsiders in their classrooms than they had expected. This was surprising - indeed "shocking" - to them. They were also surprised at how hard it was to break in fully, and to become a fully valued and functioning member of the classroom community. The three interns also found it difficult to gain respect from their students as they navigated social- cultural differences with their students in a classroom that did not feel like their own. They each developed a position of authority in their own classrooms and took on

different teacher professional identities (Luehmann, 2007) that afforded opportunities not only to manage the behavioral issues in their classroom, but also to gain respect from their students and to develop "powerful" relationships with them. Their storied identities expanded and became more complex as they developed relationships with their students and their mentor teachers. In other words, their storied identities of science learning percolated to become part of their storied identities of becoming a science teacher. In addition, they also leveraged their storied identity of science learning in their developing practice.

Reauthoring Their Teacher Professional Identities to Fit in and Gain Respect from Their Students

There were certain components that shaped their storied identity of becoming a science teacher. Namely, the components that stood out were their positioning themselves as active members of their classroom and building relationships with their students. The dynamic interaction of these components mediated the meaning the interns made about the tensions that surfaced between them.

In their developing practice, all three interns found themselves negotiating how to make sense of their teacher professional identity as it related to a socially and culturally different classroom setting from their own lived experiences. They realized that inhabiting their own teacher professional identity was an ongoing process. The three interns refined in their own classroom context their teaching identities in order to relate better to their students and to deliver the content. They came to produce new identities of themselves in order to fit into a classroom context where their diverse students were "other people's children" (Delpit, 1995). Their initial teaching experiences provided them with new experiences through which to re-author their

teacher professional identity as contextual to their classroom settings.

Gaining respect, in their stories, was a part of being an insider to their classroom communities. It was about more than having good management and teaching strategies, although these were important. All three interns took on more of a position of authority in their own classrooms. As mentioned before, Becky found herself re-conceptualizing her teacher professional identity, from the "soft-spoken" teacher, and adopting a teacher professional identity of the "tough" teacher, to gain her students' respect, but also to position her in a space of authority with her students. She found out that more than half of her students came from single-mother households, where the social-cultural norm for them was to communicate in a "tough, aggressive" tone of voice. So with her teacher professional identity, Becky went from being a "soft-spoken" teacher to becoming "aggressive" and firm in the tone of voice she used with her students.

David also found himself reconstructing a different teacher professional identity with his students. He adopted a different teacher professional identity and a "tough skin" as a teacher. He went from being "meek" to being more "loud and demanding" in his class. It was not easy for him. There were times when he felt like "he lost his cool," which frustrated him, because that went against his calm demeanor and personal values. Yet he saw re-conceptualizing his teacher professional identity as a way to gain respect from his students, but also as his way of participating in his "figured world."

Ashley also reauthored her teacher professional identity by December 2012 before starting her lead teaching in January 2013, to change from the "understanding" teacher to the teacher of content and "life skills." By "life skills," Ashley was referring to teaching them to be

respectful in class and to be responsible. She had re-conceptualized her teacher professioal identity so that she could show her students some "tough love," but this also helped her reach her students and teach them content.

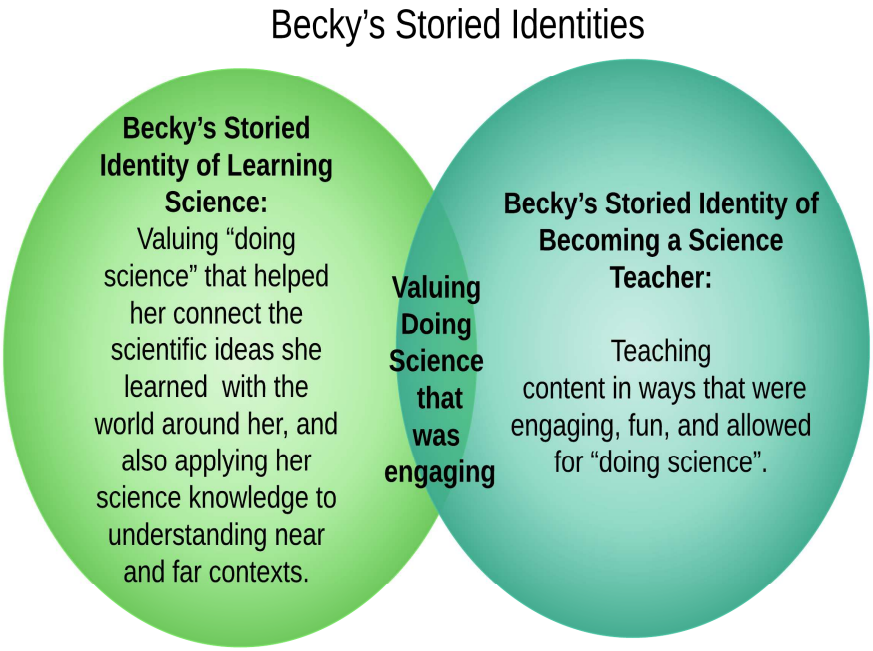
Leveraging from Their Storied Identities of Learning Science to Shape Their Storied Identity of Becoming a Science Teacher

The interns framed their initial teaching goals through powerful experiences with science in their earlier lives-which shaped their storied identity of learning science. But they also crafted their teaching practice in response to those experiences they found disempowering. Thus, their storied identities of learning science ended up being powerful resources that they could leverage as they sought to work through these challenges that they encountered in their classroom context.

When using a storied identity lens to look at the interns' developing practice, I found that it afforded opportunities to compare how their storied identities of science learning showed up in their practice. By looking at the three interns' storied identities, I found that Becky and Ashley had their storied identities overlap more than David. In other words, what they valued in their storied identity of science learning was also salient in their storied identity of becoming a science teacher and was a focal point in their developing practice and before their lead teaching.

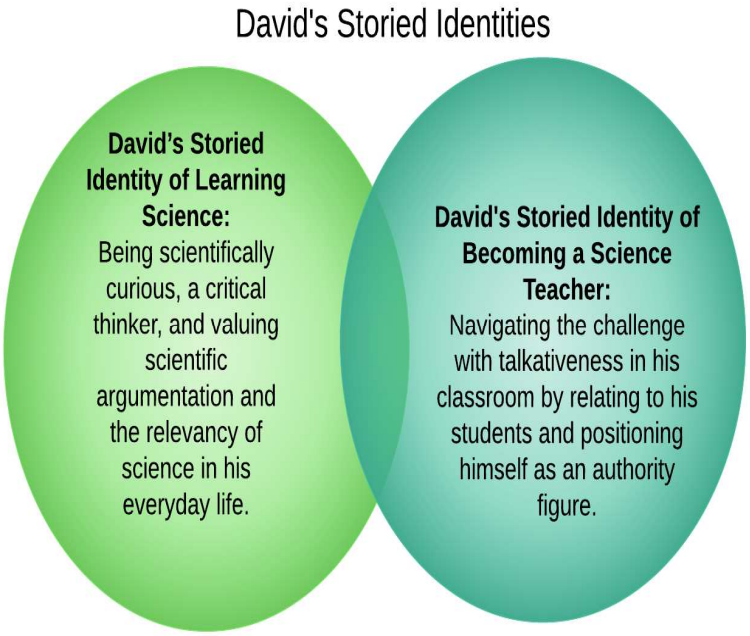
For example, Becky valued "doing science" that helped her link the scientific ideas she learned with the world around her, and also applying her science knowledge to understanding near and far contexts. Her storied identity of learning science surfaced in her developing practice because she prioritized teaching science to her students in engaging and interactive ways that connected to them, but also showed them that she was "passionate" about their learning. She foregrounded teaching science in ways that were fun and allowed for "doing science," which was what she leveraged from her own empowering experience of learning science. (See Figure 5.1)

Figure 5.1 Becky's Storied Identities



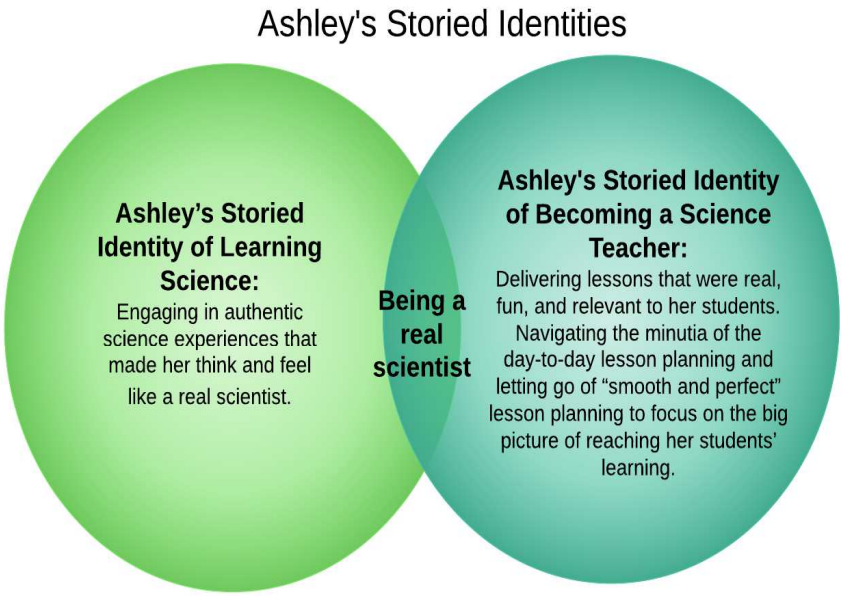
In David's case, as his storied identity of becoming a science teacher developed, what we see it revolving mostly around was how he reconciled with the tension of getting students to respect him as an authority figure and dealing with the talkativeness in his class. David leveraged his storied identity of learning science in how he related to his students. He talked about how he approached the talkativeness, which was a disempowering experience for him, by looking at ways to relate to his students and to be "reassuring." He tried to relate to his students' lived experiences, as was the case with Cindy, who went from special education to general education, just as he did when he was in ninth grade. He took the initiative and talked to Cindy, and was encouraging her to stay positive and to work harder. This was one way of tapping into his person experience of learning science to better relate to his students, but it was not a central theme of his storied identity of learning science. (See Figure 5.2 below)

Figure 5.2 David 's Storied Identities



For Ashley, her storied identity of learning science revolved around valuing doing "real science." This is also seen in her developing practice and in what she valued for her own students as well. Ashley valued engaging in authentic science experiences that made her think and feel like a real scientist. The lessons and activities she planned were centered on providing authentic real science experiences to her students. For example, when she taught the lesson on monosaccharides, she made sure her students built 3-D models of a starch chain and a fructose molecule, but also had them taste the different properties of each. (See Figure 5.3 below)

Figure 5.3 Ashley 's Storied Identities



Their storied identities of becoming a science teacher before their lead teaching in January 2013 informed how they framed their initial experiences teaching in an urban setting. I argue that the more overlap there was around their storied identities of science learning with their storied identity of becoming a science teacher, the more they seemed to leverage their storied identity of science learning in order to implement teaching strategies that drew from their storied identities of science learning and that helped them make sense of the challenges in their classroom contexts.

Table 5.1 Summary of Interns' Storied Identities as Science Learners

Storied Identity of Learning Science	Becky	David	Ashley
Their sense making of their science learning.	Valuing "doing science" that helped her connect the scientific ideas she learned with the world around her, and also applying her science knowledge to understanding near and far contexts.	Being scientifically curious, a critical thinker, and valuing scientific argumentation and the relevancy of science in his everyday life.	Engaging in authentic science experiences that made her think and feel like a real scientist.

Table 5.2 Summary of Interns' Initial Storied Identities of Becoming a Science Teacher

Storied Identity of Becoming a Science Teacher	Becky	David	Ashley
Priorities that the interns honed in on during the first three months of their student teaching, from September 2012 to December 2012.	Teaching content in an engaging way that allowed her students to "do science," and making sense of the multiple identities she faced situated in her classroom context.	Navigating the challenge with talkativeness in his classroom by relating to his students and positioning himself as an authority figure.	Delivering lessons that were real, fun, and relevant to her students. Navigating the minutia of the day-to-day lesson planning and letting go of "smooth and perfect" lesson planning to focus on the big picture of reaching her students' learning.

CHAPTER VI

Storied Identities and Practice

This chapter recounts the experiences that Becky, Ashley, and David highlighted as they were learning to teach in different urban contexts. Specifically, it addresses how their storied identities shaped what the interns prioritized in their learning to teach. I conceptualize learning to teach as encompassing their lesson planning, along with the adaptations they made to the challenges they named and their reflections surrounding their lessons. In addition, I refer to learning to teach as the process of developing a teacher professional identity (Luehmann, 2007, or how they viewed themselves as urban science teachers.

The three interns were asked to choose two lesson plans from their lead teaching experience that best represented their learning to teach trajectory. The first lesson they picked was from the beginning of their lead teaching, in February 2013, while the second one was from the end of their lead teaching, in April 2013. By picking these time periods, I sought to look at how their lesson planning, implementing, and views of themselves as urban science teachers developed over a span of about three months.

In the first part of this chapter, my major aim is to see how the storied identities of learning science surfaced in the lesson planning of the three interns. In addition, I present the challenges that the interns faced in implementing their lessons, and how they adapted and reflected about the modifications made to the lessons to make sense of these challenges as teachers learning to teach in an urban setting. These modifications are what I called storied strategies, because they are the teaching strategies they implemented in their practice that were shaped by stories of how they adapted their lessons but that I argue helped them teach in ways they valued. Then, I show how they saw their teacher professional identity develop, or their

views of themselves as urban science teachers, from the beginning of their internship year in September, 2013, to the end of their lead teaching in April, 2013, in order to see how the interns were shaped by their experiences of learning to teach. In my analysis, I sought to find out how they expanded on their professional identity after their learning to teach experience, and what they highlighted as supporting their professional identity development in productive or nonproductive ways as urban science teachers. Last, I show where each of the intern was two years after their internship year as I followed-up with them.

In the second part of this chapter, I present Table 6.2, which shows the development of the interns' storied identities of science learning and becoming a science teacher from the beginning of their internship year to the end of their internship year. I then identify the storied strategies, or the teaching strategies, shaped by their stories of learning to teach throughout their internship year, that they named and highlighted in dealing with teaching challenges but that also helped them teach in ways they valued.. These storied strategies were the teaching strategies that the interns mostly leveraged in their developing practice as they learned to teach.

Thus, this chapter focuses on my second and third research questions:

2. How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting?
    a. How do we see their storied identities expand in how they talk about their teaching practice?
3. How do we see their storied identities in how they talk about their professional identity development and their learning to teach during their internship year?

a. What storied strategies do they identify as helping them navigate their learning to teach?

By presenting linkages between their storied identities and their practice, I provide examples of how these storied identities can be a powerful lens in understanding how they made sense of their learning to teach.

How Storied Identities Shaped Their Learning to Teach

Becky's Lesson Planning

Recall that Becky's storied identity was about how she valued "doing science," which helped her connect the scientific ideas she learned with the world around her, and also helped her apply her science knowledge to understanding near and far contexts. Becky leveraged her storied identity as a science learner who valued the "doing of science" in designing and planning her two lesson plans.

First lesson. The first lesson was an activity she taught her class in February 2013. In order for her students to make a deeper connection to the process of meiosis and its different phases, Becky planned a lesson in which her students would be working in groups to get a visual perspective on how chromosomes segregate during the early stages of meiosis. She recalled that although she went over the visuals in the textbook about meiosis with her students, it was still difficult for her students to grasp the concept behind the process of meiosis.

Challenges encountered in the enactment of her lesson. Becky named three challenges in the enactment of her first lesson. First, she talked about limited lab materials to do the simulation for the phases of meiosis. She wanted her students to interact with manipulatives and to model how to set up the different phases chromosomes during meiosis I and meiosis II, but she did not have the models that could represent chromosomes that her students could use.

Second, Becky remembered that the lesson occurred at a time when her school and her students were mourning the loss of a student to gun violence. She remembered:

> Actually, when I taught this meiosis lesson, this was two weeks after we lost a student at our school to… gun violence. So a lot of my students were still coping with that. So I was trying to create a classroom environment that was really safe and enjoyable and a little bit distracting to maybe what they were going through outside of school.

Last, she found that her students were not making the connections she had hoped for from the simulation. Although the first lesson started off well, Becky found that her students were not able to model the phases of meiosis out of order, and they did not understand what the chromosomes were doing during the different phases.

Storied strategies across her lesson. According to Becky, her goal was to help her students see what the process of meiosis looked like by having them model the different phases the chromosomes were at with manipulatives they could move around. Becky was creative and resourceful, and she came up with the idea of using pipe cleaners to model chromosomes:

> I was actually at a crafts store. I was getting some materials for another lab we were doing and I saw these pipe cleaners and I remembered using these as representing these as chromosomes before… I just bought a few packs of them and took them home and was trying to think of how I could set them up to go through all the phases. So I thought about it for a while and I came up with the idea to draw the chalk cell. I had two colors for the chromosomes – white ones were from the dad and the colored ones were from the mom. So that when the students were moving these chromosomes around, they could kind of see, for example, the law of independent assortment…it was billions of combinations of how these chromosomes could line up in metaphase. So I was just

> trying to show them how, you know, if someone says, "Wow, you look a lot like your mom," it's because these chromosomes lined up and when they split, you got a lot more genetic material from your mom than your dad. So I was just trying to come up with a visual for that…So that's where the idea came from. It was just a slow thinking process.

Using a manipulative for her was the "doing science" part that allowed her students to get at the conceptual underpinnings of how chromosomes separate and segregate during meiosis, but also to apply it to their daily lives and make it relevant to them. She also incorporated peer to peer engagement but also through an "enjoyable" hands-on activity in order to distract her students from the gun violence incident and bring back a sense of a fun "safe class environment" among her students.

As part of the lesson, Becky also had her students draw a cell with a piece of chalk on their table and demonstrate the phases of meiosis by moving the pipe cleaners on the table. She recalled:

> So I'd be like, "Okay, prophase one – so arrange the pipe cleaners, your chromosomes, and show me what prophase one looks like." And I'd ask them questions like, "Is the cell diploid or haploid at this phase?" I had a list of questions I asked... And if they got it right, I would check it off and they would move on to the next phase.

Becky then circled the room. She checked the students off, if they modeled the chromosomes correctly according to the phase in meiosis they were being asked to model.

At the beginning of the lab, Becky had set it up so that she had the eight phases of meiosis on note cards, and she just randomly gave each group a different phase, but the students struggled naming the phases and connecting them to each other. She realized that her students could not start with any random phase in meiosis, and that in order for them to understand the

process of meiosis, she had to have them do it first in sequential order. Therefore, it was important for her that she sequenced the lesson so her students could make the scientific connections to the process of meiosis and its different phases.

> Initially what I did was I had the eight phases of meiosis on note cards and I just randomly gave each group a different phase. So some groups started with anaphase two or something. And I quickly realized that they couldn't just start with any random phase. They had to start from the beginning and then go step by step through the order of meiosis. So after about ten minutes I was like, "You know what? Everybody start over. Put everything in interphase and then go to prophase one."

Becky made sense of her students not understanding the process of meiosis by having them all start modeling the phases in sequential order at the same time. Ms. Berry, her mentor teacher, encouraged her to try it out the next day with her students, but to scaffold them more by giving them clearer instructions and modeling the activity for them before they did it themselves. Becky had her students start from the last phase of meiosis they stopped at, which for most of them was the fifth phase. She remembered how once students started going in order, they were feeling more comfortable with the phases of meiosis. Last, Becky wanted this lesson to be engaging and fun for her students, in order to bring their morale up after the gun violence incidence in their school.

Reflections about the lesson. In the beginning, Becky was really excited about this lesson, and she planned what they would be doing during the lesson and how she would coach them. However, she realized that it was not enough to engage her students in "fun, interactive model activities." Becky started to make sense of why her students were not "getting it." In her reflection about her first lesson, she wrote:

> Later I realized that while I may have planned the lesson activity well enough, I did not plan how the lesson fit in with the other lessons in the unit. I didn't model meiosis enough before moving to the coaching phase (which was this lesson). And two, I didn't develop an effective worksheet my students could fill out to help them write down what they were learning, as well as show me what they had learned.

Becky realized that in order for her students to make connections with the content, she needed to scaffold them even more before giving them the activity with the pipe-cleaners. As much as she valued her students making connections with the scientific content in a fun and interactive way, Becky saw that a lesson with manipulatives was not enough for them to make a deeper connection to the process of meiosis as a whole.

Becky realized that the activity better served as an assessment when she asked her students to put the chromosomes back in interphase. She believed that her students would have received the activity better if they had had more experiences before it, and a better grasp of the concept. She even thought that it would have been best as an assessment, and that the activity was "the wrong piece of the learning cycle."

When I asked Becky why she believed this lesson plan represented her as an urban science teacher, she said that she believed that she recognized that her students "may have limited experiences with science related content due to limited resources." So she viewed herself as the kind of teacher who is continuously providing her students with experiences that will help them connect to the content. Her storied identity of valuing incorporating hands-on activities so that her students could engage in "doing science" was important in her teaching and lesson planning. She went on to say:

> As an urban educator, I feel like providing them interesting, hands on lessons helps me manage the classroom, helps the students engage with the content, gets them interested and makes them maybe want to learn it.

Later on Becky explained that managing the classroom for her meant keeping her students busy and engaged. She also reiterated her belief that her students should have the opportunity to do science by engaging in hands-on activities and by using manipulatives. By providing her students with these activities, she felt that her students would be more engaged and interested in learning the content.

Second lesson. Becky described this lesson as being the first lesson in the evolution unit, in which students engaged in a hands-on activity and a simulation to explore how natural selection provides a mechanism for evolution. Becky's objective was that her students would be able to understand that variation within a species increases the likelihood that at least some members of a species will survive and reproduce under changed environmental conditions. For the activity, she hung about 225 paper leaves at different heights from the ceiling of her classroom, and she had her students represent the population that had different heights. Her students were asked to reach up with their hands and pick as many leaves as possible. Their height would represent the different environmental conditions of the population. Becky described how she designed the activity to follow a predict, an explain, an observe, and an explain sequence (PEOE). She saw that this lesson allowed her students to make their initial predictions about what would happen to their class population, to make observations after doing the natural selection simulation, and to revisit their predictions and explain their observations.

Becky also described how this lesson allowed her to address a few misconceptions her students may have had that Ms. Berry, her mentor teacher, had mentioned to her. Ms. Berry had

explained to her that a lot of her students in the community were Baptist Christians, and they grew up learning that evolution contradicts religion. Ms. Berry had forewarned her that she might encounter some resistance when teaching the evolution unit to her students, and that they "will not want to learn the material." But Becky believed that the concept of evolution does not contradict one's beliefs about "supernatural" things, and that you can still learn about evolution and not have it interfere with your religious beliefs.

Challenges encountered in the enactment of her lesson. The main challenges Becky talked about for the second lesson were limited resources and her initial worry of teaching her students about evolution. Becky addressed the first challenge of limited resources by being creative and cutting out 225 paper leaves that she drew and hung from the ceiling of her classroom on a Friday night.

Becky had talked about the initial fear she felt teaching the lesson and how her goal was to present the concept of natural selection as a theory backed by logic and scientific data:

> So what I wanted to do was, I wanted to simulate natural selection on the first day so that students could see that it's a very logical theory. It makes a lot of sense and we have so much data supporting the theory of natural selection. The students could just easily relate to this so they wouldn't feel like this was a topic that would go against their own personal beliefs.

She did not want her students to feel like she was challenging what they were learning at home in their community about evolution and religion. She hoped that they could feel like they could be open to learning about the topic after teaching the first lesson on natural selection.

Storied Strategies across her lesson. As mentioned in the first lesson, Becky believed that being creative and using the paper leaves she created for the lesson showed her

resourcefulness as an urban science teacher. She also felt that the lesson was designed to keep account of her students' beliefs and the community they were from, by presenting it in a way that allowed them to engage with the content while still contributing their ideas and thoughts. She also made the lesson fun and relevant to her students by making natural selection about themselves and giving them authority to make predictions and decisions about what would happen to their population.

Becky started off by giving her students context about Lamarck's proposal. She explained to them that Lamarck was a French naturalist in the 1700s who hypothesized that giraffes have long necks because they had to stretch their necks to reach taller, and that therefore over time their necks grew longer. Then, she asked her students to predict if they agreed with his statement about the long necks, and to explain why or why not. Becky remembered:

> And I thought all the students were going to say, "That's a ridiculous idea. Of course it's wrong!" But actually, the students were on the fence about this one. About 50% agreed and 50% disagreed with him…I had the students go around in groups and collecting leaves [that were at different heights]. I gave them rules, like you couldn't jump, you couldn't stand on the furniture or anything like that. And at the end of the simulation I divided the students into two groups. So one group, the students collected five or more leaves and the other group collected four or less leaves. I said, "Okay, well the group that collected five or more, you guys ate enough to live. So you'll live and the group that got four or less, I'm sorry, you're done." And they were all either really excited or really upset, depending on which group they were in. And I asked them to make another prediction. I said, "Okay, assuming that this group that survives is the only group of people left on the planet, would you expect the average height of their offspring to be

> taller, the same, or shorter than the average height of the students in the class?" And they all got it - "We predict their average height would be taller."

Becky saw her resourcefulness and creativity in using paper leaves to get her students to understand natural selection as representing her as an urban science teacher. She also felt that the lesson was relevant to her students because they were able to experience how natural selection works in their class population. She described how, by the end of the lesson, all her students came to the same consensus about the average height of the next population being taller.

Reflections about the lesson. According to Becky, this lesson was successful because it set the tone for the rest of the evolution unit, and she remembered that none of her students came to her telling her that they disagreed with a concept or theory about evolution. She felt happy that her students were open to learning.

As mentioned before, Becky was worried about how her students might respond to a lesson related to evolution. She talked about how the idea behind the lesson was something she drew from one of the teachers she observed last year during her senior year. However, she modified the lesson and structured it up, or in other words, having as many supports as possible for her students so that they could learn the material. She described "structuring up" as:

> Like when you're teaching physics, you also have to teach the math skills. So modeling the skill and then giving the students time to practice it and really hone that skill. And then finally to the point where they can do that really well on their own. When you're teaching something, if students don't understand it, being flexible to kind of go back and review things.

For Becky, it was important for students to be given multiple opportunities and experiences to look at the concept. For example, she talked about how structuring up the lesson could also be

assigning group roles when doing a lab. She also described structuring up as a way to give students "a structured parameter to fall in, so that they can stay on task, they can get through the material as much as possible."

Becky structured up the lesson so that students could make initial predictions with the Lamarck proposal. She believed that having her students make initial predictions before and after the simulation would help them make connections to the theory of natural selection, and that it would also make it more relevant to them.

Becky's Reflections about Her Teacher Professional Identity Development

Becky's teacher professional identity development, or her view of herself as an urban science teacher, was consistent from the beginning of her internship until the end of her internship. The following was what she wrote in September 2012, before her lead teaching in January 2013:

> One of the discussions, the first one, in the fall of 2012 you were asked, "What does it mean for you to develop as an urban science teacher?" And this is what you answered. Go ahead and read it.
>
> To me, developing as an urban science teacher means that I need to set a high bar of expectations for myself and for my classroom. Encourage students to perform to the best of their ability despite unfortunate circumstances they may be dealing with inside and outside of the classroom. Because I didn't grow up in an urban environment, it's critically important that I'm continuously learning from my students about their experiences, as well as them learning about me and my experiences. Also, it means to be flexible and learn how to be inclusive with all the students in my classroom. In all schools, students come to class at different levels and different content knowledge. But I'm finding that in urban schools, there tends to be a wider range of where students are at in terms of content

> and understanding. What I'm struggling with is how can you be firm and set high expectations, yet flexible enough to include all the students? Striking this balance seems like a daunting task.

When I asked Becky what her thoughts were about what she said, she still agreed with setting a high bar for her students, no matter what. She went on to explain that she still felt that a lot of people have the "stereotype" that if you teach in an urban school for a while and that if you get a new job in a suburban school, people might assume that "your experience was just classroom management and you taught a lower level of science to them." She also added that she saw herself as the kind of urban teacher who keeps the academic bar high so that when her students leave her chemistry class, for example, and they go to the same college as students from a suburban school, that they are as equally prepared.

> I would also say being flexible, being inclusive of all my students in my classroom. I always tried to do that.

She talked about how she still pushed and challenged her students. Not many of her students got A's during the year, but she had a lot more students get B's and C's. She would tell them, "If you want to get an A you need to be doing your homework every night. You need to be really consistent." She remembered how her students initially struggled with being more disciplined about their work, and she had to be firm about not accepting late work, which was also her mentor's policy. She went on to say that once her students became consistent with their work, they were doing better but still struggling. Becky went the extra step then to support them in their learning by getting them into tutoring after school. She added, " So by the end, they knew that if they do their work – and they could always seek me out for help if they needed it – they would be just fine."

Last, Becky talked about what helped her develop as an urban teacher was reaching out to her students and building relationships with them. For Becky, building relationships with her students was important because her students could see that she cared about their learning, whether by helping them through tutoring or calling their parents to let them know how they were doing in her class. She explained:

> I always try to build a relationship with every student and reach them as much as possible. Just because I know that in an urban setting, I think it's so important that they see that you care about them and you really want them to do well. So this year I did tutoring Monday through Thursday 3:30 through 5:30 after school, working with them. I was calling parents when things would happen. They knew that I was really involved. And it was a good thing. Even calling parents to say, "Hey, your student did really well this week." They would be like, "What? No teacher has ever called home and said something nice!"

She emphasized that as soon as she developed really good rapport with the parents, she saw changes in students' behavior and in how much work they participated in her classroom. She added that she did not reach out to the parents, though, until November 2012, and she wished she had done that earlier. She also believed that once her students knew that she would contact their parents, whether for good or bad, they did work and behaved better in her class.

Reflecting about strategies supportive of her teacher learning. Then I asked Becky to reflect about the strategies she found that helped her in her teacher learning in the beginning of her student teaching year in September 2012. I first had her read what she wrote:

> I'm finding that anything that helps structure up in a classroom is very helpful in an urban environment. It's amazing how routines, procedures, expectations and clear directions

> can transform a classroom. My first few days of teaching I was primarily concerned with teaching content and I didn't do very well because I wasn't giving clear directions. But learning how to add structure to a lesson is very helpful. I'm trying to incorporate more structure into my lesson plans, worksheets and daily classes.

After reading what she wrote, she added that she still believed structuring up a lesson, or scaffolding her students, was the strategy and tool that helped her grow as a teacher. When structuring a lesson, she thinks about what her students' prior knowledge might be and what ideas she might need to address. So she talked about how she started developing pre-assessments for her students, which was not how she started initially:

> When I first started teaching, I just kind of showed up, taught some information, assessed it later and that was that. But now I think about where they're coming from, what possible misconceptions I need to address with them and going at a pace that my students can follow. Sometimes I would move too quickly through things and the students would be confused.

Becky also believed that part of structuring up her lesson was planning it so that it was relevant to her students, or, as she called it, " trying to bridge gaps" in their content knowledge. She explained that if she taught the concept of DNA to her students out of context, they would ask about why they need to learn about it. But when her students learned about DNA in a unit that also included evolution, then she could explain to her students that "evolution changes over time; they're inheriting DNA over time." She

believed that if her students learned a difficult concept out of context and they did not see how it applied to the real world, they were not going to understand the concept. So when planning a

unit, she would always refer to the standards and objectives but still make the unit relevant to her students.

Identity and Practice: Enduring and Shaping Stories Over Time

By the end of her internship year, Becky's storied strategies encompassed the values from her storied identity of science learning. What endured and stayed the same in her stories and showed up in her storied strategies was prioritizing that her students engaged in the "doing of science" and learning through relevant hands-on activities. What grew stronger in her stories over time was teaching her students science content that was engaging, fun, and relevant to them. Becky believed that part of making the lessons relevant to her students was sequencing them so that she could bridge gaps in their content knowledge, and so they could make connections to what they learned before. What changed in her stories over time was learning to structure her lessons or scaffolding her students with more pre-assessments, to find out about their background knowledge, but also to structure her lessons and activities in ways that were not only relevant to her students but also allowed them to make scientific connections to prior knowledge as well as to their everyday life.

Where is Becky Now? Following up Two Years after Their Internship

At present, Becky has finished her second year of teaching in a high needs setting school. She is teaching in a large public high school in the same urban city she interned in.

Becky is mostly teaching chemistry, and she said that she "overall loves it." She described her first year as very tough; she learned a lot about herself and her students, but with only limited support from her colleagues. She also described her first year as a year of teaching in which she was "swimming" as best as she could**.** She spent a lot of time during the summer after her first year teaching reflecting on her first year and looking at ways to change her

classroom norms, routines, and procedures in order better to scaffold her students in their learning. According to Becky, those changes she made have made her feel more confident with what she was doing in class and more "in charge" of her classes. She also felt that during her second year of teaching her students are " very motivated …and are working really hard to support themselves and one another."

David's Lesson Planning

David's storied identity of science learning was that of valuing engaging in scientific argumentation and being a critical thinker. He enjoyed learning science by engaging in different experiences and figuring things out until the scientific content "made sense to him." In the following, I show that in both lesson plans, I found that David's storied identity of learning science until the scientific concept "made sense" surfaced in his lesson planning. In addition, I highlight what supported him in making sense of these challenges as he learned to teach and how he reflected about how he implemented the lesson.

For David, it was important that his students not only learn science content by seeing things in a textbook or hearing a lecture, but that they actually got to experience the science process and the explanations behind it. Experiencing science for him, he added, could take a lot of forms. It could be doing experiments, going to a park, or looking at plants; but it also could be doing some sort of simulation or activity that models a system in biology.

First lesson. According to David, the first lesson reflected his storied identity of science learning in that it prioritized that his students should learn science concepts through experience and critical thinking. For this lesson, he co-taught it with his physics mentor teacher, Mr. Smith. David described his first lesson as the first lesson in the heat unit, which was given as an introduction to his students. The lesson consisted of a lab, with two parts. In the first part, the

students were asked to predict the temperature of a mixture of hot and cold water. David and Mr. Smith had the students mix the water at the two different temperatures, using several different volumes of hot and cold water. Then he gave the students notes on heat, internal energy, and temperature.

In the second part of the lab, David and Mr. Smith had the students mix hot iron nails with cool water. Then the students were asked to predict the final temperature change, and to see if they understood what the specific heat capacity was. David's objective was that the students could explain why water does not change temperature as drastically as the hot nails.

Challenges encountered in the enactment of his lesson. David named three challenges for this lesson. First, he talked about the limited lab materials to do the lesson. Second, he highlighted his students' different ability levels in quantitative and math skills. He did not realize that students' quantitative thinking and their not "being able to solve an equation" would be such a hurdle. Last, David talked about his frustrations with trying to let his students "rely on themselves" to make sense of the concepts. He wanted his students to figure things out on their own, without him stepping in as much to scaffold. He said:

> But I might explain, "Here's where the hot water is, here's where the cold water is," and I might show them the materials that they had to use. But I never, when they would ask me questions about, "What do I do now?" I would always try to get them back to, "Okay, what point in the lab are you at? What does it say? Did you actually read it?" Most of them didn't actually read it. So even though I modeled it a little, a lot of it was them trying to figure it out themselves. And this is a class of mostly sophomores and juniors and seniors. So they've taken a science class before. I was trying to do less of the scaffolding and more of them getting to rely on themselves.

David was trying to find a balance as to how much scaffolding he needed to give his students. He wanted them to be able to figure things out on their own, but he knew that he still had to step in and help them out. For David, finding that balance of how much to scaffold his students without giving them the answer was hard to navigate.

Storied strategies across his lesson. When I asked David if there were any modifications he made to the lesson, he responded that he and Mr. Smith added journal questions, prompting students to look at their own data and to compare it to actual data. He added that the journal questions led him to have a discussion about temperature and internal energy. He also recalled that because of how students were struggling with the math calculations and finding out the heat, David "shied away" from a lot of the calculations. In addition, he found himself scaffolding them by helping them with doing some of the calculations as examples the next day.

David realized that he did not have the thermometer probes that could be hooked up to a computer to watch the thermometer change for this lab. However, he was resourceful, and he adapted the lesson to make sense of this challenge of limited lab materials by using "simple materials" that "cost little to nothing." David's mentor teacher, Mr. Smith, had a stockroom where they found Styrofoam cups and a teakettle "that's probably 20 years old and old alcohol thermometers." So, David did not let the challenge of limited lab materials prevent him from doing the lab with this students and helping them engage in the experience of learning about the concept of heat and change in temperature, and he was resourceful in adapting the lesson with the materials he could find.

David also found that the different math ability levels in his class led him to adapt how he approached his way of helping his students and coaching them. David remembered that he had his students make predictions before they actually mixed the materials, and he had them compare

their results to the actual result. David and Mr. Smith prompted the students to explain why they did what they did, and to explain why their prediction might have been different from what the actual result was. He remembered how he tried to get the students to explain how they got their results and the methods they used. He found out that most of his students guessed, while others took the difference between the temperatures of the two substances. He remembered that only one student took the average of the two substances' temperatures to get at the final answer. He said, "Because of the mixture of ability levels in my classroom, I had to do a considerable amount of scaffolding to keep each student up to pace with the lab." He modified the lesson so that now he would spend more time scaffolding his students by going around the class and helping them with their math calculations in order to find out how to find the measure of heat in the lab.

Reflections about the lesson. As he reflected back about the lesson, David felt that this lesson showed that he values the idea of learning science through engaging in science experiences and getting his students to interact with learning the concept through engaging in inquiry experiences. Talking about his students, he said:

> They were mixing things at different temperatures and actually observing how those temperatures changed. And they were being quantitative about it. They were actually making a measurement of, "This is 44 degrees Centigrade, this is 20 degrees centigrade, what's going to happen when we mix the two?

David saw in this lab experience that his students had allowed him to be able to talk about the concepts of energy, internal energy, heat, and temperature that they were learning about. This is what he valued, that his students learn science through experience. By having his students engage in the experience of how some objects heat up quicker than others was his way of helping

students become critical thinkers and getting them to think about scientific patterns to make sense of the ideas of heat and temperature.

David also added that he found that the different ability levels in his class led him to spend more time scaffolding his students and helping them with the math calculations, in order to find out how to find the measure of heat in the lab. As he reflected about the ability level of his students, he believed that scaffolding his students by providing them more opportunities to practice the math calculations before the lab, and by going around during the lab to see how they were doing, was a teaching strategy that supported him more in teaching this lesson.

Second lesson. For the second lesson, David leveraged his storied identity of learning science, which included valuing learning science concepts when the concepts "made sense" to him. He described the activity as an introduction to natural selection, in which he had his students look at a population of paper punches he had created. Some of the paper punches were made out of white paper, while the others were made out of newspaper. Then, David had his students spread the paper punches against two different backgrounds - a white paper and a piece of newspaper. He gave his students a minute to "hunt" or pick up all of the paper punches they could find, one paper punch at a time. In the end, any punch that was left behind on the paper after the minute was up would be reproduced to create an identical offspring of itself. Then David had the students repeat the hunting and reproduction process for several generations, while keeping track of the proportion of white and newspaper punches. By the end of the lesson, David's objective was that students could conclude that the hole punches that blended into their background would be more likely to survive a predator's attack and reproduce, and that the population of hole punches would be dominated by that color of hole punch.

Challenges encountered in the enactment of his lesson. Just as in the first lesson, David also highlighted in the second lesson the challenge of his students' different ability levels in solving math calculations. He described how his students struggled with the math calculations and how the simulation of natural selection did not make sense to them. He explained:

> [There's] a point in this lab where… they had to pull out these paper punches. And they should probably pull more of the paper punches out that look dissimilar to the background they're on. And there's a point in the lab where they need to make the ones that are remaining reproduce…Basically all you did was, if there were three paper punches that were left in the tray, you put three back in. If there were 12 remaining, then you put 12 back in. That was it. And it just didn't make sense to them.

When designing the activity and simulation on natural selection, he believed that the students would be able to make sense of how the proportion of the punch holes was influenced by natural selection, but also how the offspring remained a constant ratio to the parent before it. However, he could see that his students did not understand how to calculate the population ratio left behind, although he had tried to make it a constant ratio of the punches left behind.

Storied strategies across his lesson. David talked about trying to "save" the lesson the next day by scaffolding his students and giving them more context and examples. He realized that he had not introduced well the simulation to his students, and that he needed to model it for them, so he did one example of the simulation to show his students. Yet he found that students still did not understand the math behind the population of the paper punches being constant.

> I didn't really do a lot of intro in first hour with this lesson and I realized that I needed to do more modeling of what to do. So in third and fourth hour, and the next day in first hour, I actually set it up myself and spread it out and counted and did the first run of the

> simulation to show them how to do it. Even then, I would have students write down my numbers instead of their numbers.

What David then decided to do during the lesson was to give the students more contexts by showing them an example of actual data that happened in relation to natural selection. He brought in the peppered moth example in England during the Industrial Revolution in the late 1900s:

> [So]I brought in the peppered moth example that actually happened in England and tried to explain that… So that's kind of how I tried to save it.

He believed that giving his students more context would help the mechanism of natural selection make more sense to them.

Reflections about the lesson. David realized that his students did not understand how he presented the lab and procedures:

> [Nearly] every group in every hour had difficulties understanding how to make the population reproduce. And …none of my students – which says to me that I need to work on how to do the lesson – none of my students were actually able to do it on their own and able to actually complete it and get reasonable results.

He believed that he had to step back and scaffold his students during the lesson. For him, scaffolding took the form of checking on what they were doing, and that they were all doing the simulation and calculations correctly. Scaffolding also included his trying his best not to give them the answer, but instead trying to explain to his students why what they were doing might be wrong. David believed that trying to incorporate as much scaffolding as possible is another aspect of the lesson that represented him as an urban teacher. David added that he knew his

students were just as capable and smart as any other student from any other school. However, he felt that his students still needed a lot of help with learning how to do procedures and calculations. So, David took the initiative and scaffolded his students by sitting down with them, asking them questions, and guiding them in the activity.

David's Reflections about His Teacher Professional Identity Development

David's view of his growth as an urban science teacher changed from the beginning of his internship year to the end of his internship. The following was what he wrote in September, 2012, before his lead teaching in January, 2013:

> One of the discussions, the first one, in the fall of 2012 you were asked, "What does it mean for you to develop as an urban science teacher?" And this is what you answered. Go ahead and read it.
>
> I think that the biggest challenge for urban education is a lack of resources. This includes both material resources and human resources. The school I'm working in has class sizes in the 30's and 40's. One of my class hours has 40 students enrolled but our classroom only has 36 seats. We depend on having at least four students absent so that each student can have a seat. Obviously it would be ideal for the school to have an adequate number of seats but it may be more important for the school to have a lower teacher to pupil ratio. The problems of underfunding and understaffing compound for students as they continue through school. One year of inadequate education means that the students need to play catch up in the following school year. However, teachers hardly have the resources to teach what they need to, let alone bring students up to speed. Developing as an urban teacher centers around finding ways to work with what you have. There is an ideal level

where my students should be and there's an ideal level of resources and staffing that's required in the school; however, if you're not in an ideal situation, you'll need to make the best of your situation.

After David read it, I asked him what his thoughts were about it now that he had finished his internship year. He responded that he still agreed with what he said, but that he would use the word "ideal" less. He went on to say that he believed that urban schools are struggling not only in the amount of resources but also in the amount of involvement from parents and the value of education. His take on it was that now he believed he was the kind of teacher whose approach was "this is what students need to know and this is what I need to know to teach it."

Reflecting about strategies supportive of his teacher learning. I then asked David what tools or strategies he perceived as supportive in his teacher learning and development. Initially, David had highlighted keeping a learning journal as helpful to him during Fall 2012 and before his lead teaching:

> A tool that I have found helpful for developing as a teacher has been keeping a learning journal. A journal serves two purposes. When I write in my daily journal, it helps me summarize what I have done that day and to work through anything that I've found particularly challenging. Second, the journal acts as a record for what has happened in the past. I [would] periodically skim through my journals to see what challenges I have had and to see if I'm making progress. So that helped me, when I would actually write out, "Why aren't these kids caring? [Why do they still keep talking?]" And then talking to Ms. Berry and Mr. Smith and Susan, my field instructor, about it and hearing them say that that happens and hearing their experiences with it.

David still agreed with journaling as a supportive tool for him to reflect about his learning to teach experience and to keep track of what he struggled with. What David added as another strategy that he found helpful in supporting him were dialogic interactions and conversations that he had with his mentor teachers and other teachers in his school. He also tagged on as a strategy not being hard on himself as a teacher, because it would be easy to get discouraged then. He explained:

> It would be really easy to get very discouraged with the situation of learning to be a teacher. There's a lot that you can't really anticipate. I went into it with one idea of how I would be successful and I came out not being successful at that measurement. I was thinking I would be successful if the kids know biology…I was really hard on myself through the whole process. I would actually go home and just feel [terrible].

David also discussed that opening up more to his students supported him in a productive way in his learning to teach experience. It was not until during his lead teaching in January, 2013 that he realized that he needed to let his students know more about who he was, rather than just the Power Point slide in the beginning of the year, in which he shared with them bits and pieces about himself, such as his liking hiking. He believed that showing his students things that went on in his life helped him in how he related to his students and how they saw him as more "approachable." He remembered:

> I think with a couple of lessons after [the heat lesson], I actually kind of geeked out about my plans for a passive solar house. I was trying to explain to the kids how I would build my house so that it would be heated with passive solar, but it was something I was really interested in and I was able to make this five minute aside about how to do it. I drew a

> diagram of it and told them that a couple years from now they're going to drive by and see my house. But I was feeling more willing to do that as the year progressed.

He also remembered how he jokingly shared with his students that he spent five hours punching holes for the natural selection lesson while watching the show "Star Trek." He described how his students laughed about it and how he did too, and how his students started seeing him as more approachable. He also recalled:

> And other times, like when we did genetics and we were drawing pedigrees – and a lot of students have very complicated pedigrees – and I was trying to make mine as complicated as possible, too. It was actually close to the time that my Grandma passed away and there's a way to mark "deceased." So I was able to draw my family and then mark out the people like my grandma, my parents that have passed away. And I was trying to show, like I had an aunt that has two people that she's had kids with, so showing that part of my personal life and doing it through instruction felt more comfortable than just going out there and saying who I was.

David felt that sharing snippets of his personal life made his students see him as more approachable and be able to joke around with him. He also believed that when his students started seeing him as more approachable, he started feeling more comfortable in the classroom, which he also believed helped his students feel more comfortable with him.

Having a network of people as resources. In our earlier conversations, David had talked about how he gauged his success based on controlling the level of talkativeness in his classroom. He also had mentioned that he saw himself as being an "effective" teacher if his students were quiet, but also if they learned the content and passed most of his tests. At the end of his internship, though, David now saw his success as a teacher as more than about how much

content his students learned. Eventually, he realized that he had to learn to let go of things a little and to reach out and talk to his mentor teachers and staff in the school, which helped him see how other teachers gauged their own success in their classrooms. He felt that seeing what other teachers measured for their success helped him gauge his teaching against them, as opposed to an ideal that he set in the beginning. In the end, David came to realize how important it was to maintain a network of people and to use them efficiently to help his students and his understanding of how to be a better teacher.

When I asked him what would have sustained him more in his learning to teach, he reiterated that for him it was not being too hard on himself and having a space to talk about concerns and challenges with other peers:

> For me personally, what would have helped – I mentioned not being hard on yourself. And I don't know if this is a problem with other people. I'm guessing that a lot of people had a rough time at it. Somehow talking about that more often. I mean, there were sometimes when we talked about, "What are your worries as a teacher?" And I felt really hesitant to be really honest about it because my worries were sometimes, "What did I get myself into? Is this right for me?" Things that, for me, it was kind of intimidating saying that out loud.

He added that it was really hard for him as a new teacher to see what teachers were going through in his school and that their performance on the job was measured by how their students scored in tests. For David, these were good teachers who were teaching responsibility, something that he valued as a teacher and was salient in his storied identity of becoming a science teacher. He also added that these were teachers who were trying to get kids interested in seeing that they are responsible for themselves, while doing the best they could with the students they had. He

felt at the end that interacting with his mentor teachers and the other teachers in his school and talking to them about how they navigated the challenges of getting the students to be more engaged in class and to learn the content helped him be less hard on himself as a teacher and to focus on teaching his students the content with the available resources he had.

Identity and Practice: Enduring and Shaping Stories Over Time

By the end of his internship year, David's storied strategies encompassed only one of the values he highlighted from his storied identity of science learning. What endured and stayed the same in his stories and showed up in his storied strategies is valuing that his students learn science until it "made sense" to them, which is how he valued learning science in his own storied identity. In order to help his students learn science until it "made sense" to them, David's stories were shaped by stories of scaffolding his students more by giving them more context, but also helping them by modeling the lab procedures for them and doing some math calculations as examples for them to address the different math ability levels in the class. David's storied identity of science learning was shaped by the time he spent working in a research lab. His experiences with science in the lab made him value the trial and error that goes behind the scientific method. Initially, David's storied identity of becoming a science teacher revolved around navigating the challenge of talkativeness in his class. What changed in his storied identity of becoming a science teacher by the end of his internship year is foregrounding not being too hard on himself as a teacher and looking at reaching his students also through the life skills he taught them. He also valued learning to be more approachable with his students and opening up more with them.

Where Is David Now? Following up Two Years after His Internship

Out of the three interns, David was the only one who did not pursue teaching in a high needs-setting. He went back to graduate school to pursue his master's degree in Plant Biology

and to work with his advisor in the lab he was working at before. When I followed up with David, he told me that it was a hard decision for him to make. He added that he thought he was a good teacher, but that his "heart" was not into teaching. He explained:

> It was a hard decision for me, and I guess there were a few things that contributed to my choice not to teach. It ultimately came down to being very unhappy and not having any opportunities. I went into the [Teacher Education] program thinking that I had a unique perspective to offer…I was in special education in middle school. Starting in 5th grade, my family was falling apart, and I ended up being separated from both of my parents by the time I was in high school. Without going into all the details of why that happened, I thought that seeing that side of life might help me to better connect with struggling students. But instead of feeling like I could help more, it ended up making me feel incredibly helpless and it dredged up a lot of memories.

According to David, he did not take the decision lightly, but he did not want to spend more time teaching if his heart was not into it, because it would not be fair to his students or himself. He went on to say, "I wish I could teach. I think it is one of the most important jobs on the planet, and it disappoints me that I couldn't make it work for myself."

Ashley's Lesson Planning

Recall from previous chapters that Ashley's storied identity of learning science involved engaging in authentic science experiences that made her feel like a "real scientist." Part of being a "real scientist" meant providing opportunities for her to engage systematically in figuring things out, while getting her hands dirty and her learning challenged.

When Ashley planned both lesson plans that she chose to represent herself as an urban science teacher, she prioritized that her students would get to do and interact with "real science."

In other words, her science storied identity of engaging in real authentic experiences surfaced in what she prioritized in her lesson planning.

First lesson. The first lesson that Ashley chose was about students developing a connection between Gravitational Potential Energy (GPE), or energy of position or height, and Kinetic Energy (KE), or energy of motion, using modules and hands-on lab equipment to collect and analyze data. Ashley described how the lesson was set up so that her students would be measuring the KE and the GPE of a sled as it travels down a ramp at five different height tracks. She had her students take their own measurements, graph their data, and figure out the relationship between KE and GPE. She hoped that they would discover that the relationship between KE and GPE is an inverse relationship, and that they would also figure out that when you add them together, the total energy does not really change throughout the system.

Challenges encountered in her enactment of her lesson. Similar to David, Ashley also named her students' poor math skills as a challenge for her in implementing the lesson. She wanted her students to be able to figure out the calculations on their own and to make the connection about the relationship between KE and PE, and she assumed that their math skills were at the level of being able to calculate the KE. However, Ashley remembered that her students struggled a lot with the calculations. She recalled:

> I assumed that they would be able to do it and it would go quickly and smoothly but when it came to the KE= ½mv^2, a lot of them didn't know what to do. They didn't know how to put it into their calculator. They weren't doing the calculations correct and so that ended up taking a lot of time in class because I had sent them back there and then I had to kind of regroup them, try and go through the calculations...

Ashley realized that the lab was taking her students more time than she had anticipated. Her students had to make a lot of different measurements and make calculations out of those measurements. She saw that her students were writing down numbers, but also that they had no idea what they meant, so they ended up with the wrong calculation for KE.

She believed that they needed more scaffolding before they could do the lab. She also felt that the students needed more class discussion time to come together in their group, or as a whole class, in order to make connections from the data they collected. Since the lab took them too long to finish, Ashley remembered that the group discussion did not happen until the next day, when most of her students said, "I don't remember what I found yesterday. I just remember we put tracks down the sleds."

Storied strategies across her lesson. The only modification that stood out to Ashley was that she ended up scaffolding her students during the lab. She adapted her lesson to make sense of the challenge of her students' struggle with doing the math calculations, by scaffolding them through doing some examples with them. She went over some of the calculations with the class before they went back to do the rest of the questions at their lab tables. As much as it was a modification to the lesson, she felt that it did not work that well, and that her students needed more scaffolding to go over the math formula. So Ashley remembered that the next day; she did have them go back and talk about the lab, talk about the setup of the lab and why it worked, and discuss what the calculations and the data actually meant.

Reflections about the lesson. In retrospect, Ashley said that if she would teach this lesson again, she would have her students make predictions before doing the lab. She believed that it would help her students get their thinking going and elicit the connections and ideas they had about the concepts of gravity and force before they did the lab.

She also felt that the lab was not relevant enough to her students. According to Ashley, the lab was a real life experience that tied back to what her students were learning about KE, or the energy of motion. The lesson allowed them to have a visual representation, with the tracks and the sled, which they could tie to the concepts, but also to take ownership over what they were learning. She also believed that her lesson addressed a lot of the physics inquiry standards, such as collecting data, analyzing and interpreting data, and drawing conclusions. As much as her storied identity of science learning as valuing real authentic experiences was foregrounded in her lesson plan, it also made her realize that she had not considered how the context of finding out about the KE, or the energy of motion, of a sled on a ramp made sense to her students in an urban setting. Ashley pointed out that:

> I was always focusing on making sure it was inquiry and hands on and those kind of things…I was teaching the standards but I needed to take it a step further and make that standard relevant to them.

She wanted her students to do the science inquiry and to have the hands-on experience that went with what she viewed being a "real scientist" meant, but she felt that she had not considered other experiences, other than a lab with a sled on a ramp. She believed that having them make sense of GPE and KE in relation to a simulation, such as the sled and the tracks, was not relevant enough for her students, and instead was "very lab situational" to her students.

In addition, Ashley felt that more scaffolding would have helped her students understand better how to do the calculations. She realized that showing her students some sample calculations before the lab would have given them the practice they needed before doing them on their own.

Second lesson. Just as in the first lesson, for Ashley the second lesson embodied what she valued in her storied identity of learning science – being a real scientist. She felt that she was

able to help her students in this lesson be real scientists by drawing connections between the different parts of the lesson and by learning about the concept of electrostatic interaction between force and charges. The lesson had two parts to it, two demonstrations along with classroom discussion and a computer simulation. She started out with a first demonstration of introducing static electricity to her students. She wanted to introduce static electricity in a way that was memorable to her students. So she wore a fuzzy vest and brought balloons to engage her students in the question of what static electricity is. She recalled:

> I wore this really ugly fuzzy vest and I told the kids that I was going to do a magic trick and I was going to make the balloon just stay on the wall and not do anything. I had a couple kids who were like, "I think I know how." And then I rubbed the balloon on my vest and stuck it to the wall and then asked them, "Okay, how did this happen? Why is this happening? What's going on?" And a couple of kids were like, "Oh, static electricity," and I'm like, "Well, what's that?" and they're like, "Well, I don't know." And I said, "We've got to figure out what it is. What do you guys think it is? What other forces are acting on it?" And they're like, "Gravity." And I'm like, "Okay, so if gravity's pulling it down, what else is happening? What must be there?" And they were like, "Oh! Some other force must be holding it up." And I'm like, "Yeah! So what does static electricity produce?" "Force."

What stood out to Ashley from that lesson was how her students really enjoyed the demonstration she did with the balloons. She described how the lesson segued nicely into talking about atoms, and more specifically discussing about different charges and transfer electrons. Ashley then did the second demonstration about opposite charges, by holding a charged rod against metal leaves and having her students observe how the leaves move apart.

She ended the lesson by having the students do computer simulations, through which they worked with data and numbers to calculate Coulomb's law.

Challenges encountered in the enactment of her lesson. Ashley talked about encountering some challenges in the enactment of the lesson. In her school, she had limited computer access, which made things difficult for her at times; she was able to secure computers for this lesson, but she had them work in groups instead of doing it alone. Another technology issue she encountered was the speed at which the computers worked. She said, "The fact that the computers were so slow that they [wouldn't] be working until halfway through class" made her plan the computer simulation at the end of the lesson and make sure that it was short. Just as the first lesson, she highlighted her students' math ability as a challenge when they did the computer simulation:

> When it came to the computer part, I'd say maybe about half the kids knew what they were doing and the other half kind of struggled through it. I'd say the biggest thing that shocked me was their ability level. Their math skills were very, very poor.

Last, Ashley mentioned that the other challenge she encountered was negotiating how to balance teaching them as much content as possible while meeting the science physics standards. It was not easy for her to determine at times what was necessary to teach and what was not. For example, she said, "I had them drawing electric fields and that wasn't really necessary. It wasn't a state standard so it kind of took up some extra time that would have been nice to have at the end to talk – or even before – to talk about how to run the simulation and what they're actually doing." The standards were for Ashley her checkpoint in seeing that she covered what she had to "fit" according to the concept she was teaching.

Storied strategies across her lesson. Ashley remembered that for the most part, the lab went well. She had to modify the lesson plan slightly and make the math problems easier for her students to do in order to account for the different ability levels in the class, but she also had them do only four math calculations so that they could finish on time. She believed her students were capable, but she learned not to assume when giving them math calculations that they also knew how to do them. For her, knowing versus how to do the math were very different things and she could only find out if they knew "how to do it" once she did some examples with her students. So she scaffolded her students when they were doing math calculations, and she gave them some help and guidance with doing the computer simulation and how to enter the numbers in the formula generated by the computer simulation. Scaffolding her students was her storied strategy as it allowed her to help her students learn the lesson in ways that connected back to her own storied identity of learning science. In order for Ashley to have her students learn science by being real scientist, she modeled an example for her students, as a way of scaffolding them and supporting them in how to make sense of the graph they would get after entering the numbers in the computer.

Reflections about the lesson. For Ashley, it was important for her to give her students as much content and knowledge as possible and not shortchange their knowledge. Yet she felt that giving them all these facts and focusing on covering as many standards as possible limited the number of authentic experiences that she could have added to the lesson:

> [When] you have so many standards that you have to fit in, that has to take priority. Because you have to teach those by law. And then you run out of time and the things that you really want to do and the experiences that I think are more important than knowing some of the state standards get pushed aside. And that's hard for me because I don't teach

everything perfectly. So I still have to take a lot of time to make adjustments and do some re-teaching.

As Ashley reflected about the lesson**,** she saw it as being more cohesive and sequenced in a way that took into account her students' background in comparison to her first lesson on KE and PE. She believed that the unit and the lessons in the unit portrayed her as the kind of teacher who focused on the big picture of the concepts of the unit, but also on how to tie the different pieces of planning a unit around activities, discussions, and assessments, while always keeping students' needs and knowledge in mind:

> …I believe [this lesson] demonstrates a key component to teaching at need students, which is finding a way to build connections and plan ahead in order to tie the content and experiences together…The key to being a phenomenal teacher, high needs or not, is building relationships with your students to understand how to break down material and make it tangible. This lesson demonstrated glimpses of that in which I will continue to strive for.

She believed that when she prepared a unit plan ahead of time, instead of a lesson every day, her students had a better foundation and were more prepared to do the computer simulation. She talked about how the lesson with the balloon trick allowed her students to draw connections to their real world:

> I think that it gave them something that they witness and notice in every day life. A lot of them talked about how they had shocked their siblings when they would rub their feet on the carpet and what that means.

For Ashley, her students were learning science when they were able to make the connection between the first part of the lesson and the second part. They were able to see that using the

balloon and rubbing it more against her vest meant that it was picking up more electrons and making the balloon have a greater charge. She remembered how they were also able to connect that the greater charge meant a greater force, enabling the balloon to pick up more pieces of paper. She also believed that it helped them understand that when they looked at the graph from their computer simulation, they saw that the greater the charge, the greater the force, and they understood that it was the same thing they learned in the first part of the lesson. She went on to say:

> They were able to draw connections between the first part and the second and realize that they were getting the same results. I thought that was great that they were able to draw those connections and they didn't just view them as totally separate…I think having them do the computer simulation kind of re-confirms what they found. But I think having them do the hands on and giving them something they can actually see gave them something that they can hold on to and really keep as their knowledge when they went to the test.

Ashley reiterated her view that this lesson gave her students a fun activity they could relate to, allowing them to understand how charges and forces work together. She remembered how a couple of her students replicated the balloon experiment at home, stuck the balloon to the wall, and explained the concepts to their parents. Just as in the first lesson, for Ashley the second lesson embodied what she valued in her storied identity of learning science – being a real scientist. She felt that she was able to help her students in this lesson be real scientists, by drawing connections between the different parts of the lesson and by learning about the concept of electrostatic interaction between force and charges.

Ashley's Reflections about Her Teacher Professional Identity Development

Just as with the other interns, I wanted to find out how Ashley talked about how she saw herself as an urban science teacher. The following was what she wrote in September, 2012, before her lead teaching in January, 2013. I had her read what she wrote:

> Developing as an urban science teacher to me ultimately means having a passion for your content and learning to have a deeper passion for your students. Coming from an affluent background and school district, the first step for me was taking the time to get to know my new students and where they're coming from. I've spent years of time focusing on knowing the content like the back of my hand but realized quickly that content won't help me relate to my students, build relationships or learn how to instill a desire to learn science, or at least a respect for scientific thinking. My students are all individuals at different places in their lives in learning and need to be guided as such. I found that for some students in my class, getting the most out of them is pushing their limits through inquiry activities and challenging them with scientific phenomenon. For other students, motivation comes from high fives for making it through a single physics problem. I've learned that expecting all my students to 4.0 right off the bat is setting us all up for failure. In an urban high needs setting, a better goal to aim for is for student improvement and to help my students become more proactive thinkers in society, which I'm learning can be more beneficial for some than knowing every single step in photosynthesis. Go figure.

Interestingly, when I asked her what her thoughts were now after lead teaching, she replied that she agreed with what she said before, but that it was a lot harder than she realized. She admitted that now that she actually experienced it, she saw that it takes a lot of effort and "heart" and

"long hours and nights" to get there. But what Ashley stressed that she learned about developing, as an urban science teacher, was the importance of planning the science unit she was teaching ahead of time:

> So I'd say that I've learned the importance of planning ahead, planning as a unit instead of day to day, writing your test before you teach it because then you know exactly what they have to know and you can cut out the little extra stuff… And I kind of had a checklist at that point. How am I going to make it relevant here? How am I going to include inquiry here? How am I going to scaffold here? Where are they going to get their practice in? And it actually decreased my overall stress because I had a better understanding of where the kids were at and then I felt more in control of my classroom. Whereas before, I was just kind of hoping that they were going to be okay.

Ashley described how much of her intern year was planned week to week, and that towards the end of her internship year and during her lead teaching, she started to develop full unit plans and assessments before designing the individual plans. For Ashley, this helped her ensure that the lessons were "engaging, relevant, inquiry-based with hands-on activities.

Ashley credited her mentor teacher as pushing her to plan further and further ahead, although she "hated" it at first. In the beginning, she felt that it did not make sense to plan a whole unit that far ahead when she would end up having to make adjustments and redo all the planning. But then Ashley talked about how she finally gave in and did plan the unit ahead of time. She found that planning the whole unit ahead of time gave her a direction of where she wanted her students to go. She felt that when she planned ahead, she was able to look at other resources and look at other labs and then piece these different resources together into a more cohesive and smooth unit, as opposed to planning lessons on a whim.

Ashley realized how looking at the big picture of planning the unit ahead of time helped her look deeper at lesson planning, and how she could make the lesson more relevant to her students' lives. She also talked about how planning a unit plan ahead of time not only made it more cohesive for her and her students, but how it also allowed her ultimately to build relationships with her students:

> I realized later on that, yes, obviously lesson planning is important, but even more important is getting to know your kids and building those relationships because that's what makes teaching worth it. Because then at the end, some of the kids that were giving me problems at the beginning were like, "Miss, look! I got a 92 on my test! Aren't you proud? Aren't you excited?" And I'd be like, "Yeah, that's great!" Where at the very beginning they're like, "I hate your class and I hate you. You're so mean." But at the end when they're proud and you can share that with them, that was fun. Those are the things I remember – when my students would come up and be so excited that they did well. Or they'd be like, "I really liked this activity! This was a lot of fun!" That's probably the best moments, were those days.

Planning the unit ahead of time allowed Ashley to build the relationships she wanted with her students, which in turn connected back to what she valued in her storied identity of science learning. Her storied strategy of building relationships with her students allowed her to teach her students science in the way she valued as engaging in authentic experiences that allowed them to be "real scientists".

In the beginning, Ashley remembered how she was spending so much time figuring out the details of her lessons. She also remembered how some of the management things were falling

behind, that the talkativeness in class would be too much, and then other kids would get frustrated because they could not learn as well.

> And then I would get frustrated because they wouldn't listen. I would say as the lead teaching went on, I found out how to kind of relax, step back, handle the issues individually with the kids I was having issues with – take them in the hallway, I made a lot more calls home. As it progressed I sent a lot more kids out. But ultimately that helped get my classroom to a place where it then became a lot of fun to teach it…I had one day where we were talking about – it was right toward the end so we'd just started waves. I have the kids come up and we were dancing and doing wave motions and - I was able to do that and have fun with them and they were laughing and I was laughing…we were doing wave motions and practicing it but it was fun... When I was more relaxed I was able to build those relationships with them. I'd say that was the greatest part. Because early on I was like, "This is awful! I'm upset, they're upset, this isn't fun." And then at the end I realized that teaching can be a lot of fun. Once you get [lesson planning] stuff under control and you can really focus on the kids themselves, it can be a lot of fun.

She talked about how at the end of her lead teaching she became more relaxed with her students and more approachable.

Ashley also added that building relationships with her students not only showed them that she cared about their learning but also showed them her interest in what they did outside of her class. She even went on to attend sporting events that her students participated in,

> I went to a lot of the girls' basketball games, boys' basketball games. I went to some softball games, baseball games. And I could tell that meant a lot to the kids. They would

> come in and, “Miss, I saw you at the game!” Maybe kids that were kind of giving me some trouble earlier on then had a different level of respect for me because they knew that I cared about them and I wanted to be in their lives. Also tutoring – I've noticed, now that I'm subbing for other teachers, the kids I've tutored help me out while I'm subbing. It shows how those after school connections really touch the students. They mean something. They might not say, “Thank you,” they might not say anything; but they remember. It's important.

She could see that her students valued her reaching out to find out more about them by attending their games. She felt that her students behaved differently with her after seeing her care about their extracurricular activities, and also after tutoring them. They “respected” her more in class and were giving her less trouble in class, and they also reached out to her to help her as well when she was subbing.

When talking about building relationships with her students, Ashley mentioned also that for her it was positioning herself not as their “friend,” but as the teacher who cared about their learning, doing what was best for them and taking a “stand” when need be. She said taking a stand would be sending them out in the hall when need be or calling home when need be:

> And when they beg and cry for you not to call home, you still do it because if you don't, they're going to do it again the next day. And ultimately you're helping them, not hurting them. And so teaching becomes more about, even though it's uncomfortable for you, you have to do what's best for them. And even though you want to be liked, what's more important is that you help them. So I'd say that was a huge change from beginning to end.

So for Ashley, positioning herself as a firm teacher who did what was best for her students helped her manage more the talkativeness that could disrupt the class. She realized that she was there to help her students learn content and also life skills, and if it meant taking a stand and being firm, she was going to do it.

Reflecting about strategies supportive of her teacher learning. I then asked Ashley, just like the other interns, what tools or strategies she perceived as supportive in her teacher learning and development and as helpful to her during Fall, 2012, and before her lead teaching. She highlighted developing inquiry lessons and allowing for student discussions in her class:

> I've learned many helpful teaching tools just within the past few weeks. In science, one of the huge skills is learning how to develop inquiry lessons and allow for discussion. It's okay to let students have free rein to think and learning to pose critical questions to guide them can help students develop invaluable thought processes that couldn't be achieved through a cookie cutter lab. I've also learned that when you may not know the answer to a question a student asks, it's good to be honest with the student and admit that you don't know everything. But if you need a moment to think about an answer, a great way is to turn the question back on the student and see what they think. I had a student ask me whether holding their breath would decrease their heart rate. I asked them to think back through it. Turns out the exact mechanism isn't fully understood yet but it made for a great discussion that led into talking about homeostasis and characteristics of life.

When I asked Ashley to reflect about what she thought about the strategies she wrote early on in her lead teaching, she agreed about the importance of developing inquiry lessons, and that she feels more comfortable developing inquiry lessons now at the end of her internship. However, she added that a strategy she perceived to be supportive of her teacher learning was

making lessons more engaging and relevant to her students' lives in ways that would motivate them to learn, but that they would also see the content or the way of learning applicable to their lives. Talking about her students, she gave the example of how content might not be especially motivating to them, but the thinking process behind the lesson would be valuable to her students' lives:

> Of course, you have to teach content and maybe knowing how a mountain is formed isn't really ever going to help them in their lives, but there's something in what they're doing that could help them in their lives. Even if it's developing that thought process, it's putting the emphasis on the fact that maybe they're using critical thinking skills or maybe they're figuring something out and they're going to be doing that their entire lives. As an adult, you're constantly having to figure things out and research and when you have to buy a home, buy a car, build a family, you're constantly having to figure things out – and that's science. It's looking at what you have, investigating it and figuring it out. I think maybe it's instilling more value into the process than into the scientific fact.

Ashley described how she saw a connection of her teaching approach and her students' reaction to the content. She realized that in order for her students to learn science, she had to teach it in a way that was relevant to them but also make them learn the "real science" skills that would help them in their own lives. Her perspective reflects her storied identity of being a "real scientist." Making content relevant to her students was her storied strategy of helping her students connect to the content, while still being able to teach science in the way she valued.

Having a network of people as resources. One thing Ashley felt that she could have used more as a strategy was reaching out to other teachers more. She felt that she did not utilize other teachers as resources as much as she could have, because it took her a long time before she was

"brave" enough to go talk to them, because she did not want them to think that she was using them or that she was not capable. She went on to say:

> I don't know why I thought that way, because why not? If they've figured it out and they're doing something that's great for the kids, and as long as they care about the kids, they're going to want to share with you and you should want to use it. Because if they've been doing this for ten years, why not?

Ashley also added that her mentor teacher was a "really good teacher." She described her as her greatest resource, for she pushed her to think of unit planning and also to challenge the students by giving them inquiry based lessons that tied back to a question that they could relate to.

Identity and Practice: Enduring and Shaping Stories Over Time

What endured and stayed the same in Ashley's stories and showed up in her storied strategies of scaffolding her students in their learning was prioritizing delivering lessons that were real, fun, and relevant to them- in other words, that her students would get to be "real scientists," which is what she valued most in her own storied identity of science learning. By the end of her internship, Ashley's storied strategies were shaped by stories where she learned to look at the big picture of unit planning, which helped her design lessons that were more relevant, engaging, fun, and real to her students, hence allowing her students to be "real scientists."

Where Is Ashley now? Following up Two Years after Her Internship

Ashley is teaching sixth and seventh grade science in a rural high needs setting school. She talked about having a lot of support from fellow teachers, both veteran and novice teachers. During her first year of teaching, Ashley described about how her main priorities were "finding a way to connect to the students, organizing lesson plans and trying to stay on top of everything that is required of [her] as a teacher." She also tried to find ways to teach the standards while

keeping them relevant to her students.

She described her main challenges during her first year:

> I found that classroom management was difficult last year and also finding the extra time to contact home, finding efficient ways to analyze data, and to truly reflect was difficult. I worked many late nights as many teachers do and still felt that so much was left undone. I guess my biggest struggle was picking and choosing what was most important and learning to let go of some of the things I knew I would have to get to the next year or get better at next year when I had more experience under my belt.

During her second year, Ashley felt that lesson planning had become more "second nature" to her and more fun now that she has a foundation for the way she plans her science units. She also talked about how she can focus on the creativity of her lessons and on implementing different assessments at different parts during the unit. She said that her biggest supports during her two years teaching were the "teacher friends" she made at the school, her college peers and friends whom she still kept in touch with, her boyfriend whom she met at the school, and her family. She elaborated by saying:

> I found it is wonderful to have teacher friends because they understand trust you, have the same passions, and usually have helpful insight. Support from my family and boyfriend are wonderful though because they can give me an outside perspective and also help me to sometimes pull away from some of those issues of school and find a way to relax when I'm at home, which is important from time to time.

Overall, Ashley felt more comfortable her second year teaching after establish a baseline for her units. Also, having a network of people as a resource helped her feel supported. Table 6.1 provides a summary of the interns' challenges and the modifications they made to both lessons.

Table 6.1 Summaries of Interns' Challenges and Modifications For Both Lessons

	Becky	David	Ashley
Challenges in First Lesson	Lesson on meiosis and mitosis Limited lab materials to engage with the concept of meiosis. Students not able to model the phases out of order, as they did not have enough experiences meiosis.	Lesson on Heat. Limited Lab Materials. Different math ability levels.	Lesson on Kinetic Energy and Gravitational Potential Energy. Different math ability levels.
Modifications Made to First Lesson	Being creative and using pipe cleaners to model chromosomes for her students. Scaffolding her students by going over examples with them. Sequencing the lesson.	Scaffolding his students and modeling the procedure more for them.	Scaffolding by going over some of the math examples.

Table 6.1 (Cont'd)	Lesson on Natural Selection.	Lesson on Natural Selection.	Lesson on Electrostatic Interaction Between Force and Charges.
Challenges in Second Lesson	Limited resources and lab materials to teach the content. Initial worry of teaching natural selection and addressing how students might respond to a topic considered controversial in her students' community.	Math calculations. How simulations did not make sense and students were not able to connect the simulation to the effect on a population.	Limited computer access to do simulation lesson on force. Negotiating how to teach students as much content as possible while meeting the science standards.
Modifications Made to Second Lesson	Making it fun and relevant to her students by having them be the population undergoing natural selection. Having her students do a simulation that allows them to make predictions, share their ideas, and engage with the content.	Scaffolding his students by modeling a simulation of natural selection for them. Showing the actual data and connecting it to real world examples,(eg. the peppered-moth)	Tailoring the lab math problems and calculations according to her students' ability.

Table 6.2 Summaries of Interns' Storied Identities' of Science Learning and Becoming a Science Teacher Development

	Chapter 4 Before The Internship Year	Chapter 5 During The Internship Year and Before Lead Teaching September 2012 – December 2012	Chapter 6 During The Internship Year and during Lead Teaching January 2013 – April 2013	Identity & Practice: **Stories over time** **(enduring & shaping)**
	Storied Identity of Becoming a Science Learner	**Storied Identity of Becoming a Science Teacher**	**Storied Identities & Practice**	
Becky	• Doing science to connect scientific ideas with the world around her. • Applying science knowledge to understanding near and far contexts.	Making sense of the multiple identities she faced situated in her classroom context. 1. Racial Identity (White in a Black School) - making sense of her own different racial identity as a White person in a predominantly African-American high school, by foregrounding making her lessons fun, engaging, and interactive, rather than her racial identity as a White person. 2. Authority as a Teacher – Reauthoring her teaching identity to go from being the "soft-spoken"	Challenges encountered: • Limited lab materials. • Class morale. • Students not making connections. • Connecting to students lives (e.g., values, experiences). Storied strategies across lessons: • Creative use of easy to access resources. • Highlighted scientific connections in her teaching • Highlighted connections to everyday life. • Incorporated humor, action taking, peer-to-peer engagement. • Incorporated pre-assessments to	<u>What endured and stayed the same:</u> • Prioritizing that her students engage in the "doing of science" and learning through relevant hands on activities. <u>What grew stronger:</u> • Foregrounding teaching her students science content that was engaging, fun, and relevant to

Table 6.2 (Cont'd)		teaching identity she started with at the beginning of her internship year to become that of "tough" teaching identity. Teaching Content in Ways That Were Engaging, Fun, and Allowed for Doing Science. 1. Prioritizing her students "doing science" by engaging in lessons through peer-to peer discussions, hands-on activities, and classroom presentations.	determine what kinds of scaffolding needed.	them. • Sequencing lessons so that she could bridge gaps in their content knowledge, and so they could make connections to what they learned before <u>What changed in her stories:</u> • Learning to structure up her lessons or scaffolding her students with more pre-assessments to find out about their background knowledge.
David	• Being scientifically curious, and a critical thinker.	Navigating the challenge with talkativeness in his classroom: 1. The talkativeness made him feel	Challenges encountered: • Limited lab materials. • Students not making connections. • Different math ability levels.	<u>What endured and stayed the same:</u> • Valuing that his students learn

Table 6.2 (Cont'd)

- Valuing learning science until it "made sense" to him through engaging in experiences and scientific argumentation.

- Valuing scientific argumentation and the relevancy of science in his everyday life.

inadequate as a teacher.

2. Reluctant to voice the feeling of inadequacy because he was afraid he would be seen as not enamored enough with teaching.
3. Being reassuring to his students was his way of navigating the talkativeness in his class but also relating to his students. Positioning himself as an authority figure was another way he tried to navigate the talkativeness in his classroom, by adopting a firm teaching identity, as opposed to the "meek" teaching identity he identified with in the beginning of his internship year.

Storied strategies across lessons:

1) Scaffolding his students and modeling the lesson procedures for them.
2) Being resourceful in using "simple and cheap" lab materials such as Styrofoam cups and old thermometers in place of beakers and probes.

science until it "made sense" to them.

<u>What grew stronger:</u>

- Foregrounding scaffolding his students more by giving them more context, but also helping them by modeling the lab procedures for them and doing some math calculations as examples for them to address the different math ability levels in the class.

<u>What changed in his stories:</u>

- Not being too hard on himself as a teacher and looking at reaching his students also

Table 6.2
(Cont'd)

				through the life skills he taught them. • Learning to be more approachable with his students and opening up more with them.
Ashley	Engaging in authentic science experiences that made her think and feel like a real scientist.	Navigating the minutia of the day-to-day lesson planning and letting go of "smooth and perfect" lesson planning to focus on the big picture of reaching her students' learning. 1) Helping her Students Make Deeper Connections to the Content. 2) Valuing her lesson planning running smoothly.	Challenges encountered: • Limited lab materials. • Different math ability levels. • Limited computer access to do simulation on force. • Negotiating how to teach as much content as possible while meeting the science standards. Storied strategies across lessons: • Scaffolding her students and going over some of the math examples with them before they did them themselves. • Having her students work in groups to address limited computer access and tailoring the lab math problems and calculations according to her students' ability.	<u>What endured and stayed the same:</u> • Delivering lessons that were real, fun, and relevant to them- in other words that her students would get to be "real scientists." <u>What grew stronger:</u> • Foregrounding teaching her students science content that was relevant to them. • Foregrounding scaffolding her

Table 6.2 (Cont'd)

	• Designing her lessons as part of a cohesive unit plan that took into account her students' knowledge.	students. <u>What changed in her stories:</u> • Learning to look at the big picture of unit planning, which helped her design lessons that were more relevant, engaging, fun, and real to her students. • Unit planning also allowed her to focus on building relationships with her students, as she was not stressing on the minutia of day-to-day lesson planning as much.

Storied Strategies: Anti-deficit Perspective to Teaching in a High Needs Setting

Using a storied identity analysis allowed me to get further insight into what teaching strategies Becky, Ashley, and David highlighted as supporting them in making sense of the challenges they identified in their teaching practice and in their learning to teach in an urban context. The five teaching strategies that surfaced across the three interns as they learned to teach were (1) building relationships with their students, (2) being resourceful and creative when faced with lab materials, (3) making science relevant to their students, (4) scaffolding their students in their learning, and (5) having a network of people as resources in helping them be better teachers and helping their students learn. Out of these five teaching strategies, those that connected back to their storied identity of science earning and helped them teach in ways they valued are what I called storied strategies. I conceptualized these storied strategies as also a way for the interns to approach their students from an anti-deficit perspective (Cochran-Smith, 2000), as capable of learning and meeting high expectations.

Building Relationships with Their Students

All three interns talked about how relating to their students and building relationships with their students helped them reach their students. In Becky's case, building relationships with her students took the form of tutoring them after class, but also building rapport with their parents. David started building relationships with his students much later than Becky. He described that he was not sure how much to open up with his students. For him, building relationships with his students also was about sharing synapses about his life, and relating them to the lessons he taught. As mentioned before, he would share with his students that while he made the punch holes for the natural selection lesson, he spent five hours doing it while watching

the show “Star Trek,” which his students found hilarious. Finally, Ashley talked about how she also started attending her students’ games, showing them that she cared about their learning, but that she also was interested in their interests as well.

Being Resourceful and Creative When Faced with Limited Lab Materials

Both David and Becky talked about being resourceful and creative when it came to addressing the challenge of limited lab materials to do the lab experiments. In David’s case, he resorted to using Styrofoam cups and old thermometers, in place of the probes and beakers that his school did not have in order to do the heat lab with his students. He also went to the recycling center close to his university to get paper to use to make punch holes for his natural selection simulation. Becky also sought out creative venues to teach her students fun and engaging lessons. For her first lesson, she went to a crafts store and bought pipe cleaners that her students could use to represent chromosomes for the meiosis-modelling lab. For her second lesson, she ended up tracing and cutting out 225 paper leaves so that her students could use in her natural selection simulation. Both Becky and David did not let limited lab materials short-change their students of having fun and engaging experiences.

Making Science Relevant to Their Students

The storied strategy of making science relevant to their students was mostly salient in Becky and Ashley’s stories about their strategies of learning to teach. Both of their storied identities of learning science were about valuing science that was relevant to them. We see that in how they strove to make their lessons engaging, fun, and relevant to their students as they learned to teach. Becky, for example, made the natural selection simulation lesson about her students, so that they were the population that was undergoing the process of natural selection.

Similarly, Ashley talked about designing a lesson demonstrating how using the balloons that she rubbed against her sweater could be a relevant example for her students to understand electric charges and an activity that they could replicate at home. Both Ashley and Becky leveraged their storied identities of science learning in that they strove to make their lessons fun, engaging, and relevant for their students to learn the science content.

Scaffolding Their Students in Their Learning

All three interns described how they used the storied strategy of scaffolding their students in their learning as supportive in navigating the challenge of helping students make connections to the science content they were learning. Scaffolding their students took many forms for the interns. For Becky, she called scaffolding her students as structuring up the lesson. She described it as providing her students with different experiences and activities that would help them make connections to the content. She also believed that part of structuring up her lesson was planning it so that it was relevant to her students, or, as she called it " trying to bridge gaps" in their content knowledge. For both David and Ashley, scaffolding their students was about giving them as many examples as possible before doing the math calculations. It also took the form of modeling the lab for them, or going around the class and helping them figure out the math calculations. Ashley also saw that unit planning was a big part of her scaffolding her students, because it allowed her to plan ahead of time her activities and assessments, and to take into consideration how to make the lessons more relevant to her students' knowledge and lives.

Having a Network of People as Resources

All three interns highlighted that the teaching strategy of having a network of people as resources was instrumental in empowering them in their learning to teach. Becky had started by

looking up to her mentor teachers as role models, but by the end of the year she decided to take what was best from each one of them. Her mentor teacher, Ms. Yang, made her understand the importance of being organized and firm about policies with her students and how this results in better management and behavior in her class. With Ms. Berry, Becky felt that she learned to be herself more, and to be more approachable with her students. Both her mentor teachers were supportive, and they encouraged her when her lesson did not go as planned, as was the case with Ms. Berry and the meiosis lab, when her students did not understand the meiosis phases out of order. Similarly, David and Ashley also credited their mentor teachers with helping them advance their way of thinking of how to be a better teacher. In David's case, it was about being less hard on himself as a teacher and gauging his success as a teacher, not about whether his students all got As on his tests, but more about what life skills they learned from him and how much of the content made sense to them. In Ashley's case, her mentor teacher was an invaluable resource who pushed her to plan the unit ahead and to make it engaging and relevant to her students. In short, the dialogic interactions with their mentor teachers, as well as using them as an invaluable resource for advice and support, helped the interns to navigate better their learning to teach experience and to empower them more in their own classroom setting.

CHAPTER VII

Discussion, Implications, and Conclusions

In this study, I looked at the storied identities of Becky, David, and Ashley as they learned to teach in different urban settings. I examined how their storied identities of learning science surfaced in their developing practice during their one-year internship experience of learning to teach. I also focused on uncovering the challenges the interns honed in on while developing their practice, and what teaching strategies they identified as helping them develop as urban science teachers. My purpose was to bring attention to not only the challenges that they highlighted as important to them, but also to get insight into the storied strategies they named that empowered them to navigate these challenges.

Summary of Findings

In Chapter 4, I answered the first research question.

1) What are the three interns' storied identities of learning science?
    a) What values do they highlight in their science learning story? How do they view themselves as science learners?
    b) Who do they highlight as important influences in their science learning story?

I mainly recounted the stories of science of Becky, Ashley and David, the interns who participated in my study. By describing their stories of learning science, I looked at what themes their stories of learning science gravitated towards, and those themes shaped what became their storied identities of learning science. For example, Becky told stories of viewing herself as truly learning science when she engaged in "doing science" and activities that allowed her to engage in learning science, but also to connect her science learning to the world around her. Therefore

her storied identity of learning science revolved mostly around valuing authentic science experiences that allowed her to be "doing science", but also that were interconnected with her life as well. David told stories of viewing himself as mostly learning science when he engaged in opportunities that allowed him to be scientifically curious about the world around him and to make his science learning relevant to the world around him. He also told stories about learning science when he was able to engage in learning that pushed him to think critically about the concepts he was learning until they made sense to him. Thus, his storied identity of learning science became about valuing himself as being a critical thinker. Last, Ashley's stories of learning science were mostly about being part of authentic science experiences that allowed her to feel like a "real scientist." So Ashley's storied identity of learning science revolved around her valuing authentic science experiences.

I also described whom the interns' named as important in their storied identity of learning science and whom they viewed as influencing their views of science learning. Becky, for instance, highlighted both her science education college professor and her physics high school teacher as important in helping her appreciate the value of science learning as "doing science." Both enabled Becky to partake in solving problems that allowed her to do activities, which were fun and connected to her life. David talked about how his dad initially got him interested in being scientifically curious about how things work. He also mentioned the professor, and his advisor, whom David worked with in the lab during college for three years. David credited his professor for helping him value the scientific method and its importance in pushing him to be a critical thinker. And Ashley showed that her pathway into science was strongly supported by both her mother and her AP Biology teacher. Both Ashley's mom and her AP biology teacher were main

coauthors in her science learning story because they provided opportunities for her to value and engage in doing authentic science experiences.

In addition, I described the reason why the interns chose to be science teachers. In Becky's case, she looked up to her high school physics teacher in how she taught her how to learn science, and she decided she wanted to pursue a field in science and started out as a premed student. However, she changed her mind in college and decided to become a science teacher and to teach in a high-needs setting after she learned more about the social inequalities that exist in school settings from her Teacher Education class. Similar to Becky, both David and Ashley became interested in becoming science teachers in high-needs settings after taking the same course as Becky. David began his career majoring in philosophy, but he chose to pursue a career as a teacher in a high-needs setting because he believed that everyone should have a right to an education. Ashley started out interested in becoming a veterinarian in college but realized that it was more her childhood dream and not her passion. She wanted to be able to spread her science knowledge, and so she started taking Teacher Education classes. She realized that teaching was what she wanted to pursue after seeing the impact she made on her students' learning when she tutored students in science.

In presenting their storied identities, I sought to show what they valued in their own science learning. In doing so, I portrayed the interns' identities as science learners but also what shaped their science learning story.

In Chapter 5, I answered the second research question:

2) How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting?

a) How do we see their storied identities expand in how they talk about their teaching practice?

I mainly presented the stories that shaped their identity as beginning teachers and that revolved around them becoming a science teacher. The stories were based on the reflections they wrote from September, 2012, to December, 2012, and right before their lead teaching in January, 2013. I used these reflections to find out what their storied identity of becoming a science teacher revolved around. I looked at the patterns and themes that were repeated in their stories, and those became their storied identities of becoming a science teacher.

In Becky's case, her storied identity of becoming a science teacher revolved around making sense of her multiple identities- her racial and teaching identities- and how she navigated them in order to fit in her classroom community. Her storied identity was also about her figuring out how to use her authority as a teacher in her classroom. In addition, her storied identity of becoming a science teacher was about what she valued in her own science learning storied identity- teaching in ways that were engaging, fun and allowed for "doing science." On the other hand, David's storied identity focused on navigating the challenge of talkativeness in his classroom and positioning himself as an authority figure in his classroom. Ashley's storied identity of becoming a science teacher revolved around delivering lessons that were authentic, fun, and relevant to her students. Both Becky and Ashley's storied identities of science learning surfaced in their storied identity of becoming a science teacher. There was an overlap between the storied identities of science learning of Becky and Ashley, unlike David's storied identities, whose initial storied identity of becoming a science teacher before his lead teaching was focused mostly on navigating the challenges of talkativeness in his classroom and gaining

respect from his students by mainly positioning himself as an authority figure. I will explore this further in the Discussion section of this chapter.

In Chapter 6, I answered the second and third research questions:

2) How do the three interns' storied identities of becoming a science teacher take shape as they learn to teach in an urban setting?

    a) How do we see their storied identities expand in how they talk about their teaching practice?

3) How do we see their storied identities in how they talk about their teacher professional identity development and their learning to teach during their internship year?

    a) What storied strategies do they name as helping them navigate their learning to teach?

I looked across the two lesson plans that the interns chose as depicting them as urban science teachers. My objective was to get at a deeper understanding of how their storied identities shaped their learning to teach in the two lesson plans they selected. In addition, I looked at how they viewed themselves as urban science teachers and what teaching strategies, or storied strategies, they highlighted as helping them make sense of their learning to teach.

Drawing upon the lesson plans they chose, I was able to see the challenges they highlighted in their lesson plans. The challenges that the interns named mainly were limited lab materials, different math ability levels, students not making connections across the different parts of the lessons, and teaching as much content as possible to not short-change their learning. I also

looked at the modifications they made to their lessons to address these challenges, and how they reflected about the enactment of their lessons. Then, I summarized the storied strategies, or the teaching strategies they named that connected back to their storied identities and helped them teach in ways they valued. These storied strategies were the teaching strategies that surfaced in their lesson plans, as well as during their lead teaching, that they talked about as helping them negotiate the challenges that came up in the enactment of their lesson plans.

Last, I looked at their teacher professional identity development, or how they talked about themselves as an urban science teacher, from the beginning of their internship year to the end, to see how they were changed by the experience of learning to teach. My purpose was to see how they talked about how they saw themselves as urban science teachers and how that developed over the span of their internship year. Becky had described herself initially as the kind of urban science teacher who was resourceful, flexible, and who sets the bar high for herself and her students. By the end of her internship year, she talked about her teacher professional identity as also seeing herself as the kind of urban science teacher who reached out to her students and built relationships with them in order to help them learn and be more engaged in her class. She also talked about how she saw herself as the kind of teacher who structured her lessons in a way that offered her students multiple ways of learning by incorporating several activities and authentic science experiences, as well as formative and informative assessments throughout. Similarly, David talked about how in the beginning of his internship year, he saw his teacher professional identity as one where he described himself as a resourceful teacher who would work at getting his students to an "ideal" level of learning. At the end of his internship year, David described his teacher professional identity as one where he would use the word "ideal" less after his experiences teaching in an urban setting, and naming challenges such as limited lab resources

and his students' varied math abilities. He also talked about how his teacher professional identity now developed to include him being the kind of teacher who scaffolded his students more and provided them with more examples and math practice. Last, Ashley talked about how initially her teacher professional identity was about her being the kind of teacher who was enthusiastic about teaching her students authentic real science. At the end of her internship year, Ashley viewed herself as the kind of teacher who would spend the time to plan units ahead, which helped her structure the lessons making them relevant to her students.

I also followed through with the interns to see where they were, and if they pursued teaching in a high-needs setting. Out of the three interns, only Becky and Ashley pursued teaching in a high-needs setting. David decided not to pursue teaching because he felt that "his heart" was not into teaching and that it would not be fair to his students if he became a teacher. Instead, David went back to graduate school to get his master's in Plant Biology.

Discussion

In my study, I examined the storied identities of three teacher candidates learning to teach in an urban setting. What my study suggests is that a storied-identity lens can contribute to understanding the complexity of how identities are shaped by stories and life experiences and how their storied identities of science learning and becoming a science teacher provide a better understanding into the different practices that teachers enact under the same teaching context and how their teacher professional identity develops.

As previously stated in my literature review, research has found that identity is socially constructed (Gee, 2001; Lave & Wenger, 1998; Brown, Collins, & Duguid, 1989). Not only is identity socially constructed, but also it is dynamic and fluid. In other words, identity is tied to one's personal history and dependent on interactional context (situational, social, institutional),

and thus it is continuously changing (Enyedy, Goldberg, & Welsh, 2006; Holland, 1998; Wenger, 1998). Similarly, researchers have argued the importance of looking at identity as a set of narrative definitions (Richmond, Juzwik, & Steel, 2011; Hall, Johnson, Juzwik, Wortham, & Mosley, 2010; Sfard & Prusak, 2005). For instance, Holland et al., (1998) wrote:

> People tell others who they are, but even more importantly, they tell themselves and they try to act as though they are who they say they are. These self-understandings, especially those with strong emotional resonance for the teller, are what we refer to as identities. (p. 3)

In their telling of their stories of science learning and becoming a science teacher through the interviews, journal reflections, and discussion forums, teacher candidates were highlighting what was important to them as science learners and teachers. My findings suggest that looking at the storied identities of science learning and becoming a science teacher enabled me to see how teacher candidates interpret and frame their initial experiences teaching in an urban setting.

Recall in Chapter 5 the findings about the overlap or lack of overlap in their storied identities of science learning and becoming a science teacher. Becky's storied identity of learning science surfaced in her developing practice before her lead teaching because she prioritized teaching science to her students in engaging and interactive ways that connected to them, but also showed them that she was "passionate" about their learning. In David's case, as his storied identity of becoming a science teacher developed, what we see it revolving mostly around was how he reconciled with the tension of getting students to respect him as an authority figure and dealing with the talkativeness in his class. For Ashley, her storied identity of learning science revolved around valuing doing "real science." This is also seen in her storied identity of becoming a science teacher before her lead teaching and in what she valued for her own students

as well. Ashley valued engaging in authentic science experiences that made her think and feel like a real scientist. The lessons and activities she planned were centered on providing authentic real science experiences to her students. Tables 7.1 and 7.2 provide a summary of their storied identities of science learning and becoming a science teacher.

Table 7.1 Summary of Interns' Storied Identities as Science Learners

Storied Identity of Learning Science	Becky	David	Ashley
Their sense making of their science learning.	Valuing "doing science" that helped her connect the scientific ideas she learned with the world around her, and also applying her science knowledge to understanding near and far contexts.	Being scientifically curious, a critical thinker, and valuing scientific argumentation and the relevancy of science in his everyday life.	Engaging in authentic science experiences that made her think and feel like a real scientist.

Table 7.2 Summary of Interns' Initial Storied Identities of Becoming a Science Teacher

Storied Identity of Becoming a Science Teacher	Becky	David	Ashley
Priorities that the interns honed in on during the first three months of their student teaching, from September 2012 to December 2012.	Teaching content in an engaging way that allowed her students to "do science," and making sense of the multiple identities she faced situated in her classroom context.	Navigating the challenge with talkativeness in his classroom by relating to his students and positioning himself as an authority figure.	Delivering lessons that were real, fun, and relevant to her students. Navigating the minutia of the day-to-day lesson planning and letting go of "smooth and perfect" lesson planning to focus on the big picture of reaching her students' learning.

The findings from Chapter 5 demonstrate that using a storied identity lens allowed me to see an overlap between the storied identities of science learning and becoming a science teacher for both Becky and Ashley. (See Figures 7.1 and 7.3.) On the other hand, David's storied identities of science learning and becoming a science teacher did not present an overlap in his storied identities. This critical overlap is what I call a productive overlap of storied identities because it shows that what is highlighted in their stories that shaped their storied identity of becoming a science teacher can be linked back to what they valued in their storied identity of science learning. In contrast, David did not highlight in his stories of becoming a science teacher, as narrated in his journal reflections, what he valued in his storied identity of learning science. Instead, the stories that he focused on before his lead teaching revolved around navigating the challenges of talkativeness in his class. The productive overlap of their storied identities framework suggests that both Becky and Ashley's understanding of their initial experiences learning to teach in an urban setting were strongly connected to their storied identity of science learning. As their storied identity of becoming a science teacher developed contextually over time, the overlap with their storied identity of science learning was still present and showed that they drew from their storied identities of science learning from the beginning of their internship year. However, in David's case, there was an absence of the productive overlap of his storied identities of science learning and becoming a science teacher, which in turn shows how he talked about what he focused on in his initial experiences of becoming a science teacher. What he focused on in his initial storied identity of becoming a science teacher were mostly the day-to-day activities of dealing with the challenges of learning to teach in relation to his students, and specifically navigating the talkativeness in his class. Recall that identity is viewed as a fluid, dynamic, relational, recursive, and discursive process (Beijaard, Meijer, & Verloop, 2004; Hall,

et al., 2010; Juzwik, 2006; Richmond, et al., 2011; Sfard & Prusak, 2005). What this study further suggests is the idea that as they were learning to teach, their storied identities of becoming a science teacher were capturing the relational complexity of the interaction in their social context. In addition, the context-driven challenges and reactions to these challenges as faced by these different interns could be the reason for the lack of overlap in David's case. In addition, David may have selected this aspect of navigating the talkativeness of his students as his teaching challenge because it prevented him from reaching his goals of teaching science the way he valued in connection to his storied identity of science learning. He did not seem to have the tools or resources, which would have allowed him to narrow the gap between his valued goals and the reality of his context. What follows is a breakdown of the relationship between storied identities and teacher professional identities and the relationship between storied identities and storied strategies (See Figures 7.1, 7.2 and 7.3 for the productive overlap framework of storied identities for each intern.)

Figure 7.1 Productive Overlap of Storied Identities Framework

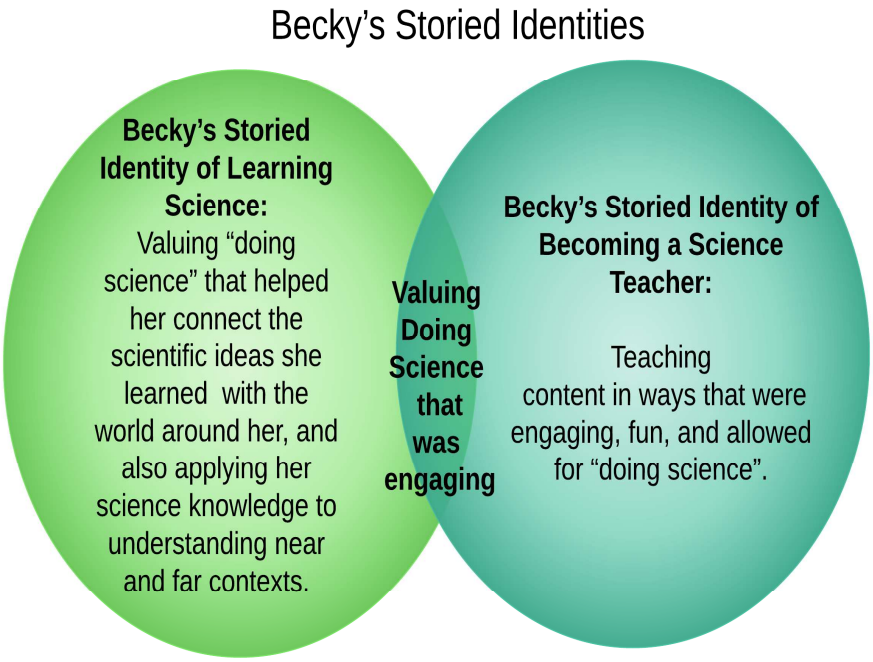


Figure 7.2 Lack of Productive Overlap of Productive Storied Identities Framework

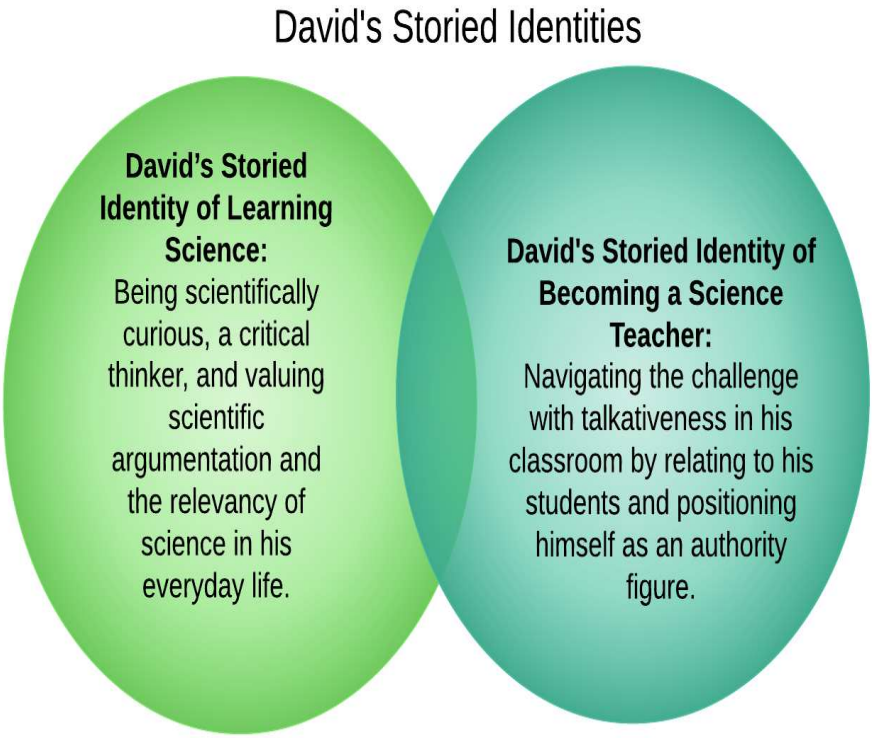
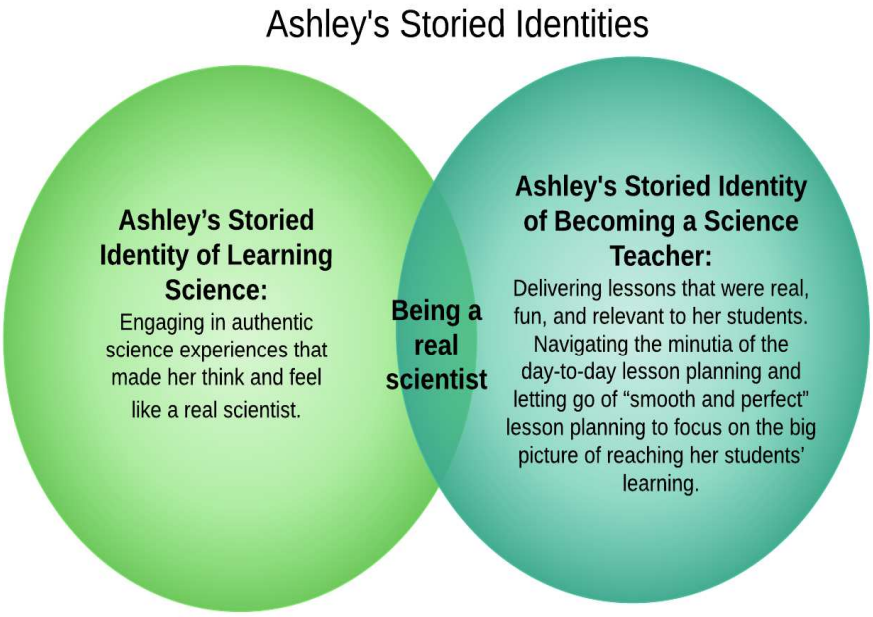


Figure 7.3 Productive Overlap of Storied Identities Framework



Relationship Between Storied Identities and Teacher Professional Identity

Peressini, Borko, Romagnano, Knuth and Willis (2004) described professional identity as a filter for teacher learning that allows teachers to accommodate to the conflicting tensions that arise from managing day-to-day classroom activities, as well as to deal with decision making and lesson enactment priorities. Richmond, et al. (2010, p. 27) viewed teacher candidates' professional identity as including their values ("personal needs and felt obligations that drive their priorities") and positioning ("with respect to communities of practice, that is, school professionals, and the TE program", as examples of two communities of practice that teacher candidates might align themselves with. In my study, I conceptualized teacher professional identity as how they recognized themselves as urban science teachers (Luehmann, 2007). I found that the teacher candidates' storied identities surfaced in how they talked about their developing teacher professional identity.

Recall in Chapter 6 that I presented the interns' teacher professional identities and looked at how they developed from the beginning of their internship year to the end of their internship year. For instance, Becky's teacher professional identity at the beginning of her internship year was one in which she described herself as the kind of teacher who was "resourceful, flexible, and inclusive of all students in her classroom." By the end of her internship year, Becky's teacher professional identity also included seeing herself as the kind of teacher who reached out to her students and built relationships with them. She described herself as the kind of teacher who would care about her students' learning by staying after class to tutor them or calling her students' parents to make sure they were aware of how their kid was doing in her class. She also described herself as the kind of teacher who would now structure her lessons more and provide opportunities for more experiences and assessments for her students, in order to scaffold them

more in their learning. Her teacher professional identity development connected back to her storied identities of science learning and becoming a science teacher, because her view of herself as the "resourceful" teacher or the teacher who structures her lessons was what helped her teach in the authentic engaging learning experiences she valued.

Initially, David's teacher professional identity was one in which he described himself as a resourceful teacher, or the kind of teacher who would "find ways to work with what [he has]" to teach his students. In addition, he described himself as the kind of teacher who was attentive to getting his students at an "ideal" level of learning. At the end of his internship year, however, David described himself as the kind of teacher whose approach to teaching was "this is what I need to know and this is what I need to know to teach it." He said that he would now describe himself as the kind of teacher who would use the word "ideal" less, and he went on to elaborate about how seeing his mentor teachers and peers work hard and put in hard work with limited resources and still get their students to learn the content made him view his teacher professional identity differently. As his storied identity of becoming a science teacher developed, so did his teacher professional identity. David's storied identity of becoming a science teacher developed from negotiating the challenges of talkativeness in his class to that of scaffolding his students in their learning by being resourceful. His storied identity of becoming a science teacher, as mentioned before, developed by the end of his internship year to include the kind of teacher who taught in ways that pushed students to be "critical thinkers", which is what he valued in his storied identity of science learning, but also included the kind of teacher who scaffolded his students in the process and was creative when faced with limited resources.

In Ashley's case, her teacher professional identity initially was about seeing herself as the kind of teacher who was passionate about teaching the content and her students, while helping

her students be more proactive thinkers. At the end of her internship year, Ashley viewed herself as the kind of teacher who would spend the time to plan units ahead, which helped her to structure the lessons, making them relevant to her students, but also to teach in the ways she valued in her storied identity of science learning, which was being able to learn science by engaging in "real science." Her mentor teacher was the one who pushed her to be the kind of teacher who plans units ahead to structure her lessons. Ashley came to see her teacher professional identity now as being the kind of teacher who planned units ahead, which allowed her to be the kind of teacher who reached out to her students and built relationships with them, but also to teach them in ways that she valued where they learned as "real scientists."

While in their internship, the teacher candidates were learning to become a certain kind of teacher while interacting with their students and mentor teachers. Their teacher professional identities were contextually constructed through their interactions with their students and their mentor teachers (Holland, 1998; Wenger, 1998). In other words, their learning to teach or their authoring their teacher professional identity was contextually situated (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991) where I would argue that their mentor teachers were also a critical part of the context or filter through which they were learning to become a science teacher.. What the cases of the three interns showed was the important role of context (Beijaard, Meijer, & Verloop, 2004), mostly how they related to their students in shaping their teacher professional identity. In addition, the findings highlight how their teacher professional identity was inextricably linked to their storied identities, because as their storied identities developed contextually over time, so did their teacher professional identity.

Relationship Between Storied Identities and Storied Strategies

My findings demonstrate that a storied identity lens can help better pinpoint the areas in which teacher candidates highlight as priorities in their practice as they learn to teach in an urban setting. Several studies have argued that an identity lens can provide insights into teacher learning and practice (Hall, Johnson, Juzwik, Wortham, & Mosley, 2010; Luehmann, 2007; Gee, 2001; Helms, 1998). Other studies have suggested that differences in professional identities inform differences in practice (Chong, Ling, & Chuan, 2011; Hewson, 2007; Lasky, 2005; Leuhmann, 2007), given the same teaching context. For example, Enyedy, Goldberg, and Welsh (2006) used the construct of identity to investigate how two veteran teachers navigate teaching dilemmas. They found that differences in teacher identity, or the ways they viewed their classroom and their roles as teachers, informed what challenges they focused on, as well as the teaching practices they implemented. Kang (2011) looked at teacher candidates' future identities of what kind of teacher they wanted to be, or their "designated identities" and the kinds of practices they wanted to be better at. Kang found that their "designated identities" helped inform what they highlighted in their teaching and interactions within their community of practice, and that their designated identities were stable throughout. Similar to Kang (2011), I found that the differences in storied identities were linked to differences in the storied strategies they highlighted. I define storied strategies as the teaching strategies they talked about in their stories of practice, which they named and highlighted as helping them make sense of the challenges they faced in their teaching practice during their lead teaching.

The teaching strategies that the interns told in their stories of becoming a science teacher during their internship year fell into five categories. These five categories of teaching strategies were: (1) building relationships with their students, (2) being resourceful and creative when

faced with limited lab materials, (3) making science relevant to their students, (4) scaffolding their students in their learning, and (4) having a network of people as resources in helping them be better teachers and helping their students learn. By calling these teaching strategies storied strategies, I am making the distinction that the interns were using in naming them and in highlighting them as the teaching strategies they used and valued to help them navigate the challenges in their practice during their lead teaching. In addition, these storied strategies were the teaching strategies that connected back to their own storied identities of learning science, because they were the teaching strategies that they used to teach in the ways they valued in their own storied identity of science learning.

Let us take the case of the two interns Becky and David. Becky and David taught the same lesson on natural selection but their deliverance of the lesson can be attributed to not only the difference in their teacher professional identity (Chong, Ling, & Chuan, 2011; Hewson, 2007; Lasky, 2005; Leuhmann, 2007), as discussed above, but also to the differences in their storied identities. Both Becky and David named limited resources as one of the teaching challenges for implementing the lesson on natural selection. David had also named poor math skills as another teaching challenge. Recall that Becky's storied identity of science learning revolved around her valuing "doing science," which helped her connect the scientific ideas she learned with the world around her. The teaching strategies she highlighted as important to her in making sense of her teaching challenge of limited resources and also teaching a topic that she was apprehensive about teaching, due to the majority of her students coming from a "Baptist community" and that were linked to her storied identities of science learning were her storied strategies. The storied strategies she highlighted as helping her navigate the challenge of limited lab materials, but also to teach in ways that she valued that connected to her own storied identity

of science learning as learning science by "doing science," were being resourceful and creative when faced with limited lab materials and making science relevant to her students. Becky made sure that she made the lesson fun and relevant to her students, by having them be the population undergoing natural selection. She also was creative in her use of resources, by making paper cuts of leaves and hanging them from the ceiling of her classroom, instead of using expensive probes. Both of these storied strategies that she highlighted were what helped her teach in ways she valued in her own storied identity of science learning, and they helped her students learn science by "doing science."

David's storied identity of science learning was one in which he valued learning science that pushed him to think critically about the concepts he was learning until they made sense to him. In addition, his storied identity of science learning was about doing science that allowed him to use scientific argumentation and the scientific method. The science learning experiences that he had highlighted and that shaped his storied identity of science learning were tied to his experiences as a researcher in a lab as a college student. Unlike Becky, David did not highlight the teaching strategy of making science relevant to his students. However, similar to Becky, he did highlight the teaching strategy of being resourceful and creative when faced with limited lab materials. He talked about how he used materials from the recycling center to make simulations of the population example for his class for the natural selection lesson. He also talked about using the teaching strategy of scaffolding his students by modeling examples of how to find the population for natural selection. These two teaching strategies he named and highlighted specific to this lesson plan were his storied strategies because they were the teaching strategies that allowed him to teach in the ways he valued from his own storied identity of science learning, which was to push his students to be critical thinkers.

The differences in their storied identities informed the different storied strategies that Becky and David chose to talk about and highlight as important in navigating the teaching challenges they names and to teach in the ways they valued. Becky had talked about how the lesson on natural selection was successful for her and how the storied strategy of making it relevant to her students helped her students understand better the mechanism of natural selection. On the other hand, David described the natural selection lesson as one that "did not go so well." The storied strategies he talked about helped him deal with the challenge of limited resource materials, but he felt that his students still struggled with using math skills to find the population of natural selection. So, as was the case with David, what is important to keep in mind then is that storied strategies that interns name and highlight are not always a straightforward resource in dealing with the teaching challenges they identify.

Implications and Conclusions

My study mainly is set to inform teacher preparation programs about how a storied identity lens provides a deeper insight into teacher candidates' interpretation of their initial experiences teaching in an urban setting, but also what teaching strategies, or storied strategies, they hone in on in their learning to teach experience. In the end, there is a need for examining learning to teach from the angle of teacher candidates' storied identities, and how it informs the storied strategies they interpret as helping them teach in the ways that they value. The implications for teacher education and research on teacher education are discussed below.

Implications for Teacher Education Programs

On balance, while my study contributes to identity scholarship by bringing into play storied identities and storied strategies, it also contributes to teacher design, and to teacher learning, as teacher professional identity development, and to teacher education. Storied

identities are a resource teacher candidates bring in as they learn to teach, and these identities will influence the way they interpret their practice, as my study revealed. Therefore, the steps to follow for teacher preparation programs are to have teacher candidates talk about their storied identities, to be thoughtful about them, and to be reflective about them.

A storied identities lens can give teacher preparation programs a tool to help teacher candidates to be more aware of how they are engaged in the process of creating their teacher professional identity (Coldron & Smith, 1999; Walkington, 2005) and to think about their science learning experiences as shaped by their identities (Lave & Wenger, 1990), as well as to help them think differently about their own learning to teach experiences in relation to their storied identities. As my study shows, teacher candidates need to understand that they can make an impact on their own learning to teach experiences, because their developing practice is guided by their storied identities of learning science and becoming science teachers; however their teacher professional identities and their developing practice are not fixed, but are shaped by interactional and situational contexts that they experience during their internship year, in their classroom with their mentor teachers and their students. Teacher education programs should consider providing opportunities for beginning teachers to tell their stories of science learning and learning to teach, and to be aware of how they view their teacher professional identity development in relation to their storied identities and how context plays a role in shaping their teacher professional identities and their practice.

Artifacts. In order to draw upon the power of using storied identities as a lens in helping teacher candidates make sense of their learning to teach, teacher preparation programs could consider asking teacher candidates to identify the artifacts that they believe are symbolic to them

in their science learning story and becoming a science teacher. Having teacher candidates choose their artifacts could help them dig deeper to reflect about their own stories of becoming a science teacher. The artifacts they choose could very well represent them in their storied identities as a science learner and becoming a science teacher. As was the case in my study, the interns selected two lesson plans as their artifacts, one from the beginning of their lead teaching and the other one close to the end of their lead teaching, which they deemed as representing them as urban science teachers. Having them talk about these two lesson plans gave them awareness of their own learning to teach experiences. When teacher candidates understand how to use a storied identity lens on their own learning to teach journey, they may be better able to identify moments where they see their strengths and where they see they have places to improve; but it also helps them understand that authoring their teacher professional identity is an ongoing, relational, situational, and dynamic process (Beijaard, Meijer, & Verloop, 2004; Hall, et al., 2010; Juzwik, 2006; Richmond, et al., 2011; Sfard & Prusak, 2005), and is also context-dependent. Bringing their storied identities out in the open through artifacts or discussions to reflect and critique them can help teacher candidates give value to their own storied identities and give them agency, or "being able (or having the potential) to make a change in one's context—either real or imagined" (Richmond, In press), over the teaching challenges they may encounter in their own learning to teach.

Creating a space where teacher candidates share their storied identities. Enyedy et al. (2007) suggested having teachers be aware of their own identities as a science teacher and how their identities are linked to their practice. They argued that this awareness would provide teachers more "control…[over] adapting a current teaching practice and be able to use their identities as a compass to navigate teaching dilemmas" (p.92). Therefore, the steps to follow for

teacher preparation programs would be to have teacher candidates talk about their storied identities, to be thoughtful about them, and to be reflective about them. At the same time, teacher preparation programs need to make sure that teacher candidates are aware that some of the ways that they are going to make sense of these storied identities will not be helpful. In other words, a storied identities lens is a way of making sense of their learning to teach, but it is also shaped by different layers of contextual complexity, coming from different stories and shaped by different experiences. This is where teacher education programs could provide a space where teacher candidates could share the sets of stories of science learning and becoming a science teacher and how these stories develop over iterative time. Field and Latta (2001) summed up well the nature of the experiences that teacher educators could consider:

> The task for teacher education ... becomes one of creating spaces where the primary imperative is not to master technique, plan lessons, or manage students through activities to achieve 'closure,' but to be open to experience, to be radically 'undogmatic'...so that being mindfully in touch with self, other and the concrete particular – the subjects that matter in our lives – becomes a real possibility. (p.894)

I discuss next blogging as an example of an online space for teacher candidates to engage in telling, sharing, and discussing their storied identities of science learning and becoming a science teacher, and bringing an awareness to their teacher professional identity, or their view of themselves as urban science teachers.

Blogging in support of teacher professional identity development. Blogging may provide teacher candidates that space to learn about their own storied identities and their connections to their teacher professional identities, and also how their storied identities might inform their storied strategies. For instance, Luehmann (2008), in her study about blogging and

teacher professional identity, underscored how one veteran teacher's use of blogging and telling her stories of herself and her classroom, as well as her interactions with her peers, helped her navigate the teaching challenges she faced in her practice as an urban science teacher, and helped her view herself as a reform-minded science teacher. In other similar studies, researchers have also argued that blogging can be seen as a potential vehicle for expression and its potential to support developing teacher professional identity (Luehmann, Henderson, & Tinelli, 2013; Luehmann & Tinelli, 2011; Luehmann & Tinelli, 2008).

When teacher candidates position themselves in a space, such as a blog, where they have epistemic authorship of their own storied identity and how they are constructing their own learning to teach trajectory, it can allow them better ways to see and understand their own learning to teach and how their own views of themselves as teachers develops. The three interns all participated in discussion forums and were blogging about their experiences teaching. However, the discussion forums were focused mostly on specific prompts, such as their views of themselves as urban science teachers or what they believed supported them in their learning to teach. Although these prompts were asked throughout their internship, I, the researcher, was the one who initiated these prompts and not the interns.

According to Lave and Wenger (1991), communities of practice membership would help teacher candidates develop common shared values, learn from each other, and have space for reflecting on their own perceptions of learning to teach (Saka, Sutherland, & Brooks, 2009). As an aspect of social practice, learning for teacher candidates then involves becoming a full participant and a member of a virtual professional community of practice. Thus, one way of providing "more powerful learning" (Feiman-Nemser, 2001) that involves authentic experiences and reflection is by having teacher candidates learn how to be part of more defined communities

of practice, in which they learn how to develop knowledgeably skilled identities in practice.

These teacher candidates were already part of communities of practices (CoP) – the CoP of their teacher preparation program and the CoP of the schools (where they were interns). These teacher candidates shared a domain of interest (Lave & Wenger, 1991), the teacher preparation program itself, and they were set apart from the rest of the teacher candidates by their membership in the classroom community exclusive to the school in which they were teaching at. Furthermore, their membership in this CoP of different peers evolved as they learned from different members with varied expertise. What they all shared, however, in this CoP was that they were learning to be part of a community that supports the uptake of the knowledge, discourse, and practices needed to exist within their community of beginning teachers.

As we saw in David's case, who was the only intern who did not pursue teaching, he believed that what would have supported him more in his learning to teach was finding a space to share with his peers his "worries" and challenges. He felt that the classroom discussions did not provide him the space to share what he emphasized in his stories of becoming a science teacher, nor to talk more often about having a "rough time." He remembered,

> …there were sometimes when we talked about, 'What are your worries as a teacher?' And I felt really hesitant to be really honest about it because my worries were sometimes, 'What did I get myself into? Is this right for me?' Things that, for me, it was kind of intimidating saying that out loud.

Geisel and Meijers (2005) argued the importance of providing a space for teacher candidates to talk about fear in their teacher identity formation. In my final interview with David, he had named that having a space to talk about his stories of practice and to share them with his peers

would have supported him in his teacher learning. Teacher preparation programs can prepare the kind of support that David did not get by providing teacher candidates with an online space in the form of a blog, to share their storied identities in groups among their peers in their teacher preparation classes. This online platform could help create a dynamic space for participating, creating, and maintaining virtual CoPs.

Productive overlap of the storied identities framework. Teacher educators could use the productive overlap of different storied identities framework (See Figures 7.1, 7.2 & 7.3) to make sense of their teacher candidates' development and possible sticking points. What the productive overlap of storied identities framework allowed me to do was pinpoint where David faced his doubts in his learning to teach journey, because it highlighted in his early stories of becoming a science teacher what he believed was important to him in his developing practice. In other words, it helped me capture what David struggled with in his learning to teach experience. In David's case, for example, his doubts about becoming a science teacher surfaced initially in the beginning of his internship and shaped his initial storied identity of becoming a science teacher. Unlike Becky and Ashley, they both showed an overlap in their storied identities of science learning and becoming a science teacher, and interestingly they were the ones who pursued teaching in a high-needs setting. Studies have argued for an approach that may help teacher candidates develop their teacher professional identity to help increase teacher retention rates (Hong, 2010; Cheng, Chan, Tang, & Cheng, 2009; Milligan & Ragland, 2011). In David's case, his initial storied identity of becoming a science teacher was shaped by the complicated outcomes of his interaction and negotiation with his students. What the productive overlap framework of storied identities brings into the forefront is the importance of social context in authoring their storied identities of becoming a science teacher. I conjecture that the productive

overlap framework of their storied identities suggests that the interns' storied identities are influenced by contextual settings but that it also may provide a possible sticking point for teacher educators to look at in gaining insight about what a lack of the overlap of the storied identities framework might tell us about teacher candidates learning to teach.

Implications on Research of Teacher Education

This study used a storied identities lens specific to the stories about science learning and becoming a science teacher that the teacher candidates told. Their storied identities were shaped by the stories they told and that they highlighted through their own lenses. My purpose from the study was to understand their own perceptions about their developing practice through their storied identities and how their teacher professional identity, or their view of themselves as urban science teachers, connected back to their storied identities. However, one's teacher professional identity is not only how one recognizes one's self as a certain kind of teacher, but it is also how others recognize you as a certain kind of teacher (Gee, 2001;Luehmann, 2007). So, teacher professional identity and practice can be perceived differently, depending on the person telling it (Richmond & al, 2011). In addition, identity is socially constructed and is shaped also by how others perceive the person (Lave & Wenger, 1998).

What future research in teacher education could consider is how storied identities are authored by others as well as by the teacher candidates. In my study, their storied identities were not through the narratives that their mentor teachers told about the teacher candidates' developing practice, as was the case in Kang (2011) and Richmond, et. al., (2010). Getting insight into the other people who shape the storied identities of becoming a science teacher of these candidates could help teacher education programs see another side told about their stories of practice.

As Kang (2011) in her study did, If I had wanted to get at what others, such as their mentor teachers, perceive the teacher candidates' practice, I would have also looked at the narratives told by their mentor teachers. Having insight into the storied identities of becoming a science teacher as told by the mentor teachers would provide a different perception about the teacher candidate's practice and the relational context that shapes teacher professional identity. For example, David's initial storied identity of becoming a science teacher was about his navigating the talkativeness in his class. David's mentor teachers might very well have told different stories of practice about David that in turn shaped his storied identity of becoming a science teacher. His interpretation of his lesson on natural selection was that his lesson was not as successful as he would have liked it to be, because his students did not understand how to find the population in the natural selection simulation. But the story about the natural selection lesson told from his mentor teachers' perspective may very well have been perceived differently-maybe as successful from his mentor teachers' perspectives. What is important for future research in teacher education is to look at how we can help them re-consider their storied identities and their meaning in their interpretation of their teacher professional identities and their practice. It is also important to help push future research in ways of helping teacher candidates become more aware of how their teacher professional identity can change, and that their teacher professional identity is key to their teacher learning (Beijaard, et al., 2004).

Conclusions and Next Steps

My study revealed insight about stories of teaching challenges and how three teacher candidates drew upon their storied identities to respond to these challenges encountered during their internship year. Taking the time to assist them in representing their own stories and experiences could have helped them better navigate the challenges they name. The teaching

strategies they named and that connected back to their storied identities were their storied strategies. Teacher candidates addressed teaching challenges differently, based on their storied identities. This study shows that storied identities are tools for understanding teacher learning because they are able to capture and bring in an in-depth contextual characterization of what shaped teacher candidates' learning as it related to their practice. By pushing the lens of storied strategies as embedded components of teacher learning and development, teacher preparation programs can enable teacher candidates to identify the storied strategies they see as affirmative in making a differential impact in their own learning to teach experience. Finally, a storied identities lens is a great resource for teacher preparation programs, because it can inform about the possible connections between teacher candidates' storied identities of science learning and becoming a science teacher, their teacher professional identities, and how it related to their practice as they learned to teach in a high-needs setting.

APPENDICES

Appendix 1: Life History Interview Protocol

The purpose of this interview is to try to get at what it is about your story that you think informs your desire to be a science teacher in a high-need setting:

What motivated you to become such a teacher? A Noyce Scholar? What does it mean for you to be a Noyce Scholar? (These questions were asked at the end of the interview)

1. Introductory comments

This is an interview about the story of your life experiences with science learning. Teachers lives vary tremendously, and they make sense of their own science experiences in a variety of ways. Our goal is to begin the process of making sense of how teachers interpret their own science experiences. Therefore, we are collecting and analyzing the stories of teachers' experiences with science and looking for significant commonalties and significant differences in those stories that people tell us.

2. Critical events

We would like you to concentrate on a few key events that may stand out in bold print in your story. A key event should be a specific happening, a critical incident, a significant episode in your past, set in a particular time and place. It is helpful to think of such an event as constituting a specific moment, which stands out for some reason in your experiences with science. A very difficult year in high school would not qualify as a key event, because it took place over an extended period of time.

I am going to ask you about several specific events. For each event, describe in as much detail as you can what happened, where you were, who was involved, what you did, and what you were thinking and feeling in the event. Also, try to convey what impact this key event has had in the

story of your life-experiences with science and what this event says about who you are or were as a person and as a student teacher.

Event #1: Peak experience. A peak experience would be a high point in your story about science in your life—perhaps the high point. It would be a moment or episode in the story in which you experienced extremely positive emotions; like joy, excitement, great happiness, uplifting, or even deep inner peace after some science/math experience. Tell me exactly what happened, where it happened, who was involved, what you did, what you were thinking and feeling, what impact this experience may have had upon you, and what this experience says about who you were or who you are now as a student teacher.

Event #2: Nadir experience. A "nadir" is a low point. A nadir-experience, therefore, is the opposite of a peak experience. It is a low point in your experiences with science. Thinking back over your life, try to remember a specific experience in which you felt extremely negative emotions about science. You should consider this experience to represent one of the "low points" in your science story.

What happened? When? Who was involved? What did you do? What were you thinking and feeling? What impact has the event had on you? What does the event say about who you are or who you were as a student teacher?

Event #3: Turning point. In looking back on one's life, it is often possible to identify certain key "turning points" —episodes through which a person undergoes substantial change. I am especially interested in a turning point in your understanding of science. Please identify a particular episode in your life-story that you now see as a turning point. If you feel that your science story contains no turning points, then describe a particular episode in your life that comes closer than any other to qualifying as a turning point.

Event #4: Important childhood scene. Now describe a memory about science from your childhood that stands out in your mind as especially important or significant. It may be a positive or negative memory. What happened? Who was involved? What did you do? What were you thinking and feeling? What impact has the event had on you? What does it say about who you were? Why is it important?

Event #5: Important adolescent scene. Describe a specific event from your adolescent years that stands out as being especially important or significant with respect to science.

Event #6: Important adult scene. Describe a specific event from your adult years (age 21 and beyond) that stands out as being especially important or significant with respect to science.

Event #7: One other important scene. Describe one more event, from any point in your life, that stands out in your memory as being especially important or significant with respect to science.

3. Life-challenge

Looking back over your life and interactions with science, please describe the single greatest challenge that you have faced. How have you faced, handled, or dealt with this challenge? Have other people assisted you in dealing with this challenge? How has this challenge had an impact on your experiences with science?

4. Influences on the life-story: positive and negative

Positive. Looking back over your life-story, please identify the single person, group of persons, or organization/institution that has or have had the greatest positive influence on your perspective of science. Please describe this person, group, or organization and the way in which he, she, it or they have had a positive impact on your story.

Negative. Looking back over your life-story, please identify the single person, group of persons, or organization/institution that has or have had the greatest negative influence on your perspective of science. Please describe this person, group, or organization and the way in which he, she, it or they have had a negative impact on your story.

What is it about your story that you think informs your desire to be an urban science teacher? a Noyce scholar?

5. Alternative futures for the life-story

Now that you have told me a little bit about your past, I would like you to consider the future. I would like you to imagine two different futures for your story.

Positive future. First, please describe a positive future. That is, please describe what you would like to happen in the future with regards to your interactions with science, including what goals and dreams you might accomplish or realize in the future.

Negative future. Now, please describe a negative future. That is, please describe a highly undesirable future for yourself with regards to your interactions with science, one that you fear could happen to you but that you hope does not happen.

Appendix 2: Unstructured Interview on the Two Chosen Lesson Plans

I. Guiding questions when talking about the lesson plans:

1. Why did you select this lesson plan?
2. Tell me what stories you have about teaching this lesson plan?
3. In what ways do these lesson plans represent you as an urban teacher?
4. In what ways do these lesson plans represent you as a science teacher?
5. What resources did you draw upon to create each particular lesson?

Appendix 3: Exit Interview Questions

Becky-Exit Interview Questions

1. How has your science teacher identity developed through the course of your yearlong student teaching?

2. What would you say are strategies that have helped you pull together your ideas of teaching into a coherent picture?

3. In your post in our first discussion forum of Fall 2012, you were asked " What does it mean for you to develop as an urban science teacher? " and this is what you answered: …

   To me, developing as an urban science teacher means that I need to set a high bar of expectations for myself and for my classroom. Encourage students to perform to the best of their ability despite unfortunate circumstances they may be dealing with inside and outside of the classroom. Because I did not grow up in an urban environment it is critically important that I'm continuously learning from my students and about their experiences -- as well as them learning about me & from my experiences. Also, it means to be flexible and learn how to be inclusive with all of the students in my classroom. In all schools, students come to class at different levels and different content knowledge-- but I'm finding that in urban schools there tends to be a larger range of where students are at in terms of content and understanding. But what I'm struggling with is how can you be firm and set high expectations, yet flexible enough to include all of the students? Striking this balance seems like a daunting task for me. (9/21/12)

   a) How would you answer that question now? (Give examples from your field or non-field experiences.)

4. In your post in our first discussion forum of Fall 2012, you were asked, "What are 'tools' or 'strategies' that you perceive as supportive in your teacher learning and development? How would you answer that question now? (Give examples from your own field or non-field experiences.)

   I'm finding that anything that helps "structure-up" in a classroom is very helpful in an urban environment. It's amazing how routines, procedures, expectations, and clear directions can transform a classroom. My first few days teaching I was primarily concerned with teaching content and I didn't do very well because I wasn't giving clear directions. But learning how to add structure to a lesson is very helpful. I'm trying to incorporate more structure into my lesson plans, worksheets, and daily classes. However, I'm wondering how I can use more non-verbal cues and routines to help keep students on track. I feel like I spend a lot of time verbally reminding students what they should be doing, and I want to find a way to be more efficient with directions so I can spend more time on content. (9/21/12)

   a) How would you answer that question now? (Give examples from your field or non-

field experiences.)

5. How would you say the different events in your science learner and becoming a science teacher shaped your own trajectory?

6. Briefly, what one experience would you highlight from your internship as particularly impacting your science teacher identity?

David-Exit Interview Questions

1. How has your science teacher identity developed through the course of your yearlong student teaching?

2. What would you say are strategies that have helped you pull together your ideas of teaching into a coherent picture?

3. In your post in our first discussion forum of Fall 2012, you were asked " What does it mean for you to develop as an urban science teacher? " and this is what you answered: …

   I think that the biggest challenge for urban education is a lack of resources. This includes both material resources and human resources. The school I am working in has class sizes in the 30s and 40s. One of my class hours has 40 students enrolled, but our classroom only has 36 seats. We depend on having at least 4 students absent so that each student can have a seat. Obviously, it would be ideal for the school to have adequate numbers of seats, but it may be more important for the school to have a lower teacher-pupil ratio. The problems of underfunding and under-staffing compound for students as they continue through school. One year of inadequate education means that the student needs to play catch-up in the following school year. However, teachers hardly have the resources to teach what they need, let alone bringing students up to speed.

   Developing as an urban teacher centers around finding ways to work with what you have. There is an ideal level where my students should be, and there is an ideal level resources and staffing that is required in a school. However, if you are not in an ideal situation, you will need to make the best of you situation.

   a) How would you answer that question now? (Give examples from your field or non-field experiences.)

4. In your post in our first discussion forum of Fall 2012, you were asked, "What are 'tools' or 'strategies' that you perceive as supportive in your teacher learning and development? How would you answer that question now? (Give examples from your own field or non-field experiences.)

   A tool that I have found helpful for developing as a teacher has been keeping a learning journal. The journal serves two purposes. When I write my daily journal, it helps me to

summarize what I have done that day, and to work through anything that I have found particularly challenging. Second, the journal acts as a record for what has happened in the past. I will periodically skim through my journal to see what challenges I have had, and to see if I am making progress.

5. How would you say the different events in your science learner and becoming a science teacher shaped your own trajectory?

6. Briefly, what one experience would you highlight from your internship as particularly impacting your science teacher identity?

Ashley-Exit Interview Questions

1. How has your science teacher identity developed through the course of your yearlong student teaching?

2. What would you say are strategies that have helped you pull together your ideas of teaching into a coherent picture?

3. In your post in our first discussion forum of Fall 2012, you were asked " What does it mean for you to develop as an urban science teacher? " and this is what you answered: …

   Developing as an urban science teacher to me ultimately means having a passion for your content but then learning to have a deeper passion for you students. Coming from an affluent background and school district the first step for me was taking the time to get to know my new students and where they're coming from. I've spent years of time focusing on knowing the content like the back of my hand, but realized quickly that content won't help me relate to my students, build relationships, or learn how to instill a desire to learn science or at least a respect for scientific thinking.

   My students are all individuals, at different places in their lives and learning, and need to be guided as such. I've found that for some students in my class getting the most out of them is pushing their limits through inquiry activities and challenging them with scientific phenomena. For other students, motivation comes from high fives for making it through a single physics problem. I've learned that expecting all my students to 4.0 off the bat is setting us all up for failure. In an urban at needs setting a better goal to aim for is for student improvement and to help my students become more proactive thinkers in society, which I'm learning can be more beneficial for some than knowing every step in photosynthesis, go figure. (9/21/12)

   a) How would you answer that question now? (Give examples from your field or non-field experiences.)

4. In your post in our first discussion forum of Fall 2012, you were asked, “What are ‘tools’ or ‘strategies’ that you perceive as supportive in your teacher learning and development? How would you answer that question now? (Give examples from your own field or non-field experiences.)

   I've learned many helpful teaching tools just within the past few weeks. In science, one of the huge skills is learning how to develop inquiry lessons and allow for discussion. It's okay to let students have free reign to think, and learning to pose critical questions to guide them can help students develop invaluable thought processes that couldn't be achieved through a cookie cutter lab. I've also learned that when you may not know the answer to a question a student asked it is good to be honest with the student and admit that you don't know everything, but if you need a moment to think about an answer a great way is to turn the question back on the student and see what they think. I had a student ask me whether holding their breath would decrease their heart rate, I asked them to think back through it. Turns out the exact mechanism isn't fully understood yet but it made for great discussion that lead into talking about homeostasis and characteristics of life. (9/21/12)

   a) How would you answer that question now? (Give examples from your field or non-field experiences.)

5. How would you say the different events in your science learner and becoming a science teacher shaped your own trajectory?

6. Briefly, what one experience would you highlight from your internship as particularly impacting your science teacher identity?

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