

The Career Paths of Mathematics and Science Teachers in High Need Schools

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Gillian Roehrig and Fred Finley, Co-Advisors

October, 2009

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Acknowledgements

I cannot begin to adequately express my gratitude to Dr. Gillian Roehrig and Dr. Frances Lawrenz for their guidance throughout my completion of this dissertation and my graduate program. The mentoring you provided was exemplary and working under your guidance throughout the past three years afforded me an irreplaceable opportunity to gain valuable professional skills. I can move on to the next phase of my career feeling competent and confident that I am well prepared because of the time and energy you invested in me. Frances, I especially want to thank you for allowing me to work on the Noyce evaluation, specifically on the project which eventually turned into my dissertation!

To Dr. Fred Finley and Dr. Bhaskar Upadhyay, thank you for your feedback and encouragement as I completed this dissertation. The personal and professional support you provided was refreshing and your kind words were treasured and will continue to be as I move forward. I also had many opportunities to work with excellent faculty with the Department of Curriculum and Instruction and I thank you for sharing your expertise with me and challenging me in my coursework throughout my program.

I also could not have done all of this without the help of my wonderful Noyce Evaluation teammates! Thank you for your hard work in collecting some of the data and transcribing hours and hours of interviews. Anica Bowe, Tina Madsen and Maureen Braam, you saved me an immense amount of time by your efforts and allowed me to focus on the intense analysis. The regular feedback you provided on my emerging findings was also incredibly helpful and I am also grateful for your kindness and support throughout this effort.

I have been surrounded by a great group of Science Education graduate students and they deserve many thanks for their friendship and support. Our conversations both about school and outside of school made my experience in graduate school much more rewarding than it would have been if I were on my own. I especially want to thank Selcen Guzey, Mia Dubosarsky and Mary Sande for their support and listening to my rantings and ravings when coursework was busy, assistantships were overwhelming or I was just avoiding writing my dissertation. I also want to thank those who completed their program before me and provided insider tips along the way: Joel Donna, Sarah Hick and Anne Kern. Thank you for sharing your experiences with me and encouraging me along the way!

I also want to thank my parents and the Sealions for their ongoing encouragement throughout this process. I wouldn't be at this point today if it were not for the upbringing provided by my family and their incessant support. Mom and Dad, you instilled in me a desire to never give up and strive for excellence in all that I do. But you also showed me the value of family and helped me to find a satisfying balance between my professional and personal lives. My dear Sealions, you have been with me since I started teaching and now as I complete my doctorate. Thank you immensely for your prayers and checking in on me during the long, lonely days of coursework and writing.

Lastly, I need to thank my family. Jason, thank you for not letting me quit. There were many times when I was overwhelmed by the process, yet you were a constant

source of encouragement, even if your support came in the form of the simple statement, “You’re not quitting.” And my little Sam. You were just a newborn when I started this dissertation and now, one year later, Mommy is finally done. You have been such a good, patient baby. Thank you for your smiles and the joy you bring to my life. During the doldrums of writing, I just had to pull out your picture and I was motivated to keep going. You are a treasure and a blessing.

Abstract

High-poverty schools typically have higher levels of attrition than other schools, particularly in mathematics and science. Financial incentives have often been used to attract teachers to high need schools and subjects. Despite extensive investments in these incentives and extensive research regarding recruitment and retention, little is known about how these areas interact with one another over teachers' careers. The purpose of this study is to address the lack of integration of these areas by investigating the career paths of 38 Noyce scholars. Acceptance of the Noyce funding requires teaching in high-need schools for two years. Grounded theory methodology was guided by the research question: What are Noyce scholars' reasons for the decisions made on the career path of becoming and remaining teachers in high need schools? Analysis resulted in an explanatory model of the "pathway to retention in high need schools." The model indicates that the career paths of teachers in high need schools are complex and interactive. Interactions among the reasons the scholars chose to enter teaching, their school setting, community, teacher education and the Noyce funding appear to play a role in their eventual satisfaction and retention. The study has implications for the recruitment and retention of teachers in high need schools.

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Chapter One Rationale

Is There a Teacher Shortage?

The Need for Well-Qualified Science and Mathematics Teachers

Research on student achievement in mathematics and science has regularly supported the finding that teachers play a vital role in mediating student learning gains (e.g. National Research Council, 2000; Rivkin, Hanushek & Kain, 2005). Teacher quality¹ has been defined in a variety of ways, but there are a number of indicators of teacher quality which appear to be related to student achievement. For example, Goldhaber and Brewer (2000) suggested that students of teachers certified in mathematics had higher achievement gains than students of teachers without certification in mathematics or those who were teaching mathematics out-of-field. Others have suggested that student achievement gains are positively related to teachers having a degree in the subject in which they teach (e.g. Darling-Hammond, 1999). Wayne and Youngs (2003) also reported that student achievement was positively influenced by teachers who graduated from prestigious institutions. Although findings have been mixed regarding the influence of teacher experience on student achievement (Wayne and Youngs), Rivkin et al.

¹ Darling-Hammond (1999) defined “well-qualified” teachers as those with certification and a major in their teaching field. She found persistent correlations between these qualifications and student achievement. However, she cautioned that these are rough indicators of teacher quality and suggested that “more fine-grained distinctions [exist] among types of state certification standards, teacher education programs, professional development offerings, and education requirements that make a difference to the teachers’ abilities and their students’ outcomes” (p. 39). Throughout this paper, “well-qualified” will be used to describe teacher qualifications including certification and a subject area major in the teaching field, but it is worth noting that these areas alone do not necessarily indicate quality teaching in the classroom.

suggested that years of teaching experience is positively related to student learning gains, particularly beyond the novice years.

Given the important role of the teacher on influencing student achievement, it is troubling to know that not all students are taught by well-qualified teachers. Often the disparities in teacher quality are more acute in environments with high levels of student poverty and higher percentages of minority students (Murphy, DeArmond & Guin, 2003; Scafidi, Sjoquist & Stinebrickner, 2005). For example, Ingersoll, (2008) reported that over 40% of low income students are taught by out-of-field mathematics teachers compared to 16% of their wealthier counterparts. Jacobs (2007) reported that urban schools often have much higher vacancy rates in mathematics and science than suburban schools and tend to fill their vacant positions with substitute teachers or those without full certification credentials. He also reported that teachers with less than three years of experience are more common in urban than suburban schools. Darling-Hammond and Sykes (2003) concluded that a broad teacher shortage is not a problem, but rather that localized shortages in certain geographic regions is a more appropriate way to define the teacher shortage problem in the US.

The need for well-qualified teachers is particularly acute within science and mathematics. Ingersoll's (2008) analysis of the 2003-2004 Schools and Staffing Survey (SASS) data found that 22% of all secondary mathematics classes were taught by unqualified teachers. Henke, Zahn and Carroll (2001) also found that secondary science teachers had higher rates of attrition than elementary teachers. It also appears that teachers with the highest academic qualifications are more likely to leave the profession than less qualified teachers as Scafidi et al. (2005) reported that teachers with higher

ACT scores had higher attrition rates than those with lower scores. Guarino et al. (2006) summarized that “the preponderance of evidence suggests that teachers with higher measured ability have a higher probability of leaving” (p. 186).

In addition to findings which suggest that urban and other high need schools experience greater shortages of mathematics and science teachers, others have also suggested that turnover is much higher for teachers in high need schools compared to low need schools. It appears that teachers tend to leave high need environments for schools with lower percentages of minority students, students of higher socioeconomic status (SES) and better wages (Ingersoll, 2001; Lankford, Loeb & Wyckoff, 2002). Therefore, not only do high need schools have difficulty staffing their classrooms with well-qualified teachers, but also with retaining those teachers. In fact, Ingersoll (e.g. 2006) has commented that teacher supply issues may be more related to teachers leaving the profession early rather than training too few teachers to begin with.

Much research exists which attempts to explain why high need schools experience teacher shortages and why science and mathematics teachers, in particular, tend to leave high need schools for low need schools or leave teaching entirely. Many of these studies have used large databases such as the 1990s and early 2000s SASS data (e.g. Ingersoll, 2001, 2008; Weiss, 1999) or the University of Texas at Dallas’ Texas Schools Project database (e.g. Hanushek, Kain & Rivkin, 2004) to describe trends in teacher recruitment and retention according to teacher and school characteristics. These studies have shed light on who tends to enter teaching (according to demographic characteristics such as age, gender and ethnicity), what schools they tend to prefer (size, geographic location or urbanicity and other organizational features of schools such as autonomy and

administrative support) and how attrition or retention rates vary according to teacher and school characteristics. Although these studies have provided much information on who tends to become teachers, how long they stay in teaching and some of the reasons why they remain in or leave teaching, many of them miss the finer details of teachers' career decisions and influences on their career paths. They sacrifice detail and nuances for statistical power and generalizability. While they have offered significant findings which can direct policy and have implications for teacher education, more nuanced studies are needed to more fully understand teachers' career decisions and career paths. Teachers are complex human beings, and as such, career decisions which influence why they enter teaching and why they choose to remain in or leave cannot often be boiled down to demographics or limited school features.

A small number of studies have emerged over the past ten years which attempt to shed some light on teachers' career decisions and career paths and these have begun to inform the research community on how teachers' career decisions interact with their actions and influence job satisfaction, career moves and longevity in the profession (e.g. Johnson and Birkeland, 2003; Rinke, 2007, 2009). This research, often termed "professional paths" research, has provided a complex and detailed look at the lives of teachers in terms of their career paths and what influences their decisions and career moves over time. In addition, these studies often bridge the divide between research on recruitment and research on retention. They indicate that a complex nexus between these areas exists and needs to be attended to in order to more fully understand school staffing problems (Ingersoll, 2001).

Despite small inroads being made into a more complex understanding of teachers' career paths, there is still much to learn to better understand the many forces acting on teachers' career decisions, how these forces interact with one another and how the decisions made over time influence teacher retention, particularly for mathematics and science teachers in high need schools. It is clear, though, that the existing research base indicates that well-qualified science and mathematics teachers are needed to staff high need schools in order to improve student achievement and provide equitable education for all students. However, the problem appears to be one not only of recruiting qualified individuals to high need schools, but also retaining teachers in high need schools once they have begun teaching. A better understanding of how to effectively recruit and retain teachers in high need schools requires a more comprehensive understanding of their career decisions and career paths over time.

Meeting the Need for Qualified Science and Mathematics Teachers

Despite the fact that there is still much to learn about teachers' career paths and what influences recruitment and retention, a number of policy initiatives have been enacted at the local, state and federal level to meet the demand for well-qualified teachers for all students in all subject areas and improve teacher retention rates. Many of these initiatives involve financial incentives in the form of salary bonuses, housing assistance and tuition reimbursement to attract people to teaching who would not have otherwise considered the profession and to attract teachers specifically to high need schools. These measures often involve efforts to improve retention rates as well by requiring individuals who accept the incentive to teach in certain schools for certain periods of time. The National Science Foundation's (NSF) Noyce Scholarship Program is one example of a

program designed to attract science, technology, engineering and mathematics (STEM) majors to teaching careers and high need schools. The Noyce program provides funding to support completion of teacher education and scholarship recipients (“scholars”) agree to teach in high need school districts for two years for every year of funding they receive.

Financial incentives such as the Noyce program are common as Jerald and Bosner (1999) report that 27 states have some form of loan forgiveness or scholarship program for prospective teachers. In fact, a variety of state programs provide funding for individuals to become certified in return for teaching in the state awarding the funds, such as the Massachusetts Mathematics and Science Teachers Scholarship Program, while others focus on attracting teachers to high need schools such as New York University’s Urban Teachers of Mathematics and Science Scholarship Program. Other efforts have attempted to expand the teacher pool by appealing to career changers (e.g. Troops to Teachers and programs focusing on paraprofessionals) or by portraying teaching as a civil service (Teach for America).

While these types of financial incentive programs have a long history under the National Defense of Education Act (NDEA) of 1958, their influence on recruitment, retention, decision making and career paths of prospective and practicing teachers is relatively unknown (Guarino et al., 2006). In fact, Imazeki (2008) concluded that with the exception of one study (Clotfelter, Glennie, Ladd & Vigdor, 2008) nothing had been researched on the effectiveness and influence of financial incentives other than salary on the recruitment and retention of teachers. Scholarships and other financial incentives are believed to assist individuals who would otherwise be unable to further their education and to attract them to careers they may not have considered, but little research supports

these assumptions. Guarino et al. (2006) suggested that more extensive research has been conducted on the influence of alternative certification programs on recruitment and retention than on other recruitment strategies like financial incentives. They recommended that more empirically-based research is necessary to effectively guide state and national policy.

Statement of the Problem

Research indicates that high need schools have a great need for well-qualified science and mathematics teachers. They suffer from greater turnover than other schools, and financial incentive programs have often been utilized to solve staffing and retention problems. However, the prevalence of financial incentive programs and the large body of research on the recruitment and retention difficulties of science and mathematics teachers in high need schools does not hide the fact that little is known about teachers' career decisions and career paths and more specifically what influences job satisfaction and career moves. Although studies which address how teacher- and school-level variable singly are related to recruitment and retention, there is little research which brings these areas together to present a more holistic view of teachers' career paths over time and a deeper understanding of what influences career decisions. About the lack of holistic studies involving teachers' career decisions, Chin and Young (2007) write:

If we are serious about filling our schools with teachers who are committed to serving all children, especially those with the greatest needs, we need a better understanding of the persons entering the profession, the commitments and dispositions they bring, and how they as persons engaged with other teachers and students interpret and make sense of their initial experiences in schools, the settings in which many of their beliefs and attitudes are first established. That is, solutions to complex problems, such as the recruitment of qualified candidates to the teaching profession,

require more rather than less subtle and complicated methodological approaches (p. 82).

Additionally, Guarino et al. (2006) concluded that the research base on the influence of preservice policies (such as recruitment strategies, entry requirements and types of preparation) on career paths and long-term retention is incomplete, with the exception of studies focusing on alternative certification programs. In summary, although there has been much research on why teachers enter and leave the profession, as well as the role of school environment, the community and teacher dispositions in the career decisions of teachers, little is known about how these areas interact with one another, particularly for mathematics and science teachers in high need schools. Attracting and retaining well-qualified teachers for all students requires a more comprehensive and nuanced understanding of the career paths of science and mathematics teachers in high need schools.

Research Purpose

To achieve equitable science education for all students, it is clear that well-qualified teachers are needed in high need schools. Once well-qualified teachers begin their careers in high need schools, they can be retained and an experienced work force can be developed which can positively influence student achievement. However, the task of recruiting and retaining high quality mathematics and science teachers for high need schools is not simple, and understanding the decisions that influence teachers to choose teaching, teaching in high need schools and staying or leaving teaching can shed important light on future policy interventions. The purpose of this study is to address the lack of integration of these different issues by investigating the career paths of 38 Noyce

scholars. Grounded theory methodology (Strauss and Corbin, 1990) was guided by the research question: What are Noyce scholars' reasons for the decisions made on the career path of becoming and remaining teachers in high need schools?

Overview of Following Chapters

The review of literature, Chapter Two, begins by providing readers with a background on the various influences on teacher recruitment and retention as broadly defined in the research literature. This literature has often been large-scale in nature utilizing extensive databases and attempts to explain teachers' career moves through investigating individual- and contextual-level variables. This literature base is then connected to a smaller body of literature on teachers' career paths. I also include a summary of the role of financial incentives and educational preparation on teachers' career paths and retention.

Chapter Three describes the methodology of this study including the rationale for using the qualitative orientation and grounded theory methodology to investigate my participants' career paths. I also include a detailed description of the Noyce program and my participants to give readers a better understanding of the context of my study and who provided data. The analytical techniques used are then extensively described. Grounded theory methodology can be quite complicated and I want readers to fully grasp the techniques involved so as to better make judgments of the validity and quality of my work and the associated findings. I conclude Chapter Three with a description of the limitations of my study and how I address these limitations to enhance the validity of my work.

In Chapter Four I describe the findings of my work including a model of the pathway to retention in high need schools and a descriptive and interpretive account of the interview data.

Chapter Five concludes with a juxtaposition of my findings with the current research base on teachers' career paths. I address how my study added to the literature on teachers' career paths and summarize the findings in light of existing work on financial incentives and educational preparation. I then address the implications of my findings for future research on the career paths of science and mathematics teachers in high need schools as well as implications for policy and teacher education programs.

Chapter Two Review of the Literature

Theoretical Framework

Research on the careers of teachers has a long history; in the mid-20th century, research tended to focus on the characteristics of *who* entered teaching and following that time, the *motivation* to teach also became a focus of research (Brookhart and Freeman, 1992). Additionally, who left teaching and why they left has an historical presence in the research literature (e.g. Oaklander, 1969). The research on teachers' careers has indicated a wide variety of influences and levels of influence (individual, contextual, etc.) on teachers' career decisions. Because of this, existing research on the career paths of teachers has utilized a number of theoretical frameworks. Some research has focused on the individual teacher using psychological (e.g. social learning theory, Chapman, 1983) frameworks while others have used sociological (e.g. Lortie) or organizational (e.g. Ingersoll, 2001) perspectives. Some have taken an even broader approach within an economic supply and demand framework (e.g. Guarino et al., 2006; Stinebrecker, 2002). As the nature of this dissertation is to investigate the broad influences on teachers' career paths using grounded theory, a single theoretical framework will not be utilized in either the literature review or the actual study. Instead, a variety of theoretical frameworks will be discussed and viewed holistically within the larger realm of teachers' career paths. However, a brief review of the common frameworks will be discussed next.

Frameworks Focusing on the Individual

A variety of research studies have focused on the individual-level characteristics of teachers in the context of a number of theoretical frameworks. For example, some researchers have utilized a life history approach to ground their studies of teachers'

careers paths such as Huberman (1993) who identified the professional life cycle of teachers using in-depth interviews with over 150 French high school teachers. More recently, Brunetti (2001) used a life history approach to study job satisfaction among experienced high school teachers in a large, suburban California school district. Social cognitive theory framed Coladarci's (1992) study on teacher efficacy and commitment while Chapman's (1983) review of the literature on retention utilized a social learning theory framework to construct a model of teacher retention based on individual-level characteristics.

Frameworks Focusing Beyond the Individual

Given the complex nature of teacher career decisions and paths, other studies have moved beyond the individual teacher and utilized frameworks which attend more explicitly to the larger implications of the school community. For example, Lortie's (1975) sociological study of teachers and their careers focused on the characteristics of individual teachers as well as the larger school and community in which they work. Ingersoll's (e.g. 2001, 2004) work using the Schools and Staffing Survey data (SASS) used an organizational perspective, focusing on the relationship between school environments and teacher retention and the larger implications of teacher turnover for schools. Guarino et al. (2006) and Stinebrickner (e.g. 2002) focused on an economic supply and demand framework; they investigated the larger factors influencing the supply and demand of teachers within broad labor markets.

Because teaching and the decisions involved in becoming a teacher and remaining in the teaching profession involve a myriad of influences, a broad range of theoretical frameworks is necessary to fully understand existing research on the career paths of

teachers. Each of these areas offer valuable insights into the many complex issues involved in teachers' career decisions. Therefore, throughout the remainder of this chapter, studies from a variety of frameworks will be described to ground the current study.

A variety of sources were consulted in the preparation for the review of literature. Using the search terms teacher career paths, teacher attrition, teacher retention, and attrition in urban schools, among others, Google Scholar and the Noyce Evaluation Literature Review Web site were used to compile a list of possible studies for review. Generally published studies less than 10 years old were included; older studies were included if they had a strong presence in the research base or were particularly relevant to the focus of this dissertation. Pertinent reports were also included and Digital Dissertations was consulted for recent work on teacher career paths, particularly in mathematics and science. Studies that related to career decisions were included, while those comparing attrition/retention to teacher performance, classroom teaching and student achievement were excluded. This process resulted in a substantial list of studies to inform the review of literature.

Review of Literature

The review of literature on teacher career paths and retention revealed that there is no shortage of research on these topics. Rinke (2008) organized the literature on teacher career paths and retention into two broad categories: research on teacher retention and research on "teachers' professional lives," which includes career paths and decisions. Within research on teacher retention, Rinke further organized the literature into individual and contextual influences on retention. Teacher retention/attrition research is

often large-scale involving substantial data sets and quantitative analyses. Studies in this body of research have often sought to define who leaves or remains in teaching according to demographic characteristics and how attrition or retention vary from different settings such as school types, location and size.

Teachers' career paths research has taken a variety of forms. These include large-scale studies which sought to describe the career trajectories of teachers and define traditional pathways as well as smaller-scale studies which have focused on contextual issues influencing teacher career decisions along their career paths. Included in this body of research are also studies which focus on career decisions such as teachers' initial motivations to teach and expectations about teaching.

In the following sections, I begin with a review of general teacher retention literature including individual and contextual influences. Then, I describe teacher career paths or professional lives research including motivations to teach and other influences on teachers' career decisions. Next, I describe studies that bring together teacher retention and career research which "...begin to conceptualize teachers' careers as one entity. Rather than considering pre-service, in-service and retention or attrition as separate phases of an individual's life, they can be considered longitudinally as part of one educational experience" (Rinke, 2008, p. 9). Lastly, because the nature of this study involved the unique role of financial incentives and teacher education on teacher career paths, I conclude with sections related to these areas.

Retention Research

Individual Characteristics

Gender, ethnicity, age and background. Historically, the teaching profession has been largely dominated by White females (Lortie, 1975). Additionally, Brookhart and Freeman (1992) in a review of the literature from the 1960s to 1980s on who enters teaching concluded that entering teaching candidates are largely female. Recent work, such as Broughman and Rollefson (2000), using 1993-94 SASS data, shows similar trends (see also Henke, Chen, Geis & Knepper, 2000) and suggests that around 70% of teachers are females. Others have suggested that although the percentage of minority students has been steadily increasing, the percentage of minority teachers has remained comparatively low (Henke, et al.; Kirby, Behrends & Naftel, 1999). In fact, Broughman and Rollefson found that 84% of entering teaching candidates were White, non-Hispanic. Guarino et al. (2006) in a review of the literature also concluded that White females dominate the teaching force, although they suggest the percentages vary by subject matter area and school level.

The influence of demographic trends on attrition and retention has also been studied. Borman and Dowling (2008), in a comprehensive meta-analysis of quantitative studies since the 1980s focusing on teacher turnover found that women have higher rates of attrition than men and Whites are more likely to leave teaching than non-Whites. Lortie (1975) and Stinebrickner (2002) found that women are more likely to leave for family-related reasons such as the birth of a child. Borman and Dowling's meta-analysis also indicated that married persons and those with children were more likely to leave the profession than single people or those without children. In fact, Wayne (2000) concluded

that attrition is more often because of family and personal reasons rather than job dissatisfaction. Ingersoll (2001a) also reported high levels of turnover among teachers in high-poverty, urban schools for personal reasons, suggesting that it accounted for 41% of teacher turnover.

A teacher's age also seems to have some bearing on retention or attrition. Borman and Dowling (2008) found that teachers under 30 and over 50 years of age had higher rates of attrition. Other studies have supported this trend and indicated a U-shaped curve with higher attrition rates for younger teachers and those nearing retirement (Hanushek, Kain & Rivkin, 2004; Ingersoll, 2001). This trend was found regardless of whether the individuals were new teachers who did not have other careers prior to teaching or those who became teachers after a career change. Chambers (2002) suggested that because career changers are often older (average age of 31 when entering teaching), that they have higher rates of retention. Despite the role of absolute age in attrition, teachers in their first five years in the classroom appear to have higher rates of attrition than more experienced teachers (Guarino et al., 2006); Ingersoll (2003) estimated that 45% of new teachers leave within their first five years in the classroom. Borman and Dowling's meta-analysis however, cautioned against attempts to define attrition and experience as a linear relationship, particularly for teachers with greater than five years of experience.

Second career teachers. It has been reported that between 33-48% of new teachers entering the workforce are entering after pursuing another full-time career first (henceforth referred to as "career changers"; Johnson and the Project on the Next Generation of Teachers, 2004). Within the Noyce program, Lawrenz et al. (2008) reported that around half of Noyce scholars were career changers. Additionally, Salyer

(2003) found that many career changers preferred to use alternative certification routes to become teachers. Johnson and Birkeland (2003) found that career changers are more likely to change schools if they are unsatisfied with their working environment than first career teachers and they concluded “Our data suggest that those with prior career experience—often in higher-status and better-resourced lines of work—were less tolerant of schools that did not support good teaching” (p. 592).

Academic qualifications. Guarino et al.’s (2006) review of the literature on teacher recruitment and retention suggested that individuals with the strongest academic qualifications tend to not enter teaching. Additionally, Borman and Dowling (2008) summarized that teachers with graduate degrees are more likely to leave the profession than those without, and that those with high scores on academic achievement tests are also more likely to leave, however differences were slight for both groups. Guarino et al. also investigated attrition rates and academic ability and concluded that more qualified teachers have higher rates of attrition. Boyd et al. (2005b) found that high-achieving teachers (defined by performance on general knowledge certification exams) are much more likely to leave their school when the proportion of low achieving students is high and that the increased attrition rates persisted when teacher and student race were accounted for.

Contextual Characteristics

School environment. Much research has supported the finding that generally, teachers tend to leave high poverty, low performing schools with high percentages of minority students for low poverty, high performing schools with low percentages of minority students (e.g. Boyd et al., 2005b; Lankford et al., 2002; Lankford, Loeb, Socias

& Wyckoff, 2002; Stinebrickner, Scafidi, and Sjoquist, 2003). Preferences for these types of schools seem stable regardless of salary differentials (Hanushek et al., 2004) and studies which have investigated teacher transfers within districts, where salary scales are comparable, indicate that working conditions seem to play a more important role in teacher transfers than wages (Bacolod, 2007; Ingersoll, 2001; Smith and Ingersoll, 2004).

Beyond basic school characteristics, other aspects of the work environment have been shown to be important to teacher decision making. Borman and Dowling (2008) suggest that the “characteristics of teachers’ work conditions are more salient for predicting attrition than previously noted” (p. 398). Ingersoll (2001a) wrote that much of the literature on teacher attrition emphasized individual factors and tended to ignore school-level effects; however much of his research over the past 10 years has sought out the organizational factors of schools that contribute to teacher satisfaction and retention or attrition. In fact, Ingersoll, using the SASS data, found that after controlling for teacher (such as age, gender and experience) and school (such as urbanicity², private/public, and school size) characteristics, organizational-level variables (such as salary, administrative support and autonomy) still accounted for some of the variance in teacher turnover. Others (e.g. Kelly, 2004) have suggested that school- and district-level effects are less significant in predicting teacher turnover than individual-level effects. Despite some disagreement about the role of the school organization in teacher job satisfaction and career decisions, Ingersoll (2001a) wrote:

Two reasons directly related to the organizational conditions of teaching are, together, the most prominent source of turnover. Forty-two percent of

² Martin (1976) defines urbanicity as the “degree to which a geographic unit is urban” and it is used in this paper to denote differences between urban, suburban and rural settings

all departing teachers report as a reason either job dissatisfaction or the desire to pursue a better job, another career, or to improve career opportunities in or out of education. Teachers who migrate to other schools list low salaries, lack of support from the school administration, student discipline problems, and lack of teacher influence over decision making as the primary reasons underlying their move (p. 22).

Weiss (1999) also used the SASS data and concluded that

...perceived school leadership and culture along with teacher autonomy and discretion were the strongest variables associated with first-year American teachers' feeling that it is worthwhile to exert their best effort, commitment to career path, and intentions to stay in teaching (p. 865).

She also suggested that increasing teacher autonomy and “professionalizing the structure of teaching not only enables teachers to play an important part in school leadership but also maximizes opportunities for advancement and the variability in job roles” (p. 866).

The research base indicates that a wide variety of school-related factors can influence job satisfaction, teacher career paths and retention or attrition. Each of these areas will be treated separately below.

Salary. The impact of salary on teacher turnover and transfers has been extensively studied and Guarino et al. (2006) summarized that “the recent empirical literature found that higher salaries were associated with lower teacher attrition and that teachers were responsive to salaries outside their districts and their profession” (p. 194). Johnson and Birkeland (2003) found that many of the new teachers in their sample reported that lower job satisfaction was related to low salaries. Farkas, Johnson and Foleno (2000) found that over half of their participants suggested that salary increases would increase teacher quality, but when asked whether the participants would change schools for a salary increase, an overwhelming majority (around 75%) said they would select a school with any of the following over a salary increase: 1) better student behavior

and parental support; 2) supportive administration; 3) highly motivated and effective teachers and 4) school with similar philosophy and mission as themselves.

While a large body of research exists on the influence of salary differentials in teachers' career decisions about where to teach and whether they stay in teaching, little empirical research has been conducted on the role of specialized salary strategies, such as bonuses, to improve long-term retention rates in high need subject areas and schools (Imazeki, 2008). However, in a recent longitudinal study of the North Carolina salary bonus for mathematics, science and special education teachers in high poverty and low achieving schools, Clotfelter et al. (2008) found that the bonus reduced turnover by 17% and suggested that their findings likely underestimated the influence of the salary bonus because of low participation rates in the program.

New teacher induction. As emerging research revealed the importance of the school organization in teacher job satisfaction, induction programs for new teachers became a common attempt to impact the working environment. Research on the effects of induction programs over the past ten years have suggested that induction programs have a positive influence on teacher job satisfaction and retention. For example, Smith and Ingersoll (2004) concluded that mentoring for first year teachers reduced teacher turnover and that successful mentoring included having mentors in the same subject, common planning time and regularly scheduled collaboration. Johnson and Birkeland (2003) also found that teachers without support were more likely to leave the profession or change schools than teachers with support.

Other smaller scale studies have revealed some of the aspects of mentoring that have been effective. Kelley (2004), in a longitudinal study of graduates from the

University of Colorado at Boulder's teacher education program, reported that an intensive mentoring program including university- and school-based support resulted in retention rates of over 90% after the participants had been teaching for four years. The school-based mentoring included weekly support from an expert-teacher mentor whose sole duties were to support new teachers. The university-based mentoring included monthly or bi-monthly cohort³ group meetings as well as graduate courses designed to focus the teachers on "inquiry into practice." Although the effects of the different mentoring components were not studied, the program as a whole seemed very effective for the teachers and schools involved.

Administration. Large-scale studies (e.g. Ingersoll, 2001; Weiss, 1999) often indicate the pivotal role of administration in teacher decisions to remain in or leave the teaching profession. Other smaller-scale studies have similarly found the importance of administration on teacher attrition and migration (e.g. Olsen and Anderson, 2007). Johnson and Birkeland (2003) in a study of 50 new teachers found that the participants who switched schools often did so in search of a supportive environment, including strong administrative support. Costigan (2005) conducted an in-depth narrative analysis of three New York City teaching fellows who were committed to teaching in public New York City schools for at least two years. He found that his participants were considering leaving teaching because of stifling administrative oversight in terms of curricula and student achievement and differing expectations regarding student behavior, discipline and

³ According to Beck and Kosnik (2001) cohorts are generally described in two ways: "clustering students in small groups (of perhaps half a dozen) for specific purposes, such as practice teaching or course projects... In other instances, it is proposed that all the students in a program do most of their course and practicum work together for the duration of the program, under the guidance of a small faculty team" (p. 925). Much of the existing research does not specifically define "cohort."

follow through with administrators. Weiss suggested that administrative support for new teachers often outweighs student behavioral problems in career decisions and stated,

It may be that problems with students and school social climate do not in themselves necessarily always explain why new teachers leave. Rather, it may be when new teachers see mis-management of behavior problems (part of school leadership) that they think about leaving teaching (p. 866).

Weiss (1999) also commented on what administrators can do that may best support new teachers:

When principals communicate their expectations clearly, enforce student rules of conduct and support teachers in doing so, provide instructional or management guidance and necessary materials, and when teachers are evaluated fairly and recognized for a job well done, first-year teachers are more inclined to have high morale, to be committed to their career choice and to fully anticipate that they will stay in teaching (p. 866).

Farkas et al. (2000) wrote that the teachers in their sample wanted administrators who “exercise quality control, carefully choosing personnel and resisting compromise...This theme, once again, is a workplace where staff can focus on being effective and getting results instead of dealing with distractions” (p. 34). Lastly, Ma and MacMillan (1999) conclude that administrators play an important role in influencing teacher job satisfaction, especially for inexperienced teachers.

Collegiality. Colleagues have also been shown to have an important role in teacher job satisfaction and eventual retention or attrition. Stanford (2001) in a grounded theory study of 10 experienced elementary teachers found that support, particularly from colleagues, was one of the reasons the teachers had persevered in the profession. Borman and Dowling (2008) found that “a greater reported prevalence of school-based teacher

networks and opportunities for collaboration was related to lower attrition rates” (p. 390) and suggested that the combination of induction programs and collaboration among colleagues may be effective in reducing the high attrition rates during teachers’ first five years of teaching.

Resources. Borman and Dowling’s (2008) meta-analysis found a variety of sometimes conflicting influences of resource availability and spending on teacher attrition. For example, some studies included in the meta-analysis found that increases in per-pupil spending did not positively influence retention, while increases in instructional spending did increase retention. They concluded that average class size and student-teacher ratios were not significantly related to increases or decreases in teacher attrition rates. Regarding the quality of the school environment (lighting, care of the facilities, etc.), Buckley, Schneider and Shang (2005) found that poor qualities are associated with higher attrition rates.

Community. The role of the community or geography in influencing teacher career decisions has been studied less frequently than other areas such as teachers’ initial motivations to become teachers. In fact, Bacolod (2007) writes that there has been little research on how teacher sorting occurs in various contexts. However, Lortie (1975) suggested that teachers are “place-bound,” particularly for females in that they look for teaching jobs near where they live, have established roots or grew up. More recently, labor market researchers (e.g. Martin, 2000) have noted this trend across occupations and suggest that individuals have strong affinities for certain places; this creates market

segmentation resulting in disparate localities with very different wages and working conditions even when the areas are very close to one another.

Within educational research, Boyd et al. (2005a) studied new teachers in New York state and found that “In seeking their first teaching jobs, prospective teachers appear to search very close to their hometowns and in regions that are similar to those where they grew up” (p. 127) and suggested that most new teachers took jobs within 40 miles of their hometown. They also found that teachers were willing to commute farther to teach in their hometown rather than another similar nearby area (e.g. suburban hometown versus suburban town closer to where they currently live) and were likely to travel farther to teach in their hometown rather than switch to a different environment (e.g. suburban versus rural or urban). Boyd et al. concluded that such preferences have important implications for staffing hard-to-staff urban schools and suggest that “Teacher candidates coming from suburban or rural hometowns strongly prefer to remain in those areas, rather than teach in the urban districts—both because of the importance of distance and because teachers have preferences with respect to urbanicity” (p. 127). They conclude that alleviating staffing problems in high need schools should focus on recruitment in high need areas and through partnerships between high need school districts and higher education rather than various incentives or other forms of compensation to attract individuals from outside those areas.

Costigan (2005) more closely studied the influence of the community culture on three New York City teaching fellows and found that it was an important determinant of job satisfaction. As the teachers in Costigan’s sample were from prestigious

undergraduate institutions, they often felt that the academic culture they were accustomed to were at odds with the culture of the community in which they taught. He also found that his participants experienced difficulty bridging the cultural gap between differences in ethnic background.

Longitudinal Studies of Individual and Contextual Characteristics

Some studies have sought to describe teacher patterns of entry and exit into the profession by combining analyses of both individual and contextual influences over time. Much of this research has attempted to describe patterns of entry and exit into teaching based on age, gender, minority status, years of teaching experience, school location, school type and student body characteristics. The studies are generally longitudinal in nature utilizing extensive databases of teacher and school characteristics.

Recently, Boyd, Lankford, Loeb and Wyckoff (2003) conducted a longitudinal study of all New York state public school teachers over the past 30 years. They sought to describe typical career paths, how the paths have changed over time and how different paths relate to school types and teacher and school characteristics. They found persistent differences in the retention rates of urban and suburban teachers, with urban schools generally having higher rates of attrition although the differences between urban and suburban schools has fluctuated over time. However, the authors concluded that the most important finding of their study was that where teachers initially chose to take their first teaching job, not teacher turnover, accounted for most of the variation in teacher qualifications (as measured by performance on certification exams) across different schools. More qualified teachers and those from prestigious undergraduate institutions

seemed more likely to leave the profession and the authors concluded that “Teachers from highly competitive undergrads who start in urban districts are substantially more likely to leave teaching than those starting in suburban districts” (p. 20), leaving urban schools with a less qualified workforce than other areas.

Kirby, Naftal and Berends (1999) studied the teacher workforce of Texas from 1980-1999 to describe the teachers’ career paths and how they relate to staffing high need schools and a diverse student population. They found that over time, the proportion of female teachers has remained steady and that of minority teachers has steadily increased, but was not proportional to minority student enrollments. The authors were concerned that recent changes to certification and testing requirements for new teachers may slow the entrance of minority teaching candidates into the teacher supply pipeline, further exacerbating the disproportionately low numbers of minority teachers.

Teacher Professional Paths Research

Initial Motivations

Many concerns seem to influence the desire to become a teacher. Brookhart and Freeman’s (1992) review of the literature from the 1960s to 1980s indicates that the major impetuses for becoming teachers are altruistic or service-oriented desires. Altruistic or service-oriented desires have been described in various ways in the research literature. For example, in analyzing reasons for teaching, Lortie (1975) described five main themes which were attractors to teaching for his sample, two of which are related to altruistic or intrinsic motivators and the other three which are not (Table 1). The reasons people enter teaching appear to be fairly consistent over time and Wilson, Bell, Galosy

and Shouse (2004) conclude that “The results of teacher surveys by the National Education Association (NEA, 2003) over the past 30 years replay five themes that Lortie identified as attracting people to teaching” (p. 146). In addition, Richardson and Watt (2006) found that preservice teaching candidates chose the profession for reasons related to perceived teaching ability, contributing to society, working with children and other intrinsic motivations.

Table 1

Lortie's (1975) Five Themes of Attractors to Teaching

Attractor	Description
Interpersonal	Desire to work with children
Service-oriented	Desire to provide a service to children, the community or society
Continuation	Desire to work in a school environment because of one’s positive school experience as a child
Material benefits	Security, financial rewards
Time compatibility	Teaching provides a good schedule and is compatible with family/other obligations

Recently, Guarino et al. (2006) in a review of the literature on teacher recruitment and retention from the 1990s to early 2000s, suggest that a “tentative finding based on a small number of weaker studies is that an altruistic desire to serve society is one of the primary motivations for pursuing teaching.” They suggest this finding is limited as there has been little current research regarding psychological or altruistic motivations for choosing teaching. However, in a factor analysis of a survey of preservice teachers on

their reasons for entering teaching, Moran, Kilpatrick, Abbot, Dallat and McClune (2001) found six factors and concluded that the six factors formed two groups: intrinsic and extrinsic (Table 2) motivations for teaching. Although others have included intrinsic and altruistic reasons separately (e.g. Brookhart & Freeman, 1992), Moran et al. chose to group the two areas together. In general, the research literature (e.g. Johnson & Birkeland, 2003; Moran et al.; Lortie, 1975) seems to suggest that extrinsic reasons are less influential on choosing teaching as a career than altruistic or intrinsic reasons. Moran et al. concluded that both males and females and particularly secondary-level teachers were strongly motivated by the intrinsic desire for intellectual fulfillment, even more so than their desire to work with children. Overall, it seems that the reasons people enter teaching are diverse, although they generally encompass some kind of altruistic or intrinsic motivations which are defined in a variety of ways.

Table 2

Moran et al's (2001) Two Groups of Motivations for Teaching

Group	Factors included
Extrinsic	Favorable working conditions*
	The high status of teaching and a desire to be in authority*
	The influence of others*
	Aspects of teacher training and teaching as employment
Intrinsic	A love for children and a sense of vocation
	Intellectual fulfillment and a desire to serve society

*Note. These factors were not significantly related to career choice

Little research has been conducted which investigates how reasons for entering teaching vary according to demographic characteristics or how different motivations guide teachers to choose to teach in specific types of schools. Some studies have suggested that different cultures appear to value different aspects of teaching and that in Western countries, altruistic reasons are more prominent, while teachers in developing countries seem to value the extrinsic rewards of teaching (Bastick, 1999; Yong, 1995). Additionally, why teachers choose to teach in urban schools versus other schools is not well understood except for the role of geographic and urbanicity preferences (e.g. Boyd et al., 2005a). However, some have suggested that the desire to work in an urban setting may be related to notions of social justice or the desire to contribute to the urban community (Nieto, 2003; Olsen and Anderson, 2007).

Although there is less research on how the reasons one enters teaching relates to future retention, Lortie (1975) and other more recent work has focused on this area. Lortie suggested that although the influence of parents and teachers were often motivators for entering teaching, they played a small role in whether one stayed in the profession. Additionally, Lortie concluded that although extrinsic rewards (job security, salary) play a minor role in attracting people to teaching, they seem to play a larger role in influencing teachers to remain in teaching. Recently, Moran et al. (2001) suggested that it was possible that those who entered teaching for extrinsic reasons may have lower levels of commitment to the profession; however, they expressed that it is possible for those who entered for intrinsic reasons to also have lower levels of commitment, thus their findings were inconclusive. Nieto (2003) in a sample of eight urban secondary

teachers suggested that remaining in teaching, particularly in urban environments, was related to her participants' sense of social justice, love of children and desire to perform a public service.

Watt and Richardson (2008) also investigated this area and surveyed over 500 preservice teachers on their "planned persistence" in the profession and conducted a cluster analysis to group the participants. Their analysis revealed three clusters of participants who were grouped according to their planned persistence, planned effort, professional development and leadership aspirations: a) "highly engaged persisters," those who planned to be highly involved at all levels; b) "highly engaged switchers," those who planned to be highly involved except for planned persistence and c) "low engaged desisters," those who planned low levels of persistence and engagement at all or most levels. Watt and Richardson then compared the three groups to investigate group differences regarding motivations for teaching. They found that the "highly engaged persisters" scored high on measures of intrinsic and social utility values (e.g. sense of social justice), while the "low engaged desisters" scored low in those areas. No differences were found between the groups and their reasons for teaching related to personal concerns such as job security and time for family. Watt and Richardson also discussed that teacher preparation programs can play an important role in preparing teaching candidates for the demands of teaching and shaping realistic expectations for the profession.

Other research has focused specifically on the motivations and career paths of career changers. Lerner and Zittleman (2002) used structured surveys to investigate 16

career changers and their motivations and career experiences. They found that most did not pursue teaching initially because of poor pay and lack of respect, but they eventually pursued teaching because of the desire for meaningful work. Additionally, alternative certification routes are often pursued by career changers (Salyer, 2003). Salyer, in a study of 38 second career teachers pursuing alternative certification, found that many pursued teaching because of the desire to work with children and make a difference, but also because of a desire for more time for family and perceived job availability. Chambers (2002) found similar findings in that career changers were motivated by altruistic reasons and the desire to serve society, but they were also motivated personally by the desire for greater autonomy and creativity than their previous career provided. Pragmatic concerns were also noted by Chambers in that the career changers desired the financial security and flexibility that teaching afforded them. Haggard, Slostad and Winterton (2002) further noted that career changers are less likely move once they begin teaching because of family and financial responsibilities.

Commitment to Teaching

A substantial body of research on the role of teachers' professional commitment and their career decisions and career paths exists. Many have investigated what role the school and environment and demographic variables play in influencing professional commitment and eventual retention. For example, Billingsly and Cross (1992) found that influences from the school environment such as leadership roles, role conflict and stress were more related to commitment than demographic variables such as gender and age. Although commitment was not specifically investigated in Quartz and the TEP Research

Group (2003) study of UCLA's teacher education program graduates, the program's inherent focus on social justice and urban education suggests that most teaching candidates who enter their program likely are committed to social justice and urban education and Quartz and the TEP Research Group found higher rates of retention of their graduates after five years in urban schools than national retention rates.

Coladarci (1992) reported that the majority of new teachers entering the teaching profession with a low commitment to education were significantly more likely to leave within five years than others, especially for the areas of science and mathematics. Day, Elliot and Kington (2005), in an investigation of teachers who had been in the profession for 25-35 years, concluded that commitment is "a set of personal and professional values that extend well beyond the traditional ideas of caring and dedication" (p. 573) and suggested that low commitments to teaching are related to higher levels of turnover, lowered job satisfaction and motivation, while environments that support commitments to education in the form of collegial connections and administrative support are related to retention. While these studies focus on the relationship between commitment while teaching and retention, it could be extrapolated that notions of commitment are likely present during recruitment and can have implications for whom to recruit and which strategies most effectively identify those with the highest levels of commitment.

Peske, Liu, Johnson, Kauffman and Kardos (2001) also investigated the perceived long-term commitment of 50 first and second year teachers in Massachusetts. They found that nearly three quarters of their participants had taken a "lifelong commitment" pathway to teaching in that they had decided to become teachers at a young age, entered a

teacher preparation program immediately upon graduating from high school and entered teaching immediately upon completing their teaching education. However, the authors found that a majority of their participants' commitments were more tentative once they began teaching. Peske et al. found that many participants were "exploring" teaching or wanted to contribute to education before moving on to other routes. They also found that their participants were highly influenced by their work environment such as salary, professional growth, advancement opportunities and working conditions.

Motivated to Develop Professionally

Beyond the initial motivation to become teachers, many researchers have noted the importance of being challenged in one's work, growing professionally and continually learning in teacher's job satisfaction and retention or attrition. Nieto (2003), for example, found that intellectual work was important to her participants' perseverance in teaching. Rinke (2009) in a case study of eight urban science teachers found that her participants were actively exploring their career options throughout their career in search for professionally meaningful avenues. Ashdown and Hummel-Rossi (2005) studied the influence of a professional development program on 18 teachers from a variety of subjects and found that professional development opportunity was related to the participants feeling more committed to teaching. Margolis (2008) studied teachers with 4-6 years of experience and found that their satisfaction was often linked to "regenerative opportunities" including differentiated teacher roles, such as serving as mentors, and "generative roles," which involved expanding their sphere of influence. Ma and MacMillan (1999) found that more experienced teachers expressed lower levels of

satisfaction in their professional role as a teacher than inexperienced teachers, suggesting that professional perceptions were developmental over teachers' careers.

The Career Paths of Teachers

The remaining studies in the review of literature investigate the many nuances which influence teacher career decisions and job satisfaction. Chapman (1983) constructed a model of teacher retention that included the following areas of influence on attrition and retention:

- (a) the personal characteristics of the teacher
- (b) the nature of teacher training and early teaching experience
- (c) the degree to which the teacher is socially and professionally integrated into the teaching profession
- (d) the satisfaction teachers derive from their career
- (e) the external environmental influences impinging on the teacher's career" (p. 47).

Chapman (1984) and Chapman and Green (1986) found that this model was an appropriate fit for their sample's (including current teachers, those who left teaching and those who completed teacher education but never taught) career decisions.

More recently, Rinke (2007; 2009) conducted an in-depth case study of eight novice science teachers in urban schools and investigated their dispositions toward their careers and potential career paths. She found that her sample included two types of teachers: those who were on a path of "integration," where they considered themselves as part of the educational system for a long time and those who were on a path of "participation" and considered themselves as only participating in the educational system for a short time. Rinke concluded that the integrated teachers were committed to teaching from the beginning of their careers, had been so from a young age, and came from low to

middle class backgrounds. They were also highly involved in their schools both inside and outside of the classroom. Conversely, the participating teachers were less committed to teaching, were more motivated by upward mobility in a career and tended to come from middle class backgrounds. While they were focused mostly on their classroom work, they had impersonal, professional relationships with students and colleagues.

Roellke and Meyer (2003) conducted a longitudinal case study of four early career teachers in urban New York City and also interviewed eight additional participants. They focused on the career decisions of the participants and how they related to preservice preparation, motivation to teach and the school environment. The participants all cited the importance of urban field experiences from undergraduate program prior to teaching as important to their satisfaction as teachers in urban environments. However, they felt that observing one urban classroom was not enough; the participants suggested that observing a variety of urban settings and classrooms and excellent teachers was key to successful preparation for urban environments. The participants also valued multicultural education and focusing on politics of teaching, diversity, identity; they suggested that more explicit and in-depth attention needs to be paid to these areas in preservice preparation.

Support also emerged as an important element in the career decisions of the participants in Roellke and Meyer's (2003) study. For example, two participants had mentoring from their university including free graduate courses, and also supervised practicum experiences and student teachers for the local university which they highly valued. The need for collegial and administrative support was valued for all participants,

and participants who had changed schools often did so because of lack of collegial and administrative support. In fact, the authors concluded that consistent collegial and administrative support for dealing with the challenges of managing urban classrooms was more important to the career decisions of the participants than salary. However, the high cost of living in urban New York City was an ongoing concern for many of the participants.

Johnson (2004) and Johnson and Birkeland (2003) studied the career paths and plans of 50 new teachers in Massachusetts over the course of four years. They found that a supportive environment was highly influential in their participants' career decisions. A professional culture which explicitly attended to collegiality, integrated new teachers into the culture of the school and staff and was supported by the administration was very important to teachers who were settled and satisfied in their teaching careers. They also found that participants who were satisfied in their career were supported so that they could experience success in teaching, and they were not overwhelmed by difficult initial class assignments. The most satisfied participants also experienced opportunities for professional advancement in the form of leadership opportunities.

Chin and Young (2007) conducted a study which combined personal and contextual factors as they studied the career decisions of over 1,800 individuals obtaining licensure in California through alternative certification. They used an "ecological approach" that was person-oriented rather than variable-oriented to investigate more holistically the motivations for choosing teaching as a career and how those motivations were shaped by the backgrounds of their participants. They also investigated how those

motivations influenced their internship phase and eventual commitment to become teachers following their internship. Using surveys to collect data on the participants' motivations, then factor and cluster analysis of the surveys, they developed six typologies of participants who enter alternative certification programs based a combination of background characteristics, motivations for teaching and specific life circumstances.

Chin and Young's (2007) six groups were:

a) "compatible lifestylists": those who saw teaching as a compatible career for their family situation. They had little experience in schools or with children (other than their own) and often held unrealistic notions of the profession;

b) "working-class activists": individuals (generally minorities) who were the first in their families to graduate from college and were strongly motivated by service-oriented or reform ideals;

c) "romantic idealists": the youngest group which often had family members as teachers. They were typical teaching candidates that were white and female;

d) "following in the family tradition": those who had highly educated parents as teachers. These participants were often parents themselves and had much experience with children;

e) "second career seekers": the oldest group who had the highest salaries prior to entering teaching. They generally had little experience with children and schools and were strongly motivated by personal and intellectual fulfillment;

f) "career explorers": those who had the least experience with children and schools, although many had limited exposure through substitute teaching. They were

motivated by the fast track to a teaching career afforded by an alternative certification program.

Although Chin and Young (2007) did not investigate their participants beyond their internship phase, their study provides some interesting insights into who enters teaching and why and how those motivations are related to age, ethnic and marital status and other background characteristics.

Rinke (2009) also used case studies to examine eight urban science teachers' career decisions and how they related to their professional priorities and ability to attain their priorities. Interestingly, Rinke found that all of her participants planned to move out of teaching at some point; none of them considered it a lifelong career. She concluded that her participants all wanted to contribute to urban science education in a positive way (their professional priorities). However, they felt that their contributions as classroom teachers could only help them achieve their priorities to a certain extent, and therefore, they would leave teaching to pursue other educational roles. She suggested that her participants were actively making career decisions during their teaching that would allow them to meet professional priorities. Rinke concluded that "new urban science teachers would benefit from greater opportunities for differentiated roles, the introduction of professional mentoring, and enhanced professional communities for providing feedback and recognition" (p. 23).

Thomas (2005) focused on the career decisions and paths of 98 urban teachers and the role of personal communication networks in guiding those decisions. He especially attended to the role of personal communication among those teachers who had

left full-time teaching for other K-12 educational positions. Thomas concluded that those who had shifted into other educational positions had more diverse social and professional networks in terms of age, occupation and prestige of occupation and that the urban environment played little role in the decision to switch to an educational role outside of the classroom. Additionally, he concluded that many teachers who had changed roles were actively encouraged to do so by their families, administrators and colleagues

Olson and Anderson (2007) focused on the career paths of 15 graduates of UCLA's teacher education program and investigated their plans and motivations for teaching using in-depth interviews and classroom observations. Their sample included teachers with 2-6 years of experience and they found that there were three groups of teachers: stayers (those who planned on staying in urban education), leavers (those who planned to leave urban education) and uncertain teachers. They found that their sample was largely motivated to become teachers because they were committed to kids and helping kids with similar ethnic and socioeconomic backgrounds as themselves.

The stayers had a variety of future plans including pursuing administration, completing doctoral work while remaining in the classroom and pursuing National Board Certification. They also had a strong desire to expand their influence beyond the classroom by shifting into other kinds of educational work; the authors concluded that the desire to expand the sphere of influence was developmental in that teachers with more years of experience were more likely to suggest such goals. Additionally, the authors felt that their participants remained true to their initial motivations to become teachers, but that many participants felt that shifting into other educational roles outside of teaching

would allow them to better meet their personal and professional goals. The authors concluded that providing classroom teachers with multiple roles and opportunities to exert greater influence while maintaining classroom work may influence teachers to stay in the classroom.

Draper, Fraser and Taylor (1998) conducted a longitudinal study of the past career decisions and future intentions of 192 teachers with five, ten and 15 years of experience. They determined there were four typologies of career decisions and intentions and assessed which types of teachers (according to demographic characteristics, teaching level and years of experience) tended to be most common in the typologies. They also paid particular attention to their participants' desires for advancement or promotion into non-teaching, managerial roles in schools. Their typologies included "stayers," those who did not in the past or intend to seek promotion; "movers," those who sought promotion in the past and also intended to in the future; "starters," those who had not yet sought promotion but intended to in the future; and "stoppers," those who had sought promotion in the past and did not plan to in the future.

The four typologies varied in terms of gender, years of experience and teaching level. Experienced males at the secondary level were more likely to be in the "movers" group, while inexperienced females at the primary level were more likely to be in the "starters" group. However, experienced female primary teachers were more likely to be "stoppers" and feel that they had reached their career plateau. Draper et al. (1998) concluded that applying the typologies

...highlights the attractions of promotion for many teachers, the notion of readiness to apply for promotion as a developmental process and finally, and strikingly, the disappointingly low level of appeal which the teaching task appears to have for those who have been trained to work in classrooms with children. When we consider those who expected to continue to stay in the classroom, they comprised a clear group who enjoyed their jobs and wished to continue as they were, but also a clear group who were currently unable to progress further either in teaching or, alternatively, out of teaching (p. 383).

Quartz et al. (2008) also investigated the role of promotion or “role changing” in teacher career decisions and career paths. They investigated 838 teachers with 1-8 years of experience to determine the career paths in terms of whether they remained in classroom teaching or changed into other non-teaching educational roles. The authors found that role changing was very common and that many participants had strong social justice motivations and desired to have an impact on the school environment beyond their classroom. The authors also suggested that role changing was often encouraged and therefore, a form of “sanctioned attrition” from the classroom. They concluded that communities of practice and opportunities to experience professionalism from within the classroom may encourage teachers to stay in teaching rather than change roles into administrative or leadership roles.

Financial Incentives

Financial incentives to attract people into teaching and high need schools have taken a variety of forms including 1) recruitment incentives in the form of bonuses for teachers agreeing to teach in high need schools for so many years; 2) certification stipends; 3) paid summer internships; 4) tuition reimbursement; 5) specialized, free

training for inexperienced teachers in hard-to-staff subject areas and schools; 6) loan forgiveness; 7) tax credits; 8) housing assistance; 9) retirement benefits; 10) professional development stipends; 11) salary bonuses for National Board Certified teachers who agree to teach in high need schools and 12) general salary increases (Prince, 2003). Despite how common they are in local, state and federal policy, little is known about the effect of financial incentives, other than salary increases, on teacher recruitment and retention. However, Prince tentatively concluded “Financial incentives are attracting teachers’ attention and are drawing teachers to schools they might not have considered otherwise” (p. 61).

Scholarship and Loan Forgiveness Programs

As mentioned in Chapter One, a variety of scholarship and loan forgiveness programs are in existence to attract individuals to teaching. Many of these programs are complex involving not only financial incentives, but also academic support, extensive field experiences, mentoring and employment assistance (see Clewell, Darke, Davis-Google, Forcier & Manes, 2000) while others provide mainly scholarships and loan forgiveness. Evaluation of these programs often focuses on who the programs attract to teaching and their retention, while investigations of the influence of disaggregated elements on teachers’ career decisions are less common (see Clewell et al.).

The research community and policy makers are not alone in considering the importance of scholarship/loan forgiveness programs on recruitment to high need settings and subject areas. Bradley and Loadman (2005), in a survey of practicing urban teacher perceptions of recruitment into urban education, found that scholarships for teacher

preparation were somewhat influential in attracting individuals to teaching. Still, scholarships for preservice preparation ranked 7th out of 20 options, with the improvement of school environment and salaries at the top of the list. In a similar survey evaluation, nearly 75% of practicing urban teachers suggested that scholarships for education would help recruit qualified teaching candidates, with 65% suggesting loan forgiveness programs (Goldberg & Procter, 2000).

Despite the prominence of federal and state funds invested in scholarship/loan forgiveness programs, the outcomes of these efforts in general have not been investigated frequently. Additionally, literature on the Noyce program other than evaluation reports and policy documents is also scarce. However, Abell et al. (2006) reported on the recruitment strategies and outcomes for the Science and Mathematics Academy for the Recruitment and Retention of Teachers (SMAR²T) Program at the University of Missouri which offers Noyce funding to teaching candidates. The focus of their research was on the effects of various recruitment strategies on attracting students to the SMAR²T program, and they tentatively concluded that the Noyce program funding appeared to influence some students to enter the SMAR²T program. Scott, Milam, Stuessy, Blout and Bentz (2006) also reported on the design and operation of the Mathematics and Science Scholar (MASS) Program at Texas A&M University which awards Noyce funding to teaching candidates. Readers are recommended to refer to these references for information regarding the specific operation of the Noyce program within existing teacher education programs.

Beyond the Noyce Program, the research base regarding the outcomes of scholarship/loan forgiveness programs, in terms of how scholarships influence recipients and the quality of the pool of educators available for high need areas, is also incomplete. However, Darling-Hammond and Sykes (2003) reported positive outcomes from financial incentives as scholarship/loan forgiveness programs in North Carolina and Connecticut designed to increase the number and quality of teachers across subject matter areas indeed increased the quality of teachers entering the workforce and also increased long-term retention.

Conversely, Bull, Marks, and Salyer (1994) focused specifically on the influence of scholarship programs on attracting individuals to science education and found that scholarships used to draw individuals to teaching actually attracted those who were already committed to teaching, thereby not actually increasing the supply pool. They suggested that other factors such as a desire to teach the subject matter, work with children and a sense of social justice, were greater contributors to teachers' motivation to teach and that the scholarship program simply supported those who were already committed to the profession. Liou, Kirchhoff and Lawrenz (in press) also found that the Noyce program seemed to influence recipients in two ways: it influenced them to complete their certification program and influenced them to teach in high need schools and therefore, it could be that some scholarship recipients sought out the Noyce funding as a means to complete certification rather than a motivation to teach in high need schools.

It appears that the efficacy of scholarships and loan forgiveness programs on recruiting and retaining qualified teachers to high need settings may be affected by the reasons participants actually chose to accept scholarships or enroll in loan forgiveness programs. Given the mixed results of scholarship/loan forgiveness programs, Darling-Hammond and Sykes (2003) suggested that to be effective, scholarship programs should focus not only on academic merit, but also qualities such as commitment and perseverance.

Educational Preparation

Guarino et al.'s (2006) review of the literature on teacher recruitment and retention conclude that "The literature on pre-service policies is fairly sparse, with the exception of studies that focus on nontraditional and alternative certification programs" (p. 195). They reviewed only six studies related to nontraditional certification programs and found that such programs attract higher numbers of minority and older teaching candidates. Regarding retention rates of graduates from different types of programs, Guarino et al. concluded that alternative programs seemed to have higher rates, but they cautioned the small number of studies cited and small sample sizes. They also suggested that the existing work on the retention rates of alternative certification programs did not consider the personal characteristics of their participants which may be a better indicator of retention rates rather than the influence of the program.

Some research on has focused on how to best structure teacher education programs for the variety of teaching candidates that enter them. For example, Darling-Hammond (2001) suggested that alternative certification programs are most successful

when they are longer, with extensive field experiences, such as a semester of coursework followed by a year-long internship phase. Jorissen (2003) emphasized the important role of cohort members as participants completed alternative certification programs, suggesting that the cohorts provided timely and regular encouragement and support to one another. Other than studies focusing on alternative certification, some more dated work suggested that cohorts had a positive influence on teachers' early experiences in the classroom (Fox & Singletary, 1986; Knauth & Kamin, 1994), although these studies did not investigate retention but rather job satisfaction.

LaTurner (2002) compared how teachers' academic preparation and certification status related to their commitment to teaching mathematics and science using the Baccalaureate and Beyond data from 1992-1993. He compared group differences between those who were "minimally qualified" (had 18 hours of subject matter coursework), "subject area only" (uncertified, but had subject area degrees), "certification only" (certified, but did not have subject area degrees) and "non-qualified" (without certification or subject area degrees). LaTurner found that the minimally qualified group was significantly more committed to teaching in the short and long term than all the other groups. Interestingly, he noted that although the participants who did not have certification ("subject area only" and "non-qualified") seemed highly committed in their reasons for teaching (they wanted to make a difference) they still had lower levels of commitment than the minimally qualified group. LaTurner concluded that being minimally qualified in terms of subject area preparation and certification is an important

element in determining teachers' commitment to the profession and their prospects for long-term careers.

Preparation for High Need Environments

Little is known about the influence of specific preservice programs and policies to prepare teachers for urban environments and the influence such measures have on teacher career decisions and retention or attrition. In fact, Boyd, Grossman, Lankford, Loeb, Michelli and Wyckoff (2006) conclude that,

Although many have debated the comparative effects of traditional, university-based teacher education programs and alternate route programs for both recruitment and preparation, such global distinctions do not help us understand what components of teacher education matter most, especially for preparing teachers for urban settings (p. 158).

Additionally, Sleeter (2001) in a literature review on preparing White teachers for urban environments concluded that although there was much research about changing the attitudes of preservice teachers regarding diversity and minority groups, little was known about the influence of diversity training on their careers once they entered the classroom. However, Sleeter noted that community-immersion experiences appear to be important for adequately preparing White teachers for schools with high populations of minority students and multicultural coursework may be influential. Whether these measures influence job satisfaction and retention among White teachers in urban environments, the research literature does not provide the answer.

Much work recently has emerged about graduates of UCLA's specialized teacher education program which focuses on social justice and preparing teachers for high need schools. Quartz et al. (2004) concluded that it appeared that UCLA's graduates had

higher rates of retention after five years of teaching (88% compared to 54%) than the larger teacher population and attributed the difference to some specific aspects of UCLA's program including 1) training preservice teachers to focus on the strengths of their urban environments, rather than focusing on deficits; 2) developing dispositions in preservice teachers so that they viewed themselves as "change agents" for their students and families and 3) creating an environment where the preservice teachers view themselves as life-long learners (see also Quartz, 2003). Despite this, Quartz et al. (2004) reported that the participants still consistently moved away from high need schools into low need schools. The authors attributed the migration to administration, lack of collegiality and poor facilities, rather than student behavior or high-poverty or minority students.

Alkins, Banks-Santilli, Elliott, Guttenberg and Kamii (2006) in interviews with six case study participants investigated the role of university programs in supporting new teachers and found that university partnerships were highly valued. In particular, the participants valued the relationships with schools that developed during the preservice preparation and ongoing support when they started teaching. The support took the form of methods courses while they were teaching and informal support from cohort members with whom they completed their teacher education program. However, this study did not focus on how the university program influenced teacher career paths, but rather how it was perceived to be important by the participants.

Chapter Three, Research Design and Methods

Study Context

This study was situated within a larger, four-year evaluation of the Noyce Scholarship Program funded by the National Science Foundation. The evaluation began in 2005 and will conclude in 2009. The evaluation took a participatory approach, focusing on the broad effects of the Noyce program on the teacher education programs and scholars receiving the funding. Additional emphases were on the influence of the Noyce funding on the recruitment, retention and preparation of highly qualified mathematics and science teachers. Data were collected from a variety of sources including Noyce program principal investigators (PIs) at teacher education programs receiving Noyce funds, Noyce scholars, STEM faculty at institutions receiving Noyce funds, and school district personnel who collaborated with Noyce program PIs or were employed at schools/districts which serve as practicum or student teaching sites for Noyce scholars⁴.

Although the data collection consisted of a variety of formats including online surveys and interviews, this study focused only on interviews with Noyce scholars. The other evaluation components allowed for macro-level analyses of the influence of the Noyce program, but the interviews allowed for micro-level analyses of the decisions made by the Noyce scholars throughout their career paths of becoming and remaining teachers in high need schools.

⁴ Details of the larger Noyce evaluation, including extensive data about the characteristics of teacher education institutions awarding Noyce funds and characteristics of Noyce scholars, are reported in a series of evaluation reports from the Noyce Evaluation Team at the University of Minnesota. Refer to Lawrenz et al. (2008) for more information.

Noyce Scholarship Program

Since 2002, the Noyce program has been awarding grants to institutions of higher education in the United States for providing scholarships and stipends for attracting upper-level science, technology, engineering and mathematics (STEM) majors, graduate students, and professionals, who may not have otherwise not considered the teaching profession (NSF, n.d.). As of 2007, 77 teacher education institutions were awarding Noyce funds to potential mathematics and science teachers. Scholarship and stipend amounts vary from institution to institution, but the funds were generally used by scholars to cover tuition costs, school fees and books. All Noyce scholars agree to serve as science or mathematics teachers in high need school districts for at least two years for each year of funding and those who do not fulfill their commitment to a high need school are required to repay their scholarships. According to the NSF, a “high need district” must meet at least one of the following criteria to be considered “high need”:

1. It has at least one school in which 50 percent or more of the enrolled students are eligible for participation in the free and reduced-price lunch program.
2. It has at least one school in which: (a) more than 34% of the teachers at the secondary level do not have undergraduate degrees with majors or minors in, or graduate degrees in, the academic fields in which they teach the largest percentage of their classes; or (b) more than 34% of the teachers in two of the academic departments do not have undergraduate degrees with majors or minors in, or graduate degrees in, the academic fields in which they teach the largest percentage of their classes.
3. It has at least one school whose teacher attrition rate has been 15 percent or more over the last three school years (NSF, n.d., Program Description section, ¶ 2).

Researcher Role

A number of graduate students and postdoctoral fellows were involved with the larger Noyce program evaluation; however, I was the lead evaluator for the portion of the evaluation involving interviews with Noyce scholars. In this role, I provided guidance on modifying the protocol during the iterative analysis/data collection phase and was responsible for the entire analysis of the interview data. I also conducted and transcribed some of the interviews, although other Noyce evaluation team members also collected and transcribed interview data.

Prior to being involved with the Noyce evaluation, I had little experience with high need schools or teachers and was relatively unfamiliar with the literature base in this area. This proved to be useful for my study as I was able to approach the data with few preconceived ideas of what I “should” find. However, I was a science teacher at a rural high school for three years prior to entering a doctoral program, and taught a biology class for students who had previously been unsuccessful in science courses. My experiences as a science teacher provided me with a lens through which I viewed the interview data and related to the scholars whom I interviewed. A more detailed discussion of my role in the study as it relates to study credibility and limitations will be discussed later.

Research Design

In this study I chose a qualitative approach because the broad goal was to understand the career paths of teachers in high need schools. This includes not only whether they leave or remain in high need schools, but *why*. I sought not only to explain

the participants' actions as they described them, but their perspectives of and the meaning they ascribe to their decisions and behaviors. Patton (2003) commented that "qualitative methods facilitate study of issues in depth and detail" (p. 14). Rather than collapsing the issues related to the teachers' career paths into a few discrete elements, qualitative inquiry allowed for the investigation of the many elements that could potentially influence the teachers' career paths in depth. Furthermore, Maxwell (1996) also states that qualitative inquiry is appropriate for "understanding the process by which events and actions take place" (p. 19). An emphasis on process is particularly appropriate for the larger goal of understanding and explaining the career paths of teachers in high need schools. More specifically, my study utilized interview data and a grounded theory approach to understand and explain the career paths of teachers in high need schools.

Grounded theory methodology, in particular, provides a useful way to frame and analyze and this study. According to Strauss and Corbin (1990),

A grounded theory is one that is inductively derived from the study of the phenomenon it represents...One does not begin with a theory, then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge (p. 23).

Furthermore, Strauss and Corbin write, "The research findings constitute a theoretical formulation of the reality under investigation, rather than constituting a set of numbers or a group of loosely related themes" (p. 24). In this study, the phenomenon of interest or "reality under investigation" was the career paths of mathematics and science teachers in high need settings. I sought to be open to the emergence of relevant issues related to the career paths of the participants, and grounded theory provided a framework that allowed for such flexibility, but was also procedurally rigorous.

Creswell (2007) states that

...the intent of a *grounded theory study* is to move beyond description and to *generate or discover a theory*, an abstract analytical schema of a process... Participants in the study would all have experienced the process, and the development of the theory might help explain practice or provide a framework for future research (p. 62-63).

Thus grounded theory methodology was fitting because I sought not just to describe the scholars' experiences with the Noyce program and the decisions made throughout their teacher education program and teaching careers, but to interpret and theorize about how the scholars' experiences and decisions relate to the larger core issue of retention in high need settings. It is interpretive in the sense that although the interviews probed for the reasons scholars' stayed in teaching, left teaching in high need settings for non-high need settings or left teaching careers for other careers, I also interpreted how other experiences could relate to the issue of retention. Additionally, as the review of literature indicated, the current research base on teacher retention and career paths is diverse and relatively disconnected. Using grounded theory in this study allowed me to bring together these diverse areas in one study, as they emerged from the participants' perspectives and explore the relationships among these areas.

Data Collection

Sixty-six of the Noyce program PIs provided names and email addresses for past and present Noyce scholars who had participated in their teacher education programs. Initially, sampling for participants was random; the list of scholars was randomly ordered to create a contact list and Noyce evaluation team members, including myself, attempted to contact the scholars through email for participation in a phone interview. Data

collection and analysis occurred simultaneously and therefore, as findings emerged from the analysis, sampling became purposeful to explore emerging findings and determine which types of scholars were overrepresented and underrepresented in the sample. For example, after 15 interviews had been conducted, it was determined that the sample lacked participants who had left teaching in high need settings for other settings. As additional scholars were solicited to participate in the interviews, we specifically sought out scholars who met these criteria. As the contact list provided by the PIs had many invalid email addresses and because of the eventual purposeful sampling, I did not calculate a response rate. In total, 38 scholars were interviewed.

Since this study was part of the larger Noyce program evaluation, a formal consent form was not required. However, the solicitation email notified participants about the study and measures to maintain confidentiality. At the beginning of each interview, the participants were again notified of the study's aims and confidentiality procedures as well as asked if they consented to be recorded. All participants consented, and following the interview, each participant was given a pseudonym which was used in all transcripts and analysis documents. Only one document was maintained which connected pseudonyms to participant names and all files were stored on a password-protected network.

As the larger Noyce program evaluation was participatory it involved input and participation from all Noyce program PIs in the design of the evaluation. As a result, an initial semi-structured interview protocol (Appendix A) was developed based on suggestions from the Noyce program PIs and pertinent areas of emphasis from the

research literature on recruitment and retention in high need settings. Different series of questions on the interview protocol were used for different participants based on their status at the time of the interviews. Thus, there were six different sets of questions which had the same basic structure, but additional and/or different questions based on each participant's current situation. Two of the six sets of questions pertained to individuals who were not teaching; they either left their teacher education program or chose not to teach after completing their teacher education program. The remaining four sets of questions pertained to individuals who were currently teaching or taught at some point: a) individuals who chose not to teach in high needs settings; b) individuals who left teaching in high needs settings for other settings; c) individuals who were teaching in high needs settings to fulfill Noyce program requirements; and d) individuals who were teaching in high needs settings beyond Noyce program requirements. The protocol was adjusted as needed if participants' situations did not fit in any of the existing areas. For example, two participants could not find teaching jobs upon completion of their teacher education program; since they did not choose not to teach and did not have teaching experience, the existing protocols did not fit their situation and were modified accordingly.

Additional questions were added to the protocol or modified throughout data collection as themes and areas of interest emerged during the simultaneous data analysis. The interviews were generally between 30-60 minutes and were recorded and transcribed verbatim. This resulted in over 250 single-spaced pages of transcripts for analysis.

Participants

Thirty-eight Noyce scholars were interviewed for this study. The interview protocol asked the scholars descriptive questions about their current status, future career plans, type of teacher education program and school setting. The scholars represented a diverse array of settings in terms of where they had taught or were currently teaching (their teaching environment), future plans, points in their teaching career (current status) and types of teacher education programs. Specific details about the interviewed scholars can be found in Appendix D, but some general characteristics will be described here.

The majority of the interviewed scholars were teaching (or working in administrative positions) in a high need setting beyond their commitment to fulfill Noyce program requirements. There were also a number of scholars who were in their first or second years of teaching in high need settings, thus they were still fulfilling Noyce program requirements. Some had left teaching in high need settings for non-high need settings after completing their Noyce program requirements, while some had left teaching entirely after fulfilling Noyce program requirements. Three of the interviewed scholars reported being unable to find teaching jobs after completing their teacher education program, while two other scholars dropped out of their teacher education program to pursue other careers, thus they were not working in educational settings. None of the interviewed scholars reported taking teaching jobs in non-high need settings immediately upon completing their teacher education program. Table 1 summarizes the interviewed scholars' status at the time of the interviews. For those scholars who were teaching at the time of the interviews, Table 2 indicates their number of years of teaching experience.

Table 3

Scholars' Statuses at Time of Interview

	Current status	No.	Percentage ^b
Not teaching	Completing teacher education program	1	3%
	Left teacher education program prior to completion	2	5%
	Unable to find teaching job upon completion of teacher education program	3	8%
Teaching ^a	Left teaching after Noyce program commitment	4	10%
	In high need school, fulfilling Noyce program commitment	5	13%
	In high need school, beyond Noyce program commitment	19	50%
	In low need school, left high need school after Noyce program commitment	4	10%

^a The “teaching” group includes scholars who were in K-12 education, but not necessarily in a teaching role (e.g., principal, science coach).

^b Percentages do not total to 100 due to rounding.

Table 4

Years of Teaching Experience

<u>Yrs. experience</u>	<u>No.</u>	<u>Percentage</u>
1	2	6%
2	5	16%
3	13	41%
4	8	25%
5	2	6%
6	2	6%

Note. n=32. Includes both scholars who were currently teaching and those who had left teaching at the time of the interviews.

The majority of the scholars completed post-baccalaureate teacher education programs, while a good number also obtained their teaching credentials through alternative certification routes (Table 3). Alternative certification routes were considered those in which the scholars took teacher education coursework for less than one semester prior to beginning an internship phase or simultaneously during an internship. Most of the scholars taught at the secondary level, generally in high schools, and there was almost an even mix of science and mathematics teachers (Table 4). The vast majority of scholars taught in urban areas, with only two reporting rural settings (n=2, 5%). However, the interview protocol did not probe specifically for this, thus some scholars' school settings were unknown. Many of the scholars reported holding leadership positions within their schools (n=13, 35%); positions ranged from work with student activity groups and coaching to professional development leadership roles to department chair. One third

(n=14, 37%) of the scholars had full-time careers prior to entering teaching, and therefore they were considered career changers.

Table 5

Scholars' Types of Teacher Education Program

Program type	No.	Percentage
Undergraduate	4	11%
Post-baccalaureate	17	45%
Alternative certification	8	21%
Unknown/unassigned	9	24%

Table 6

Scholars' Subject Matter Areas and Teaching Level

Subject matter and teaching level	No.	Percentage
Mathematics, middle school	2	8%
Mathematics, high school	10	40%
Science, elementary school	1	4%
Science, middle school	2	8%
Science, high school	9	36%
Science and mathematics, high school	1	4%

Note. n=25. Only scholars who were teaching at the time of the interviews were included.

The scholars also reported a variety of future plans for their careers. While some scholars were unsure of their future, many also stated they planned on continuing to teach in high need settings for a long time. Other pursuits included leaving high need settings

for other settings, leaving teaching entirely to pursue other careers or graduate school, or pursuing roles in K-12 administration (Table 5).

Table 7

Scholars' Future Plans

Future plans	No.	Percentage
Teaching in high need settings	16	50%
Teaching in non-high need settings	3	9%
Leave teaching for other careers	2	6%
Graduate school	1	3%
K-12 Administration	2	6%
Unsure	8	25%

Note. n=32. Scholars who had already left teaching or their teacher education program at the time of the interviews were not included.

Grounded Theory Analysis

The process of grounding a theory in data, moving beyond description to interpretation and then building a theory is complex, but Strauss and Corbin (1990) have provided a number of guidelines to make the process systematic and rigorous. Although this analysis did not follow Strauss and Corbin's procedures exactly, their general guidelines were applied and will be described below.

The initial step of analysis involved verbatim transcription of the data, which resulted in over 250 single-spaced pages of transcripts, and careful reading of the transcripts. NVivo software was then used to code the transcripts. For ease of managing

the large amount of data (interview transcripts ranged from 5-15 pages in length), the transcripts were first coded into six descriptive sections: scholars' background, decisions made, descriptive features, teacher education program and school/district characteristics. This is a departure from Strauss and Corbin's (1990) technique of coding small amounts of data first, then combining them into larger sections (which they refer to as conceptual categories).

Once this was completed, open coding of the data commenced. According to Strauss and Corbin (1990), "Open coding is the part of analysis that pertains specifically to the naming and categorizing of phenomena through close examination of the data...During open coding, the data are broken down into discrete parts, closely examined, compared for similarities and differences..." (p. 62).

Thus, during open coding the sections were broken down into more discrete parts and these smaller sections of text were given a label/code. For example, the "school/district characteristics" section was further coded into administration, colleagues, students, salary, etc. They were then further broken down into smaller sections and given a label/code. For example, the administration code was further broken down into "disciplinary support," "academic support," "respect," and "trust" among others. This process continued until the smallest unit of text which still retained meaning by itself was coded, thus the smallest coded units often were one to a few sentences. The labels/codes were refined and redefined throughout coding as sections of text were compared to one another in a constant comparative fashion. This process of coding resulted in 202 codes which are found in Appendix B.

Whereas the initial phase of open coding is essentially breaking down the data into extremely small parts, the next phase of the open coding portion of analysis begins to put the data back together. At this point, analysis starts to move beyond the data into tentative interpretive activities which involve categorization of the small, discretely-coded units. According to Strauss and Corbin, (1990) categorizing is “The process of grouping concepts that seem to pertain to the same phenomena...categories have conceptual power because they are able to pull together around them other groups of concepts or subcategories” (p. 65). Thus, at this point in the analysis the discrete codes were analyzed for similarities to determine if larger categories existed among the many codes. For example, some codes included “support or pressure from parents,” “cohort,” “formal support after certification,” “informal support after certification,” “new teacher support from school/district” among others. From the nature of these codes, it appears that there is a larger category of “support,” with subcategories including “school/district-based support” and “teacher education program support.” Thus, all codes related to supporting the scholars during their teacher education program and beyond were categorized as “support” and subcategorized based on the origination of the support.

Strauss and Corbin (1990) then recommend defining the properties of categories in which “Properties are attributes or characteristics of a phenomenon (category)” (p. 70). It can also be considered that properties are more well-defined manifestations of the larger categories. In our analysis, many of the initial codes could also be considered properties. Thus this phase of analysis often involved reorganizing the initial codes into more conceptual units. For example, within the subcategory “teacher education program

support” one property could be the timing of support which included “before certification” and “after certification.” Both of these properties can also be further defined according to where the support comes from; whether it is from a cohort, faculty or other avenues. It can also be seen that not all forms of support from the teacher education program and school/district are equal in terms of frequency, formalness of interaction and value by the scholars. The varying degrees of support within these properties are called dimensions by Strauss and Corbin. They write that “dimensions represent locations of a property along a continuum” (p. 69). There can also be more than one dimension for each property. For example, within the school/district support subcategory, one of the dimensions is the formalness of support. There are structured, formal support programs, such as new teacher mentoring programs, as well as unstructured, informal support networks provided by colleagues and administration. There are also varying degrees of value for the support provided by the school/district. Some forms of support are highly valued by the scholars while others are not valued at all. Clearly defining categories, properties and dimensions allow for the next phase of analysis to begin, which involves exploring larger relationships between different categories and subcategories and construction of a tentative theory. The categories, properties and dimensions are found in Appendix C.

Throughout this process, to determine if emerging categories and properties were isolated to one or a few scholars, rather than indicative of a trend within the larger group of scholars, ongoing interviews probed specifically for some areas. Thus, the interview protocol was modified throughout data collection and analysis as areas of interest

emerged. In interviewing, the Noyce evaluation team and myself continued to probe for categories and their properties until saturation was achieved. For example, within the category of support, it appeared that many scholars discussed the supportive nature of their cohorts with whom they completed their teacher education program. In future interviews, we probed specifically for the role of a cohort in the scholars' experiences and regularly received positive feedback regarding those experiences. Thus, "cohort" emerged as an important property of the support provided during the teacher education program and because it regularly was verified by the scholar interviews, that property was saturated. The relationship between the role of a cohort to other areas, such as job satisfaction, was then explored through axial coding.

In axial coding, according to Strauss and Corbin (1990), the properties and dimensionalization of categories and subcategories allow for relationships to be explored and determined across them. They define axial coding as "A set of procedures whereby data are put back together in new ways after open coding, by making connections between categories" (p. 97). Thus, Strauss and Corbin suggest looking for large categories/phenomena which cut across existing coding schemes (the codes, categories, subcategories and their properties and dimensions) and move beyond description into the early phases of theory-building and interpretation. I refer to these larger phenomena as "super-categories." Thus, in this phase of analysis, the codes, categories and subcategories were reviewed carefully to determine what super-categories cut across much of the data. Through this process, three main super-categories emerged: "choosing

teaching as a career,” “choosing where to teach” and “remaining in teaching in high need settings.”

The original categories, subcategories and associated properties and dimensions were then analyzed in relation to these three super-categories. Finding relationships within the data occurred through researcher sensitivity to the data, regular discussions within the Noyce evaluation team and analytic tools available in the NVivo software. For example, consider the “support” category previously described and the “teacher education program support” subcategory and the properties of the types of support provided (e.g. cohort, faculty, formal mentoring programs). These properties were compared to the category of “current status” of the scholars we interviewed (which we considered as indicative of retention and part of the super-category “remain teaching in high need settings”), with the associated properties “teaching in high need schools beyond Noyce program commitment,” “teaching in high need schools fulfilling Noyce program commitment,” “left teaching after fulfilling Noyce program commitment” among others. Researcher sensitivity to the data and analytic tools in NVivo were used to illuminate possible trends (relationships) between these two areas and then the tentative relationships were discussed within the Noyce evaluation team. Through this process, it was determined that support from a cohort was related to those scholars whose current status was staying in high need settings beyond their Noyce program commitment. This and other tentative relationships emerged through the axial coding phase of analysis. Further interviews probed for the tentative relationships to provide further supporting or contradictory evidence.

During this phase of the analysis, descriptive categories (described in Ch. 4) of the scholars were also used to classify scholars into groups and look for trends/relationships between different groups and the categories, properties and dimensions of those groups. The NVivo program aided in this portion of the analysis by allowing for easy grouping of scholars and searching through the codes for trends within particular groups. For example, the descriptive category “current status” described above, was considered to be an indicator of retention. As we were interested in exploring how issues related to the decision to choose teaching as a career may be related to retention, we grouped the scholars based on which property best described their current status (see examples in previous paragraph), then within those groups, we looked for trends in codes, categories and properties related to choosing teaching as a career. For example, did the scholars whose current status was “left teaching after fulfilling Noyce program commitment” have similar reasons for entering teaching in the first place? Such relationships were regularly explored and tested during this portion of the analysis.

The last phase of analysis involved selective coding. Selective coding is “the process of selecting the core category, systematically relating it to other categories, validating those relationships and filling in categories that need further refinement and development” (p. 116, Strauss and Corbin, 1990). In this study, the core category became the “pathway to retention in high need settings” and the super-categories, and remaining categories and subcategories were related to it. Validating the relationships to the core category involved further searching and re-searching the data for specific instances of validation. Contradictory data was accounted for by eliminating relationships from the

model or exploring other possible explanations within other concepts or categories. Further interviewing to achieve saturation of relationships or explore tentative relationships was conducted as described above. The final outcome of the grounded theory analysis was a model indicating the pathway to retention to high need settings as inferred from the scholar interviews.

Validity

According to Maxwell (1996), validity refers “to the correctness or credibility of a description, conclusion, explanation, interpretation or other sort of account” (p. 87) and can be threatened in three main ways: description, interpretation and theory. Maxwell suggests that the threat to valid description lies in incomplete data. This threat is addressed through having complete audio recordings and transcripts of all the interviews. Threats to valid interpretation involve “imposing one’s own framework or meaning, rather than understanding the perspective of the people studied and the meanings they attach to their words and actions” (Maxwell, p. 89-90). To address this threat, it was important for me to be aware of the role of my own personal framework and the implications of my views in this study.

As mentioned when describing my role in this study, I was the only person involved extensively in the coding and analysis of the interviews. The lens of my previous experience as a high school science teacher who left after three years in the classroom could have heightened my attention to responses that I could relate to more, while hindering my ability to perceive other responses. In other words, the perception that “I know *exactly* what they mean” which occurred periodically when I was

interviewing or analyzing the data, could have blinded me to what they *actually* meant. The concern of researcher bias was addressed through regular meetings with the Noyce evaluation PI and the evaluation team members who had also conducted and transcribed some of the interviews. All transcripts were read by at least one other team member and the codes were shared and discussed with the Noyce evaluation PI regularly for clarity and appropriateness. At times, these processes resulted in needing to recode certain transcripts or redefine and clarify particular codes. As analysis moved into interpretation and model construction, potential relationships were also shared with team members and the Noyce evaluation PI and modified as needed.

Maxwell (1996) states that the threat to valid theory involves “not collecting or paying attention to discrepant data or not considering alternative explanations or understandings of the phenomena you are studying” (p. 90). This threat is mainly addressed through the rigorousness of the procedures involved in grounded theory methodology. As findings emerged, relationships proposed and the model tentatively constructed, the emerging results were explicitly attended to in the ongoing interviews. Thus, as findings appeared to be pertinent to the career paths of the scholars, the interview protocols probed for those areas in an attempt to achieve saturation. Additionally, the data corpus was re-searched for supporting or contradictory evidence. Relationships that lacked empirical support upon further investigation were removed from the model. Furthermore, every relationship proposed in the model was investigated in the data corpus by searching for discrepant evidence. For example, as mentioned in the analysis section, cohorts emerged as an important component related to retention. Once

this relationship seemed fairly strong, the transcripts were re-searched to determine if there were instances when scholars reported being involved in a cohort and experienced a negative influence as a result.

Despite the thoroughness of the analytic procedures and the attempts to minimize threats to validity as discussed above, an obvious limitation was selection bias. It is possible that the scholars who agreed to be interviewed largely had positive experiences as teachers in high need schools and were more willing to discuss their experiences. Additionally, some types of scholars were underrepresented in the interviews. For example, only a few scholars reported leaving high need schools for non-high need schools or leaving teaching entirely. Because of the small numbers of scholars with certain characteristics, some relationships may be tentative and are noted in the narrative of Chapter Four.

Chapter Four, Findings

Model Summary and Organization

A model (Figure 1) was created illustrating the core category “pathway to retention in high need settings” and the influences on that pathway based on the scholars’ perceptions as reported in the interviews. The model indicates the main influences on scholars’ decisions regarding teaching and teaching in high need settings over time, with different periods of time represented by different shades of gray on the model. The pathway proceeds from the time of deciding to become a teacher (super-category one: “choosing teaching as a career”), to participating in a teacher education program, to deciding where to teach (super-category two: “choosing where to teach”) and then deciding to remain teaching in high need settings (super-category three). Each of the super-categories is surrounded by the main categories related to them which emerged from the analysis. A brief summary of how the model components are organized is discussed below, followed by specific details and findings related to the model components. Additional details about categories, properties and dimensions are included in Appendix C.

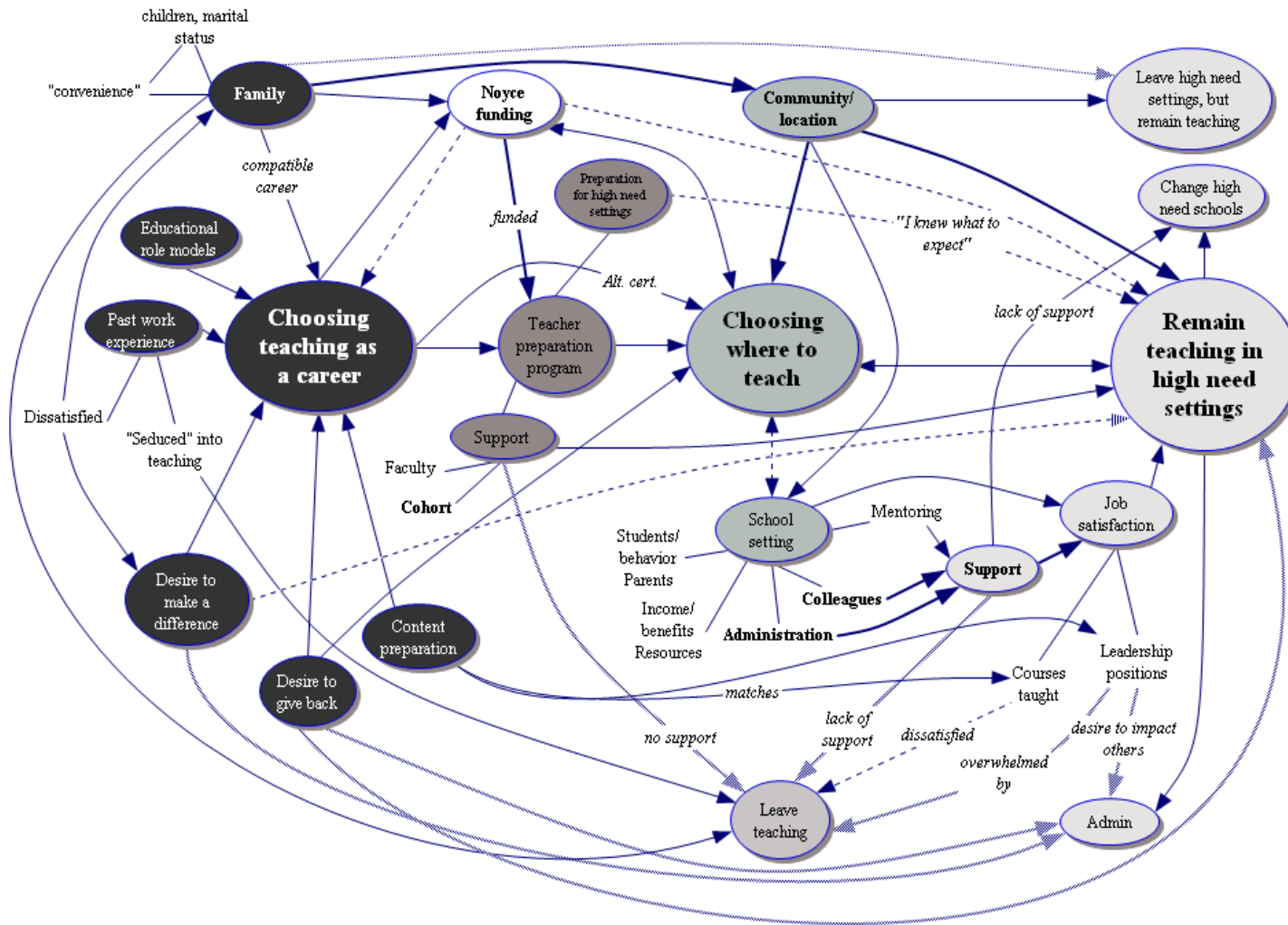


Figure 1: Model of the pathway to retention in high need settings

Model Organization

Time point one: “Choosing teaching as a career” super-category. Moving from left to right, the model starts by illustrating the influences which led the scholars to choose teaching as a career. Surrounding this super-category are the main categories which emerged from the analysis and their associated properties. Due to space limitations, properties and dimensions are not fully represented on the model but specific details about them are described below in the narrative. Table C1 also includes a summary of the categories, properties and dimensions related to “choosing teaching as a career.”

Time point two: Teacher education program. The second portion of the model indicates the time period involved in the completion of a teacher education program, and it is surrounded by the main categories related to the teacher education program which emerged as important for scholars’ retention in high need settings. A summary of the categories, properties and dimensions related to the teacher education program are included in Table C2.

Time point three: “Choosing where to teach” super-category. The next portion of the model indicates the second super-category, “choosing where to teach.” The main category which influenced scholars’ decisions about where to take a teaching job was “community/location.” Details about the properties and dimensions related to the “community/location” category are included in Table C3.

Time point four: “Remain teaching in high need settings” super-category. The last portion of the model indicates the super-category “remain teaching in high need

settings” and the associated influences on that super-category. One of the main influences on retention in high need settings was the “school setting,” and therefore it is represented on the model. Categories, properties and dimensions related to “school setting” are summarized in Table C4. Although choosing where to teach and staying teaching in high need settings occur at different points of time, interviews indicated that those two issues were often influenced by the same categories. Thus, they were highly interconnected and the interaction is represented on the model by having them shaded similarly.

Noyce funding. The role of the Noyce funding is shaded differently from the other categories as it sometimes its influence occurred prior to choosing teaching as a career, but sometimes after the scholars had made the decision to teach. Because of this, it did not fit into any specific time frame and it is shaded differently from the main time periods represented on the model. Categories, properties and dimensions related to the Noyce funding are included in Table C5.

Relationships between model components. Lines connecting the components of the model represent relationships between the super-categories, categories and properties. In some cases, arrowed lines represent the direction of the relationship. Gray or dotted lines in the model represent tentative relationships between model components in need of more research. Generally tentative relationships would be omitted from theoretical modeling; however, elements that may be of interest to the research community were retained. Relationships that were present and supported in the interviews, but were of less importance in the career decisions of the scholars are considered weak relationships and are represented by dashed lines. Stronger relationships between model components which

were extensively supported by the interview data, seemed important to the decisions scholars made and saturated through additional interviewing are represented by solid lines. As can be seen from the figure, the model is highly interactive with many relationships between the different components of the model. The next sections will describe the main super-categories, associated categories and properties and the interactive relationships between the model components.

Super-Category One: Choosing Teaching as a Career

The first super-category related to scholars' "choosing teaching as a career" which is highlighted on the upper-left portion of the model. From the interviews, six main categories emerged which related to the decision to choose teaching as a career. These six categories and their properties and dimensions will be explained next in no particular order. Refer to Table C1 for more details about the categories, properties and dimensions. Interconnectedness within these categories is also discussed.

Family

In the upper-left portion of the model, many scholars reported concerns related to "family" as one of the reasons why they chose teaching as a career. The category of "family" included the properties of marital status, concerns regarding time/effort (flexibility) and financial concerns. Some scholars reported choosing teaching as a career because they viewed it as compatible with their spouse and children. For example, Terry reported,

...probably I really wanted to be able to have summers off. My son was getting to the age where he wasn't going to be in daycare much longer and so I really needed something where I was going to have the summers off.

A few scholars reported that they perceived that teaching was a more flexible career for their families than other career options they had considered. Additionally, a few scholars mentioned choosing teaching as it provided a consistent means to financially support themselves and their families.

As can be seen in the model, the properties flexibility/finances and children/marital status are connected. Scholars who were married and/or had children were more concerned with having a flexible career and a consistent salary than those who were single and/or without children. The model also indicates that family concerns were related to many other components of choosing where to teach and retention in high need settings. These relationships will be explained later in the narrative.

Educational Role Models

Another category that influenced scholars' decisions to choose teaching as a career was "educational role models." Many scholars reported having "educational role models" in their past including family members such as parents or siblings who were teachers. Interviews indicated that this was a strong reason why they decided to enter the teaching profession as they had been exposed to the life of a teacher from a young age. A few others reported having influential teachers in high school that instilled in them a love for the content and also inspired in them a desire to teach.

Stacy was one of the scholars who had a family member as an "educational role model."

She reported:

Well, my mom was a teacher. And when, when I went to college I wanted to be a teacher but I kind of like, wanted to explore other options too. So I

just became a mathematics major. I didn't take the education route. And when it came time for graduation, I started thinking about what I wanted to do and I did want to teach.

Upon analyzing the relationship between the “educational role models” category and other categories represented on the model, no relationships were found, so there are no lines connecting this category to any others. Thus, it appears that having educational role models in one's past does not seem to be strongly related to staying in teaching in high need settings.

Past Work Experience

“Past work experience” was another category that emerged as an important element related to many scholars' decisions to choose teaching as a career. Three properties in the “past work experience” category included (a) education, referring to scholars whose previous careers were in educational settings; (b) industry, which included scholars whose previous careers were not in educational settings; and (c) general feelings about previous career. The education and industry properties were dimensionalized according to full-time and part-time work and extensiveness of work with K-12 students. Upon analysis, the properties of education and industry emerged as less significant influences on the decision to choose teaching as a career compared to how the scholars felt about their past work. Within the general feelings about the past work experience property, there were two dimensions which emerged as important to scholars' decisions to choose teaching as a career. These dimensions were “dissatisfied” with previous career and satisfaction with parts of their previous career which “seduced them

into teaching.” Due to their prominence in the interviews, these two dimensions are represented on the model.

Scholars who were “seduced into teaching” had exposure to education and young people through a variety of contexts ranging from full-time work in K-12 settings to part-time work in non-K-12 settings. Some had exposure to teaching and/or youth work by working as tutors in college, through teaching assistantships during graduate programs or through work as a substitute teacher or paraprofessional. These opportunities allowed the scholars to realize that they enjoyed such work and desired to try teaching as a career. For example, Lucy reported working as a tutor during her undergraduate engineering preparation which “seduced” her into teaching:

...with engineering I had gotten involved in several of the education outreach projects that happened with that and had gotten involved in tutoring and found that I enjoyed that more than the day-to-day engineering work. So from there I entered the [teacher education] program to get the day-to-day teaching work a try and just really enjoyed doing it and really enjoyed the students and all of the interactions...

Kim reported working at an informal education setting which “seduced” her into teaching:

I got a summer job working at a nature center and working with kids and teaching outside and it was perfect for me and it was so weird because the school I was at, my graduate school, actually had a master’s in outdoor teacher education, which there aren’t very many of them. And so I actually switched my—after my first year of grad school to um, that program. So it was all because of an experience at a nature center working for the summer.

Brenda reported working with youth in a variety of settings prior to teaching:

...well I’ve always worked with youth. And um, I um, [laughter] maybe I should be better prepared! I was a youth minister out in California, when

we lived out there for five years. And I worked with the middle grade students at a youth program, probably of about 240 some kids. So I've always been interested in teaching. Um, I've always done 4-H, FFA, always worked with youth programs, and I've taught, like, a senior citizens' [inaudible] like crafts and stuff like that.

“Dissatisfaction with past work experience” was another dimension that was related to some scholars' choosing teaching as a career. Often the scholars reported that their previous careers were unfulfilling or lacked meaning and they desired a career with value, thus they chose to enter teaching. For example, Celeste reported, “I kind of wanted to do something that had some sort of value. I didn't feel like what I was doing currently had any value.” These types of comments were often related to the “desire to make a difference” category described next, thus a line connecting those two elements is shown on the model. Interestingly, one interviewee reported her previous career did not pay enough, thus because of salary dissatisfaction, she chose to enter teaching for a higher salary.

When the category “past work experience” was analyzed in relation to retention in high need settings, only one trend emerged which is described later in the chapter which was related to the level of previous work with K-12 settings and students. Overall, the scholars who were career changers did not seem to have higher retention in high need settings compared to the scholars who were not career changers. Additionally, the type of past work experience (education or industry) also seemed to have little bearing upon retention in high need settings according to the interviews.

Desire to Make a Difference

Another category related to the scholars' decisions to choose teaching as a career was the "desire to make a difference." This category was sometimes related to dissatisfaction with past work experience, as noted in the quote by Celeste above. However, this category was relatively common both among scholars who were career changers and those who were not. The underlying features of this category seemed to be a desire to teach for moral reasons or a commitment to social justice. For example, Cara reported that she decided to become a teacher because of:

...a big social commitment. When I was working full time in laboratory I would volunteer tutoring. It was sort of a United Way program that was trying to reach out to the female and minority students who teachers thought were capable but just needed extra support and I'm just a huge, huge believer that education is the way for women to take care of themselves to support themselves.

The "desire to make a difference" category did emerge as an important element in retention in high need settings, thus a line connecting that category to "remain teaching in high need settings" is shown on the model. This relationship is explained in greater detail later in this chapter.

Desire to Give Back

Similar to the "desire to make a difference" category was the category "desire to give back." Within this category, scholars expressed sentiments related to their own experiences in high need settings and how those experiences influenced their decision to enter teaching. This is different from the "desire to make a difference" category as scholars who did not have previous personal experience in high need settings could be in

the “desire to make a difference” category. For example, Dirk reported on the need he noticed in high need schools and subject areas:

... I guess mostly just kind of felt a need for it, because I did attend a high school in New York City. And uh, just saw it there and there was a big need especially in the field of mathematics and that’s what I teach.

Sean reported similar sentiments about his own background experiences when asked why he became a teacher: “Well, because I was a high needs student. I’m from—originally from Detroit, Michigan, and I was an at-risk, high needs student, so kind of like, decided to help someone that was in my shoes.” The “desire to give back” category also emerged as important to both remaining super-categories, “choosing where to teach” and “remain teaching in high need settings.” This relationship is explained later.

Content Preparation

“Content preparation” was the last category which emerged as influential in scholars’ decisions to choose teaching as a career. Some reported liking their subject area and looking for a career where they could enact their appreciation for the content on a daily basis. For example, Mark reported that he chose teaching because “I just always enjoyed mathematics, enjoyed working with kids, worked at camps and stuff like that, and it just felt like a career I would enjoy.” For Karen, her content preparation related to moral reasons in her decision to become a teacher:

There seems to be a lack of knowledge for what science is and it seems like [the students are] not prepared. Some students will say to me, well I want to be a dentist, or I want to be (inaudible), but they say they don’t really like science, but that’s a science. You might not think of it like that, but I have a love for science and I wanted to use it. So I wanted to help them realize their aspirations.

As can be seen from the model, content preparation was also related to some other components of job satisfaction and eventual retention in high need settings. These relationships are explained later in the chapter.

Role of Noyce Funding on Choosing Teaching as a Career

For those who had left other careers to pursue a teaching career, the Noyce funding made leaving their other careers a more feasible choice. A few scholars reported pursuing teaching as a career because of the Noyce funding, although more scholars reported that they would have taught with or without the Noyce funding. On the model this is represented by a dashed line indicating that the Noyce funding influenced some scholars to teach, but a solid line indicating many scholars had already decided to teach, and then sought out the Noyce funding.

Mindy was one of the scholars who reported that the Noyce funding encouraged her to go into teaching:

...Well it was, it was a pretty marked decision, influence on my decision. My geology instructor came up to me one day and he said, 'hey, I have a place, right near your home, that's looking for a geology, what did he say, some sort of tech, tech, a field technician, level one, and they're looking for a good person, and I told them your name.' And I was like, 'wow! That's great, but, I just got offered this scholarship, this really awesome scholarship, and that means my program is going to start in the summer, and I don't think I can work and go to this program, and do a field, trip,'...And so I said, I'm going to have to turn it down. Now had I not gotten the scholarship, I probably would have taken it, because it was, it was a choice position, everybody, my whole cohort in my geology group, was looking for work, and here one had been handed to me...And I guess to summarize my response to that, I guess it definitely encouraged me to go into teaching, because at that pivotal point where I was either going to accept this geology job or go into teaching, it prompted me towards teaching.

When asked about the role of the Noyce funding in the decision to choose teaching as a career, many scholars reported it was not influential and that they would have pursued teaching regardless. However, scholars reported that the funding was important for helping them complete their teacher education program.

Choosing Teaching versus Choosing Teaching in High Need Settings

The majority of scholars who participated in the interviews, in general, seemed to consider choosing teaching as a separate decision from choosing teaching in high need settings. The decision to become a teacher preceded the decision to teach in high need settings and these decisions seemed to have different influences. For example, Jessica was one of the scholars who, when asked about her decision to become a teacher, seemed committed to teaching, but not necessarily to teaching in high need settings. When asked whether she considered teaching in high need settings prior to deciding to become a teacher, Jessica reported:

I know that there's a difference between a high needs school and not, but I kind of—I kind of see the student as a person and not really as a high needs student. So, you know, whether I teach in a high needs school or not in a high needs school, they're still the same people... to me. So that's kind of a uh, question that I didn't consider.

Because of this, the super-category is called “choose teaching as a career” and not “choose teaching in high need settings.” The influences on choosing where to teach are explained later in the chapter.

Teacher Education Program

The next component of the model is the “teacher education program.” The influence of the teacher education program was not as strong on scholars' eventual

retention in high need settings as other areas, such as the reasons scholars chose to enter teaching. As such, it is not considered a super-category. However, since it is a typical part of the pathway from deciding to become a teacher to teaching in high needs settings, it is directly represented on the model.

After deciding to enter teaching, some scholars entered an undergraduate or post-baccalaureate teacher education program and spent a good portion of time engaged in coursework (1-2 semesters or more) before student teaching. Other scholars entered alternative certification programs with less time engaged in coursework (generally a summer term or 4-6 week session), prior to an internship phase. This is indicated by a line connecting “choosing teaching as a career” and “choosing where to teach,” bypassing the “teacher preparation program.” Many scholars entering alternative certification programs were career changers; however, the whether the scholars had options in choosing their program type was not probed for in the interviews. Two main categories emerged about the role of the teacher education programs in the scholars’ pathway to retention in high need settings, thus they are represented on the model. The categories are “preparation for high need settings” and “support.” It is noteworthy that these categories could be components of all types of teacher education programs and it did not seem that particular types of programs were more highly related to retention than the others. These two categories are explained in detail next, as is their role in the pathway to retention in high need settings.

Preparation for High Need Settings

The category “preparation for high need settings” had varying levels of intensiveness of preparation which are the dimensions for this category. Preparation for high need settings ranged from very intensive (internships or student teaching in high need settings) to not intensive (coursework related to teaching in high need settings or students in high need settings) or no preparation for high need settings.

Some scholars reported that experiences in high need settings were important for familiarizing them with a setting different from their personal experiences or background. Such experiences allowed them to know what to expect when they eventually became teachers in high need settings. Of the value of such experiences, Cindy reported:

I think that’s a lot of the reason why a lot of teachers, new teachers leave, that field, the teaching field because they don’t got no experience. And they’re overwhelmed of what they’re in charge of. So with the preservice, I had an idea, so I couldn’t say I didn’t know, it’s like I knew what students I was going to be dealing with, and what to expect from them.

A few also reported the value of training/coursework related to high need students and settings such as Brenda:

...going through the...training [for high need settings], also gave me a different viewpoint of where my parents were coming from, um, because I really didn’t understand how they would have the phone turned off, they couldn’t buy a pencil or paper, but then the kids were getting the latest electronics equipment. I really didn’t understand that. But after going through—understanding about poverty and the different values that they have, it gave me a little bit better perspective on how to handle that. You know, realize that they’re just dealing with a different set of values than we are and trying to help their kids understand about responsibility.

Stacy also valued coursework related to students and schools in high need settings:

I felt especially in the philosophy of education classes that they did a

really good job of preparing us to work with high needs students, especially low income, because some of the readings and activities we did, we had to explore our own backgrounds and how those backgrounds, sort of instilled us with ideas about the world and how our students don't necessarily see the world the same way based on their background or their upbringing, and so, it was kind of getting us out of anything that was ingrained in us and that other students might not see the world in the way that we do and I thought that was really helpful, a lot of the activities and a lot of the readings really enforced that.

Upon examining the dimensions related to preparation for high need settings, it appeared that more intensive experiences in high need settings were valuable for the scholars and appeared to be related to the pathway to retention in high need settings. On the other hand, little or no preparation for high need settings seemed related to dissatisfaction with teaching in high need settings and attrition. This relationship is represented by a dashed line connecting "preparation for high need settings" and "remain teaching in high need settings" on the model. The line is dashed because the relationship was present in some interviews, but the influence of "preparation for high need settings" on retention seemed less strong than the influence of other components of the model.

Support

The category of "support" also emerged as an important component of the teacher education programs as it relates to eventual retention in high need settings. The "support" category included the properties (a) source of support; (b) formality of support; (c) frequency of interactions, (d) timing of support (during or after teacher education program completion) and (e) type of support (the nature of supportive relationships/interactions. e.g. professional help with lesson plans or classroom management or personal support providing encouragement or affirmation). The latter

four properties can also be seen as dimensions of the first, “source of support.” In other words, the source of support included cohort, faculty, self-help and no support and each of these sources could be dimensionalized according to formalness, frequency, timing and type.

The most commonly valued forms of support included a small cohort and approachable, talented faculty. The scholars did not comment on the exact size of their cohorts, therefore, no findings related to the best size of cohorts for support can be determined. However, with both faculty and cohorts, the scholars seemed to value frequent (daily or weekly) interactions and both professional and personal types of support. These components were also valued both during and after completing the teacher education program. Formal interactions with faculty (in the context of a course or assigned advising, mentoring or advising roll) seemed more highly valued than informal interactions, while informal interactions with cohort members were more valued than formal. This is probably due to the fact that interactions with faculty are more likely to be formal, while those with cohort members are more likely to be informal.

Cohorts emerged as particularly important to the scholars, thus it is in bold print on the model. Scholars valued the support of other cohort members as the cohort provided an avenue to informally share ideas and brainstorm teaching/lesson ideas during the program. For example, Amy reported:

..In the cohort that I was with, I think it was unique that we all just got along amazingly well and really um, were able to bounce a lot of ideas off of each other. And really it was more of a support group. We used to joke that we were going to counseling every week rather than class. To continue to—just continue to constantly bounce ideas off of and get new

lessons and learn how to deal with certain students, because someone else in your cohort had a similar situation. Um, so that really was very helpful. And even now, there's probably five of us that still get together relatively regularly, to meet up. So I think that in and of itself is kind of a rarity.

Many scholars reported staying in contact with other cohort members when they completed their education program and regularly exchanging ideas regarding pedagogy or just sharing difficulties and classroom struggles as teachers. For example, Brenda reported:

We still talk and we still get together once a year, we still email, and I think we're all really effective teachers because of the bond we had, the experiences we had, and you reached quite a few people here in my cohort group.

A few scholars reported that it helped them gain perspective about their struggles as new teachers as they interacted with other cohort members at different schools, for example, Vienna reported:

Vienna: At least our first year of teaching there was a lot of swapping stories and brainstorming, like what's your experience like, how's it going, what's working, blah, blah, blah.

Interviewer: and what would you say you value most from those types of interactions?

Vienna: oh my, for me it's like knowing how blessed I am to be in the situation that I'm in. I guess learning what other teachers, other people's experiences are like...

One scholar reported regularly interacting with two other teachers at her school who completed the same teacher education program, although they were not in the same cohort.

Faculty members also provided support for the scholars, both during their teacher education program and upon completion. During their education program, the scholars

seemed to appreciate the formal support provided by faculty mentors and university supervisors. A few reported on the value of having faculty advisors who would “go the extra mile” or act as an advocate for them. After certification, some of the scholars reported having formal support from their teacher education program that varied from weekly interactions to monthly/yearly workshops or courses. For example, Mindy completed a first-year induction course provided by her education program:

Mindy: ...there was some classes that I took. One was called [new teacher induction course] and it was all of my other students in my cohort, my peers that were in my cohort with me, and we were all first year teachers, and we were sharing ideas, and problems and troubles, and that was kind of nice, I wasn't the only one in the situation.

Interviewer: and did you learn things from them or the instructor, or was it more sort of reassurance that it's hard for everybody?

Mindy: um, kind of both, we learned different ideas for labs, how to do a lesson a better way. And we also were able to talk to people, and they were just, it was just nice to have someone listen to your complaints. That was nice.

The scholars also seemed to appreciate the informal support they received from faculty, namely their availability and encouragement. A few scholars reported maintaining contact with faculty and advisors after completing their program for lesson ideas and classroom management support. For example, Lucy reported on the informal support provided to her by her program after she started teaching:

What I actually used the most was the faculty contacts and little bits of help on lessons and ideas if I was struggling with something in the classroom. So rather than being in the official mentoring program I went for more the unofficial mentorship with people that I had established relationships with.

Analysis indicated that there was a relationship between support related to the teacher education program and retention in high need settings. The relationship between

support and retention is represented on the model by a line connecting “support” and “remain teaching in high need settings” indicating that scholars who felt supported by their teacher education program seemed to be more likely to stay in high need settings. A line is also shown on the model connecting “support” with “leave teaching” indicating that the scholars who reported little or no support from their teacher education program seemed more likely to leave teaching or teaching in high need settings.

Role of the Noyce Program

The role of the Noyce program in the scholars’ teacher education program was also probed for in the interviews. Two properties within the “Noyce scholarship program” category related to the teacher education program. They included “financial support” and “outcomes related to preparation.” “Financial support” was highly valued as the great majority of scholars reported that the Noyce funding provided needed financial assistance. A bold line between “Noyce funding “and” teacher preparation program on the model indicates this relationship. The connection is in bold because this was an extremely common response in the interviews. For example, Emma reported, “The bottom line, the benefit of the money... is for those like me, and some of my other classmates, who were either teaching, or trying to hold down a part time job, it helped us get through a teacher program.”

The “outcomes related to preparation” property relates to the perceived benefits and extra experiences the scholars received because of the Noyce program. For example, some scholars reported that they would have taken longer to complete their education program had it not been for the Noyce funding as they would have probably worked part-

time to earn tuition money, then enrolled in their program part-time. Similarly, some scholars reported that they were better able to focus on their preparation rather than holding a part-time job. For example, when asked how the Noyce funding influenced her decisions about teaching, Melanie reported:

I think I would have had to spend more time during the day at another job. So then I wouldn't have been able to focus as much on what I was learning and you know, how I wanted to structure a classroom and things like that. It kind of freed up a lot of time for me.

Many Noyce scholars reported having no extra coursework or experiences, thus these opportunities were not reported frequently as outcomes related to preparation. Some scholars reported minimal extra opportunities because they were Noyce scholars including specialized workshops or meetings. The scholars generally expressed positive sentiments about the extra opportunities they were afforded through the Noyce program. For example, Paul commented on a summer workshop he attended for Noyce recipients from his teacher education program:

The cohort of Noyce recipients in my college, we got together this past summer. And that was probably the best thing that I—one of the two best professional development things I ever went to. And it wasn't really, you know, a super structured, long weekend, long hours thing. But just meeting with people who have similar or worse situations than me, and recognizing that. When you get together, it doesn't have to be a complaining session, you know, but you can help each other and really, and I've actually started a project with one of my fellow teachers in [urban location] and uh, I'm having my students talk to—my rural, 100% white students talk to his 100% minority, inner city, really poverty kids. And uh, just to have a contrast and some cultural diffusion.

Because almost all scholars reported that the Noyce funding provided needed financial support, it was difficult to determine if there was any relationship between this

property and retention. In other words, the Noyce funding was a valuable source of financial support for all scholars, regardless of their current status. Additionally, there did not appear to be any relationship between the perceived outcomes from the Noyce program related to the teacher education program. In other words, there appeared to be no differences in retention for the scholars who reported that the Noyce program allowed for faster, more focused preparation and those who reported extra experiences or no extra experiences because of the Noyce program.

Super-Category Two: Choosing Where to Teach

The next portion of the model includes the second super-category which relates to “choosing where to teach.” For some scholars, though not many, the decisions to enter teaching and teach in high need settings were one and the same and thus occurred at the same time. For example, Sean reported that he knew when entering his education program that he wanted to teach in a high need setting. As this scenario was not common, it is not represented on the model. For others, the decisions to enter teaching and teach in high need settings were not the same and had different influences. Because of this, there are separate super-categories for “choosing teaching as a career” and “choosing where to teach.” Thus, the main influences on scholars’ decisions to choose where to teach include (a) categories related to the decision to choose teaching as a career; (b) community/location and (c) the Noyce funding. Each of these influences is described in detail in the following sections.

Categories Related to Super-Category One: Choosing Teaching as a Career

Choosing where to teach was for some scholars related to the reasons they had initially chosen teaching as a career. Most commonly, the desire to teach in high need settings was often connected to scholars who had expressed the desire to teach related to the category “desire to give back.” This relationship is shown on the model by a line connecting the categories “desire to give back” and “choosing where to teach.” The category “desire to make a difference” was not connected with “choosing where to teach” because scholars who responded with notions of desiring to make a difference were often general and did not apply specifically to high need settings. The scholars who expressed a desire to give back had personal experiences in high need settings which influenced their decisions to become teachers and where to teach. For example, Cindy reported how her personal background interacted with the Noyce program requirements:

I came from a high needs school, my mom was a single parent...I know what it's like to come from a low economic status...So I already had an idea that I wanted to work in a school, kind of in a high needs school, where I'm at, the same location. But the Noyce kind of just pushed me more into that direction, 'cause the schools that we worked at, during my junior and senior year were all high needs schools, so I kind of, I was able to relate to the students, and kind of, you know, this is just me right here, this is one of my older brothers, I could see the kids being like my older brothers when they were kids, and wishing that somebody pushed them, so yeah, so all that kind of contributed to my final decision of working at a high needs school. I'm not forgetting where I started, where I'm coming from, and knowing, like, a lot of these students are dealing with way more problems than I dealt with when I was in school...

Karen reported the desire to make a difference as one of the reasons why she chose teaching and related that to her particular student population in choosing where to teach:

Um, I really feel like I'm making a difference. When people can see (inaudible)...I think having a role model, and being there to show them that you can do it, don't say I'm a minority, or I'm poor, or I don't speak English that well, that pales in comparison to the greatness that you can have. So I'm blessed to be that conduit or that resource for students.

Noyce Funding

The commitment to teach in high need settings associated with the Noyce funding (“Noyce program commitment to high need settings”) was an important property which emerged about the role of the Noyce funding in scholars’ choosing where to teach. The property “Noyce program commitment to high need settings” was dimensionalized according to importance to the scholars in their decision of choosing where to teach, whether they viewed the “Noyce program commitment to high need settings” as important or unimportant. Due to space limitations on the model, the property “Noyce program commitment to high need settings” is not directly represented on the model, but rather indirectly through the “Noyce funding” component. Analysis revealed that the requirement seemed to have a stronger role in where the scholars chose to look for and take teaching jobs than in the decision to become a teacher. This is represented by a solid line connecting “Noyce funding” and “choosing where to teach,” but a dashed line connecting “Noyce funding” and “choosing teaching as a career.”

For the scholars who reported that the “Noyce program commitment to high need settings” was important in their decision to choose where to teach, they generally reported that the Noyce funding “nudged” them to look for jobs in high need settings. For example, Aiden reported that he desired to work in high need settings: “I like big schools. I like public schools. And I like seeing a lot of different faces, so any different ethnic

groups, languages, um, lots of teachers,” but he also reported that the Noyce funding influenced where he looked for a teaching job:

Well, I remember when I was in [community, state] going for my first teaching job I was uh, definitely conscious of the Noyce scholarship in that I wanted to choose a school that would meet the obligations and uh, you know, low income bracket field and then the minority—all the stuff that Noyce teacher scholarship requires on its candidates. So that was a consideration...So it definitely—I don’t think I would have taken a job if it was in a uh, affluent school. I wasn’t—it wouldn’t have met the Noyce requirements, but also, it was not what I was looking for at that time.

Other scholars reported that the Noyce funding was influential in their decision of where to teach because they did not want to repay the funding they had received, such as

Ben:

Ben: Obviously it definitely geared me towards looking for jobs only in urban areas, so I mean that, cause I was thinking, if I get a job somewhere else, I’ve got to start paying this money back. So you know that, taking money off the top of your salary. So in that sense the money definitely did make me think about, well I’m going to teach in this school district, or trying to find a high needs school.

Interviewer: so if you hadn’t had the money, do you think you’d be teaching in [community], or do you think you’d be teaching somewhere else?

Ben: (pause, 8 seconds) I’m not really sure. I mean I guess, I did a summer teaching fellowship that was for urban settings too, that was between my senior and my intern year. I think that that really influenced me a lot. So maybe if I hadn’t had the Noyce money, having that other experience would have been enough, but I really can’t say for sure.

Many, like Kayla, expressed a commitment to teaching in high need settings regardless of the Noyce funding. When asked if the Noyce funding influenced her decisions about becoming a teacher and teaching in high need settings, she reported:

Not really, because I knew that if I wanted to apply at a suburban district, that they would pay more than an urban district, it was kind of like, if I

had wanted to go to a suburban district I could have done that with a clean conscience knowing that I could have repaid the Noyce money. So [teaching in an urban district] is what I wanted to do, so [the Noyce funding] was a nice bonus.

Community/Location

The role of the “community/location” in scholars’ decisions regarding where to teach emerged as highly important compared to the other previously described influences. Having “community/location” in bold print on the model and the line connecting “community/location” and “choosing where to teach” bolded also represents this. The properties in the category “community/location” included (in no particular order): (a) proximity to family/friends; (b) cost of living; (c) distance between home and work; (d) schools; (e) values about education; (f) teaching vacancies and (g) similarity to hometown. The most important properties in the community/location category were proximity to family/friends, distance between home and work, and teaching vacancies. There was also much interrelatedness between many of the properties within the community/location category. Due to space limitations the individual properties are not noted on the model directly but rather indirectly as embedded in the “community/location” component of the model. As a whole, aspects of the community/location were prominent in nearly every interview regarding where scholars chose to teach. Few scholars reported relocating to meet Noyce program high need requirements; the majority of scholars attempted to meet the Noyce program high need requirements within or near their community of residence. Of the two scholars who did report relocating for the sole reason of meeting Noyce program high need requirements,

one had left her high need teaching environment for her hometown, and the other reported he was planning to leave as soon as his family situation allowed. Cara's response as to why she chose to teach in a high need school summarizes the general response of many of the scholars: "Honestly, cause I live here!"

For some scholars, aspects related to their family influenced where they chose to teach and took precedence over a desire to teach in high need settings. This is represented by a line connecting "family concerns" on the left side of the model to "community/location." For example, relocation due to family/spouse employment opportunities (proximity to family/friends influenced many scholars. For most of these scholars, they had moved to communities that did not have high need schools/districts or lacked teaching vacancies. Others reported living and working in different school districts which conflicted with family responsibilities (distance between home and work). For example, Terry reported that she left teaching in high need schools for substitute teaching because:

So they because...that was passing the district they had been starting at 7:15 and my son was here in our district...he was still in our intermediate school that year. He was still young enough for daycare but they next year because they built more schools in the [school] district they were going to have to shift their start time to 7:05....which meant that teachers were going to have to be on campus by no later than 6:45. And at the same time my son moved from than intermediate to junior school and he doesn't have to be on campus until 8:30 so than it was just too much of a timing conflict. And I told them if I can have first and second off...if I had two offs there then I could swing it but that would be the only way. So I thought it was in their best interest to...for them to hire someone who had a bit more flexibility for them.

Conner also expressed sentiments about where to teach that were related to his family situation in addition to “distance between home and work.” When asked where he planned to teach in the future, Conner, who had relocated from an urban environment to a more suburban setting for family reasons, reported he would likely leave his high need school:

And the reason is not necessarily because I am opposed to teaching in a high needs but it’s more a practical thing. I have got a half hour commute to my current job. I would probably be interested in working at a job that is closer to where I live and the schools closer to where I live are not high needs.

The community/location category was also related to the “school setting” category as certain aspects of the community/location will influence the type of school setting. This is represented on the model by a line connecting these two components. The school setting was generally not a deciding factor related to scholars’ initial decisions of where to teach; other elements played more important roles. However, for many scholars who had changed from one school to another, the school setting played a major role, thus a line connecting “school setting” and “choose where to teach” is shown on the model. The school setting category, while indirectly related to choosing where to teach, more commonly acted as an intermediary between choosing where to teach and the decision to remain teaching in high need settings, which is the third super-category. Because of the unique role of the school setting in both choosing where to teach and staying in teaching in high need settings, it is treated separately below before moving on to the last super-category.

School Setting

The main category within the school setting which emerged as important on the pathway to retention in high need settings was support. Mentoring programs, colleagues and administrators acted as components which provided support to the scholars and influenced their job satisfaction. This is represented on the model by having “mentoring,” “colleagues” and “administration” acting as intermediaries between “school setting” and “job satisfaction.” Almost as important were “leadership positions” and “course teaching assignments” which are also represented on the model next to “job satisfaction.” To a much lesser extent, students/behavior, salary, resources, parents and philosophy of education (compatibility with community, administration and colleagues) played a role in the scholars’ retention in high need settings, but will not be explained further. Although these aspects were discussed in the interviews, often only one or two scholars reported that these areas affected their job satisfaction which yielded the relationships between these areas and retention too tentative to warrant additional discussion. Ultimately, all these areas influenced scholars’ job satisfaction, which in turn influenced their retention or attrition in high need settings. This broad relationship between school setting and job satisfaction is represented on the model by a direct line connecting “school setting” and “job satisfaction.” The categories of “support,” “leadership positions” and “course teaching assignments” are treated separately below and their relationship to the third super-category “remain teaching in high need settings” is also described as they are very closely interconnected.

Support

Within the support category were the properties (a) source (colleagues, school-level administrators, parents/caregivers, district-level administrators and larger community); (b) type of support (e.g. academic, disciplinary); (c) frequency of support interactions; (d) formalness of support; and (e) feelings about/impression of quality. As with the support category within the teacher education program, the “source” property was dimensionalized by the remaining properties. For example, the source of support from colleagues could be dimensionalized according to the type of support colleagues provided, how frequently interactions occurred, the formalness of interactions and feelings/impression of quality.

The most prominent aspects of support which emerged from the analysis included support from colleagues, administration (school-level) and mentoring programs. These three components are indicated on the model between the category “school setting” and “support.” In particular, the role of colleagues and administrators were highly related to job satisfaction and eventual retention, thus they are in bold-print on the model as are the lines connecting them to support.

Support from administrators. The support from administration emerged as the most important component of the school setting on the pathway to retention in high need settings. The types of support from administrators that emerged most frequently in the interviews included (a) general (e.g. respect, trust, approachability); (b) academic (e.g. support for lesson planning, collaboration, professional development) and (c) disciplinary (e.g. back up teachers’ discipline, organized discipline plan, strong disciplinary presence

in school).

Vienna was very positive about the academic support she received from her administrator:

...well, our principal is really positive, is a joy to be around. He gives you some professional freedom to make decisions which I think is important as an educator. So he validates you as an educator to let you try things that you think might work.

It also appeared from the interviews that the frequency of interactions was less important to the scholars than the presence or lack of the specific types of support described above. For example, Jessica reported on the value of general support from her administrators and approachability or availability:

And also my principal would come into my classroom and ask me how I was doing or she would observe me, which is good. Um, so I thought that the—that the administrators were a lot more hands on or a lot more friendly than I imagined they would be...An interaction would be like a—well, most of my interactions are actually really short [laughter]. So uh, yeah I don't really like to like, sit down one on one with them. Um, because I guess that's just not my style. But um, yeah an interaction—most of the interactions are “Good morning,,” “Have a good day,” um “How was your day?” uh “Do you need anything?” and uh, yeah, just uh, we can—or we'll talk about a student that's maybe acting up or something and come to a conclusion together what to do about it.

Melanie also reported on the value of general and academic support from her administrators:

Melanie: They did send me to conferences teaching AP Chem and other things like that. Just to help you become more prepared before you would teach a course because they were aware that teachers needed that backing, before, you know, kind of being drawn into something. Um—

Interviewer: So would you say that was unique to your school or to your district?

Melanie: Um, I would say to the district. I know at my—the first school I taught at in [community], they didn't have—you had to ask a lot more.

Whereas down in [community], they were a little bit more proactive about, you know, just helping you find things and pushing you to do it.

These components of interactions with administrators were highly related to feeling supported, job satisfaction and eventual retention in high need settings. Kim changed from one high need school to another due to lack of disciplinary support and consistency from her administrators and she contrasted her two teaching environments:

I've finally, I know I keep saying this but I finally found a place where my school is extremely high needs. These kids have nothing, like when they go home. But they're so well-behaved and they're appreciative and a lot of that is because of the structure of the school and the teachers in the school and how they have consequences and they know their limits. So I think if I would have ended up staying in the school like I was at before I don't know how long I would have lasted, honestly. So there are high needs schools that can be so functional, but there are a lot of them that are just horrible and I would never want to go there or send my kids there or anything...

Where I came from before the kids would um, there was a lot of fights and uh, there was just really no respect at all for the teachers or the administrator and one of the reasons was the kids could feel that the administration didn't care about them. Like they—the principal never showed his face anywhere; they didn't respect him; they didn't know him. There were no real consequences for their actions and where I'm at now, there's three times as many kids, there's 1200 kids at my school and it runs like this smooth machine. There's structure, there's consequences, there's all these steps in place and kids know what those are and they know if they do something wrong then they know they will have to deal with that.

Leslie, one of the scholars who left teaching after fulfilling her Noyce commitment, reported that she left because of the lack of disciplinary support: “The administration was just very, I mean you know, inconsistent with punishing students. A student threatened me and he got suspended, but yet it was excused absences. So I mean they just weren't consistent with their punishments.”

For Serena, lack of general and academic support from administrators was creating a difficult work environment. Earlier in the interview she reported that she was being pressured to give students passing grades and when asked about what factors would influence her future in teaching in high need settings she reported:

I would have to say that it is definitely the administrative support, how the school is run. Right now, there a lot of days that I feel bullied by my administration into performing whatever task they would like me to perform. The backing of a union in a public school would really feel more secure. I would really feel more at ease. I just feel more respected. And I think that that I am giving this school such a service. I am giving them my life, everything that I have worked for and to have someone turn around and treat you in the manner that they treat you is really unacceptable to me.

Support from colleagues. After administrators, support from colleagues was also a highly important component of the school setting on the pathway to retention in high need settings. Regarding colleagues, the scholars seemed to most value “academic support” which included collaborating with colleagues on lesson planning and similar activities and “general support” which included approachability and general helpfulness. Brenda reported collaborating much with her colleagues which she seemed to highly value:

...a positive one is I have seen some teachers, you know, that have been teaching twenty-some years and we collaborate and we write grants and we come up with um, lesson plans, we come up with projects for the students, um, one teacher’s been teacher forty years, she’s retiring this year, and her and I sit down and collaborate a lot. It’s always positive. I like to keep everything positive and never, “Ugh, can you believe he’s doing this again?” It’s like, “How can we reach him?” and they’re like that as well.

Conversely, other scholars expressed frustrations at the lack of academic support provided by colleagues and lack of collaboration. For example, Gabby reported:

Gabby: It's really hard, um. I like my school where I work and stuff, um, and but sometimes I wonder if there's enough support in the science department. Because like I go ask the other two [science] teachers what they were teaching, and I shouldn't have had to go ask, we should be having meetings, so I knew where they were.

Interviewer: right

Gabby: and so I'd go ask to make sure I wasn't falling behind, or I wasn't taking my class too fast, you know? And I found that they could care less where I was, or anything. It's kind of each one to their own self, where I thought all the freshmen needed to move at the same pace, you know, not the exact same pace, but kind of together.

Interviewer: and so, would they just, they wouldn't want to talk, or they'd say

Gabby: no no, I mean they would talk to me, and they were friendly, don't get me wrong, it's just, I don't know, it's, it's like, oh, this is what we're doing this week, and that'd be the end of the conversation. And like, one of the gentlemen, he's kind of abrasive, a different gentlemen. He's like, 'well that's what I'm doin, but you can do whatever you want.' And that's how he was, you know. And you just accepted it, you know. So, but, it wasn't bad, and our department head, if I asked for anything, he'd help me but he, you never saw him other than that, unless you went to hunt him down and ask for something.

Gabby's comments also relate to "general support" which includes aspects of approachability and social support. Serena was a scholar who highly valued the informal, regular interactions with her colleagues and felt generally supported:

During lunch, we all meet as a staff in Ms. Edmonds room. She is social studies teacher. There are only 10 of us downstairs in the basement in the high school so we are really, really close to each other. So we always eat lunch with each other and talk and relieve stress like always.

"General support" from colleagues also encompasses aspects of similar philosophies of teaching, like-mindedness and effort toward teaching. In other words, the scholars seemed to appreciate colleagues who were like-minded in their effort toward

teaching and planning and expressed frustrations if their colleagues were not like-minded or not open to collaboration. For example, Paul reported being frustrated with his colleagues:

You know, I never hear anything positive from any teacher in the school anywhere. And then, none of it is um, you know, I've tried to talk to people about my struggles or whatever and then they say, "Well, you know, you'll figure it out, just go with the flow." And then, when I come up with these what I feel are good ideas and ambitious ideas and it doesn't work out, you know, for a number of reasons, and I try to talk to them about that they say, "Well, you know, you're young and you're ambitious and you'll learn over time that you shouldn't be like that."

Altogether, the scholars who expressed positive sentiments about the academic and general support they received from colleagues seemed to have higher job satisfaction and in turn, greater retention in high need settings than those who reported lower levels of support from colleagues or the absence of collegial support. It was evident from the interviews that collegial support was an important aspect of the pathway to retention in high need settings.

Support from mentoring programs. To a lesser extent, but nonetheless important, was the role of formal mentoring programs on scholars' job satisfaction and eventual retention in high need settings. The majority of scholars did report having formal mentoring programs during their early years in teaching in which some aspects they valued, while others they did not. The perceived value of the mentoring programs seemed to be highly individual with some scholars reporting the desire and appreciation for intensive mentoring interactions and others reporting the desire for more self-directed interactions. For example, Stacy reported the desire for proactive support from her

assigned mentor:

I mean it was my first year teaching and I probably could have used a lot more help than what I asked for, and he didn't really, you know, people always said, if you need anything just come find me, but I think it would have been more beneficial if they would have said, here's some help, if you need it great, instead of me going to get it, so it was more my fault, so that wasn't good. I think that's pretty much it.

Conversely, Ben reported preferring to be more self-directed in his support

and that he did not interact much with his assigned mentor:

But if I really needed something I just went to my department head, cause she was just right across the hall from me. So I mean, and then this year, we're supposed to have mentors, but I think one thing that I did, I just went out and found people. Like talked to people, decided who can help me with what I need. It was definitely more me being outgoing and finding people than the school deciding. I really feel that the support that I need, I can go out and find myself.

Overall, the scholars seemed to value support that was catered to their

personalities and unique needs with some expressing the desire for lesson planning or classroom management support and others expressing the desire for assistance with more pragmatic concerns such as copying procedures, how to enter grades and attendance.

Leadership Positions

About one third of the scholars said they held leadership positions within their schools/districts and analysis revealed that those positions seemed to be related to job satisfaction and eventual retention in high need settings. This is represented by having "leadership positions" stemming off of "job satisfaction" on the lower right side of the model. The most commonly held leadership position among the scholars was department chair, but some scholars served on school-wide committees, were coaches or advisors for student groups or held positions in administration such as principal or

science/mathematics coach. Many had held leadership positions from an early point in their teaching careers, often taking on leadership responsibilities after their first year of teaching.

For some scholars, the desire to make an impact was one of the reasons they chose to pursue leadership roles, and the gratification they felt from their leadership roles was related to job satisfaction. For example, Dirk reported feeling great satisfaction for the impact he was making through his leadership role:

And that's the reason I'm at this school and I feel that I'm—that I'm, you know, that I can offer a lot to this current school that I'm at right now. Um, right now I'm serving as the department chair and [community] has about 22/23 high schools and uh, we have a nice support network of teachers and for geometry I'm one of the trainers who train new teachers on core content knowledge and so, I've been doing a lot and I think, um, for me to share my success with teachers, um, because most of these teachers are first year teachers, they usually get assigned to the more difficult high schools and I feel like I can relate to them more. Um, they're—because I am myself at a struggling school and that's certainly one of the reasons why I want to stay at this school. Because I want to be able to stay fresh at the particular, unique struggles that teachers face at these types of schools.

Similarly, some scholars also reported a desire to “reach” the most students possible as their impetus for seeking out leadership responsibilities. For example, when Sean was asked about why he chose to pursue administration, he reported:

Um, to—because I, just being in the classroom, you see how you have like 80-90 students and you kind of like, touch those 80-90. And you want—I kind of figured what if I could be an administrator? I could touch grade levels. I would just touch the grade level next and then move on to touch the building and then touch the whole school, and then maybe touch a couple of schools, and then maybe a whole district.

The scholars who were positively motivated by their leadership positions seemed to be committed to teaching and teaching in high need settings, thus it appears that satisfaction with leadership positions is related to the pathway of retention in high need settings. However, two scholars also reported feeling somewhat overwhelmed by the leadership responsibilities, one of whom had left teaching.

Regarding the aspects of the super-category “choosing teaching as a career” which appeared to be related to leadership positions, it appeared that the “content preparation” of the scholars was important in their rise to leadership positions. This is represented on the model by a line connecting “content preparation” on the lower left side of the model with “leadership positions” on the lower right side of the model. The scholars reported having strong content knowledge compared to some of their colleagues, thus they were well-suited for holding positions such as department chairs or science coach.

Courses Taught

The course teaching assignments of the scholars was also related to job satisfaction for some of the scholars. This is shown on the model by a line connecting “job satisfaction” and “courses taught” on the lower right side of the model. In fact, many scholars expressed the desire for higher-level teaching assignments and were frustrated when they were assigned lower-level classes as there was a mismatch between their content preparation and teaching assignments. For some scholars, such as Holly, the types of classes taught were related to student behavior and discipline which reportedly influenced her future career in high need settings:

The only thing that would make me want leave would be the discipline. I came from, where I taught first was from a military-base school and I never had a discipline problem. And I don't have a lot of discipline problems but if I didn't have an upper-level math class here I would probably go back. Cause I had my choice at the other school. I mean I have my choice here now but if for some reason I didn't have that choice to have an upper-level math classroom then I would probably head out.

Stacy, one of the scholars who had left teaching, reported that her course teaching assignments played an influential role in her decision to leave:

I think if I would have had maybe, I taught geometry which I enjoyed teaching. I felt like that challenged me but I also taught a class which was called applied math. And that class was sort of frustrating to me that it was basically like another way for students to get an extra math credit in high school and I mean, sometimes I would, literally, be teaching seniors how to add integers when I knew they already knew how to do it. They just didn't want to do the work. So that was a very frustrating thing for me. So I think maybe if I would have had, I mean even if I would have had a co teacher in that class that would have been fabulous cause it was such as difficult class to teach. Or if I would have had an algebra two class or something that was a little more challenging to me would have been a little bit more enjoyable.

Super-Category Three: Remain Teaching in High Need Settings

The third super-category, “remain teaching in high need settings” was influenced by many components of the model. In the interview protocol, scholars who were currently working in high need schools or districts were asked the following question:

“What factors will influence how long you continue teaching in a high needs school?”

Nearly all of the responses were related to categories already described in previous sections of the report, and some will be highlighted here. Otherwise, relationships between model components and retention in high need settings were highly inferential.

For example, the interview protocol did not directly probe for if there were relationships

between why the scholars chose teaching as a career and their retention, thus inferential analyses explored these types of relationships.

Three main end points on the pathway to retention in high need settings are represented on the right side of the model. They include (a) “remain teaching in high need settings” which includes scholars who were teaching in high need settings beyond Noyce program requirements and those who foresaw themselves remaining in such settings; (b) “change high need schools” which includes scholars who had left one high need school for another; and (c) “administration” which includes scholars who had left teaching to pursue administration in high need schools. These end points are treated similarly as they are all related to retention in high need settings and scholars in these groups seemed influenced by similar categories, however, some differences between these groups are described in this section. Each of these groups of scholars were analyzed to determine relationships between (1) the reasons they had chose teaching as a career; (2) the reasons they chose where to teach, and (3) their eventual retention. Thus, much of the analysis involved studying within the groups of scholars just mentioned for trends related to why they chose to teach and where they chose to teach and if there were differences between the scholars who had stayed in high need settings versus those who left high need settings or left teaching completely or reported that their future plans included leaving high need settings. Due to the inferential nature of this portion of the analysis, few direct quotes are presented in the following section.

As can be seen from the model, the third super-category “remain teaching in high need settings” was highly influenced by a variety of other components on the model. This

section will describe the influences on retention starting from the left side of the model and moving to the right. Then, the end points “change high need schools” and “administration” are described.

Relationship between Super-Category One: Choosing Teaching as a Career and Super-Category Three: Remain Teaching in High Need Settings

Two main categories from the “choosing teaching as a career” super-category seemed related to retention in high need settings. They were “desire to make a difference” and “desire to give back.” This is represented on the model by lines connecting these categories with “remain teaching in high need settings.” All of the scholars who expressed the “desire to give back” were in high need settings beyond Noyce program requirements, and one had pursued administration. This suggests that scholars who had personal experience in high need settings in their backgrounds were likely to remain in high need settings.

Emma was a scholar who had taught for a few years, then pursued another career and eventually returned to teaching. She expressed both the “desire to give back” and the “desire to make a difference” in her decision to become a teacher again and she also reported how those sentiments motivated her to remain in high need settings despite challenges:

The thing, well, having previous experience in teaching, and then coming back, and being that, you know, the type of child is different, but the situations are somewhat similar. In other words, there’s still, the parental part is still important, the classroom atmosphere is still important. Having students make applications to everyday life, text to text, text to self, text to, you know, world, still important. Why science is a way of decreasing this gap between minority students and others. You know, so those are the

same issues as years ago, that hasn't changed. The type of student changed only because we lost something along the way. So you know, to, coming in and going wow, this is still here, this is still important, that's natural, then, that becomes ok. I can do this. Trying to understand the type of kids you have, and not being judgmental, you come to me as you are and we work out if we have a difference. You know, and then modeling, you have to model certain types of behavior. There are anti-social students, they have to understand that this is anti-social, this is anti-social behavior, and these are the consequences. And sticking firm, and fair, you know. My advice today now is you need the courage to care, otherwise you're going to be scared.

The "desire to make a difference" category was almost equally represented among the scholars who remained in high need settings and those who left. However, the scholars who expressed the "desire to make a difference" because of dissatisfaction with their previous career, seemed to be more prominent among the scholars who were teaching in high need settings beyond Noyce program requirements. Thus, it appears that the "desire to make a difference" is not directly related to retention in high need settings; however, if the impetus for that desire is dissatisfaction with past work experiences, this could be an indication of retention in high need settings.

It is worth noting that "family concerns," "educational role models" and "content preparation" did not seem directly related to the third super-category "remain teaching in high need settings." Therefore, it is difficult to draw any conclusions about the retention of the scholars who suggested they entered teaching for reasons related to these categories.

Relationship between the Noyce Funding and Super-Category Three: Remain Teaching in High Need Settings

Regarding the relationship between the Noyce funding and retention in high need settings, it does appear that the funding has some bearing on scholars' decision to remain teaching in high need settings. For example, Cindy reported on how the Noyce funding affected her decision to stay in teaching and teach in a high need school, "...and because I got the Noyce scholarship I *had* to teach for a couple years... now I'm in my fourth year. So I started teaching because of the scholarship I and I just stayed with it." Only one of the interviewed scholars (with the exception of those who had not completed their teacher education program or were currently meeting Noyce program requirements in high need settings) left high need settings prior to meeting Noyce program requirements. However, some left teaching completely or left teaching in high need settings for low need settings after meeting Noyce program requirements in high need schools. Thus, the relationship between the Noyce funding and remaining in teaching in high need settings seems high during the time when the scholars were teaching to fulfill the requirements of the Noyce program, but lower after that time. Therefore, the relationship between "Noyce funding" and "remain teaching in high need settings" is indicated by a dashed line on the model.

This relationship is also weak because of the scholars who reported that the Noyce funding was very influential in "choosing teaching as a career;" half had either left teaching or left teaching in high need settings. This suggests that other influences on "choosing teaching as a career" could be more important in eventual retention than the

Noyce funding and that retention may not be positively affected for scholars who report being strongly influenced to enter teaching because of the Noyce funding without other stronger influences.

Relationship between “Teacher Education Program” and Super-Category Three:

Remain Teaching in High Need Settings

As mentioned previously, both “preparation for high need settings” and “support” from teacher education program seemed related to retention in high need settings. As this has already been described, it will be summarized here. Scholars who reported higher levels of intensive preparation for high need settings seemed to be more likely to remain in high need settings beyond Noyce program requirements than scholars with little or no preparation for high need settings. Additionally, scholars who reported higher levels of support, particularly from faculty and cohort members both during and after their teacher education program, seemed more likely to remain in high need settings beyond Noyce program requirements. A key component of the support was the continuation of supportive interactions once the scholars had completed their teacher education program and were on their own, teaching in high need schools.

Relationship between Super-Category Two: Choosing Where to Teach and Super-

Category Three: Remain Teaching in High Need Settings

The main categories from the “choosing where to teach” super-category were related to retention in high need settings. They were “community/location” and “school setting.” “Community/location” was highly related to retention for scholars who stayed in

teaching in high need settings and this is represented by a line between “community/location” and “remain teaching in high need settings.”

Analysis indicated that the “community/location” property of “familiarity with community culture” played a role in scholars’ decisions to remain in high need schools/districts. For example, when asked how long she planned to stay in her high need school, Celeste reported, “I’ll probably teach at [community] forever... Well, I grew up in [community], so it’s my hometown.” Conversely, Paul, who was teaching in a state very different from his home state reported difficulties he experienced in working with his colleagues and administration that were related to “cultural” differences. Therefore, it appears that scholars who had established roots in their community of residence and community where they were teaching as well as those who were familiar and comfortable with the “culture” of the area were more likely to remain teaching in their high need school/district.

It is worth noting that in general the school setting was not the sole influence on why the scholars chose to stay or leave their particular setting. “School setting” combined with other categories seemed to influence retention and this will be described next. Although most of the categories related to the “school setting” which were highly related to retention have already been described, they will be summarized here. For example, support from “colleagues” and “administration” seemed strongly related to retention. For example, when asked what factors would influence her staying or leaving her current high need setting, Renee reported on many aspects of support:

Um, you know, a lot of it is my coworkers and the amount of help and support I have there at the district. They are really good at getting us anything we need. [Inaudible] have been wonderful, they are really easy to work with. The parents, at least the ones that I have interacted with, have been supportive.

As already described in this chapter, “support” within the school setting was highly related to job satisfaction which was highly related to retention in high need settings. In addition to “support,” “leadership positions” and “classes taught” were also important for job satisfaction and eventual retention in high need settings. Refer to the “school setting” section of this chapter for further details on these components.

End Point: “Change High Need Schools”

As mentioned, scholars who had changed from one high need school to another shared many characteristics and influences with scholars who had remained in high need settings beyond Noyce program requirements and had not changed schools. However, it is worth describing some of the reasons why these scholars reported changing schools. The “school setting” was a strong influence for this group of scholars and this is shown by a line connecting “school setting” with “remain teaching in high need settings” and then a line connected to “change high need schools.”

The aspects of the “school setting” which seemed to be related to retention for this group included “support” and “community/location.” For example, analysis indicated that scholars who lacked “support,” generally from administrators, but had established roots in their community/location or were teaching because of a “desire to make a difference” or “desire to give back” were more likely to change from one high need school to another. This is represented by a line connecting “support” with “change high need

schools” on the right side of the model. In fact, almost all of scholars who had changed from their high need school/district cited lack of support from administrators as the key reason for leaving their position. For example, Amy, who had entered teaching because of “dissatisfaction” with her previous career and a “desire to make a difference” reported that she changed from one high need school to another because her administrators did not provide general, academic and disciplinary support:

There was really poor administration—not dealing with a lot of the concerns we had. I worked with an amazing team of people. There were five of us in this departmental setting and it was an amazing team of people and four of us, we all left at the same time. Um, so it was kind of a group decision that we had made. But the administration really wasn’t receptive to a lot of the ideas that we were trying to implement and a lot of the programs we were hoping to put into place. And there wasn’t a lot of support in terms of some discipline issues that we were having, they weren’t handling in a really good manner, as well as some special ed. needs that weren’t being dealt with. We kind of felt like we hit a wall with what we could do there. We all left.

Thus, Amy indicates the nexus between the “choosing teaching as a career” super-category, “school setting” and the “remain teaching in high need settings” super-category. This nexus is also evident in the scholars who pursued “administration” and will be described next.

End Point: Administration

All of the scholars who had left teaching to pursue administration were still in high need settings and they had many similar characteristics and influences on their decisions with the scholars who remained in teaching in high need settings beyond Noyce program requirements. It is worth noting that this group of scholars was very small and findings are highly tentative. The tentativeness is represented on the model by dotted or

gray lines connecting model components. Three main areas seemed related to the end point of “administration:” within the “school setting,” previous “leadership positions” held while teaching seemed related to the desire to pursue administration and within the “choosing teaching as a career” super-category, the “desire to make a difference” and the “desire to give back” categories were related to pursuing “administration.” These influences are shown by a dotted line connecting “leadership positions” and “administration” on the lower right side of the model and lines connecting “desire to make a difference” and “desire to give back” with “administration” on the bottom half of the model.

Other End Points: Leaving the Pathway to Retention in High Need Settings

The next sections of this chapter will describe the different end points related to leaving the pathway to retention in high need settings and the categories which appeared to be related to these end points. In the upper-right portion of the model the end point “leave high need settings, but remain teaching” is represented, while on the bottom of the model the end point, “leave teaching” is represented.

End point: Leave high need settings, but remain teaching. Only a few of the scholars interviewed had left teaching in high need settings for low need settings and only a few others reported planning to do so in the future, thus findings in this section are highly tentative. However, the interview protocol did probe for reasons the scholars who were still in high need settings could envision themselves leaving those settings. The two main reasons why the scholars reported leaving teaching in high need settings for low need settings or foreseeing themselves changing school setting were “family” and

“community/location.” A line directly between “family” and “leave high need settings, but remain teaching” represents this. In fact, “family” and “community/location” were closely intertwined which is represented by lines connecting “family” with “community/location” and “leave high need settings, but remain teaching.” For example, Mark reported how both “family” and “community/location” influenced his decision to leave his high need school for a low need school:

Yeah, I mean, it was basically my wife—or, well, two things: to work on a master’s, and so we wanted to move to [community]. And that’s where my wife lived, see the community where her parents live, that’s where we wanted to live. There’s just—it’s not really a high needs area. So it wasn’t so much moving away from that, it’s just where we moved, it’s not really a high needs area.

Some scholars could envision themselves leaving high need settings due to a change in their family status. This is represented by “children/marital status” next to the “family” category in the upper-left portion of the model. For example, when asked how long she envisioned herself staying in her current high need school, Cindy reported that she planned to stay in her high need setting for a few years unless changes in her marital status warranted a change:

...it would probably be, if I relocate somewhere else in [state]. I want to stay in [state], I’ve lived here all my life, I want, I know I’m going to stay here. My thing would be, if I get married, and my husband decides to move somewhere else in [state], then I’d probably relocate.

Her response also indicates the nexus between “family,” “community/location” and “leave high need settings, but remain teaching.” It also appeared from analysis that scholars who had reported entering teaching because of concerns related to their “family” were more likely to “leave high need settings, but remain teaching” than scholars who

reported entering teaching for other reasons such as the “desire to give back.” For example, Mindy was a single parent who had entered teaching due to the financial motivations to support her children and she also reported leaving her high need setting for a low need setting. Penny also reported leaving her high need setting for a low need setting due to the desire for job flexibility because of responsibilities related to her children. This is represented on the model by having “convenience” and “children, marital status” extend from the “family” category and a connection between those two components. In fact, all the scholars who had left teaching in high need settings for low need settings had reported entering teaching for reasons related to their family. However, because this group was so small, the relationship directly between “family” and “leave high need settings, but remain teaching” is represented by a dotted or gray line as the relationship is tentative.

End point: Leave teaching. As with the previous category, only a few scholars had actually left teaching, thus findings about this category are also weak. This is represented by mostly dashed lines on the model connecting other categories with “leave teaching.” However, the interview protocol also probed for the reasons the scholars who were currently teaching could foresee themselves leaving teaching, so those responses were also included in the analysis. The main areas which related to scholars’ decisions to leave teaching or leave teaching in the future included the categories of “family” and “previous career” within the “choosing teaching as a career” super-category. Within “previous career,” the property “seduced into teaching” seemed related to leaving teaching. Also important for scholars’ decisions to leave teaching was the “school

setting” category, with the properties of “support,” “classes taught” and “leadership positions” emerging as important for job dissatisfaction and attrition.

Regarding the category of “family,” some scholars reported that moving due to a spouse’s career was related to them not teaching any longer. These scholars often expressed that they had not intended to leave teaching or teaching in high need settings, but that family changes took precedence over their desires to continue teaching. For example, Lucy, who moved because of the relocation of her spouse’s job, reported on the reasons she left teaching:

I would like to add or emphasize that the leaving of the high needs classroom, which I know is the focus of the Noyce, was in no way related to the Noyce program or my teaching prep program or anything else. It was totally a family decision...I was very happy and hope I will go back into a position like that.

In examining the reasons the scholars who left teaching or envisioned themselves leaving initially chose teaching as a career, it was interesting to note that many were “seduced into teaching” through past work experience. For all scholars who met this criterion, none had held full-time work prior to entering teaching, but many reported that they had experience as a part-time graduate teaching assistant which seduced them into teaching. Thus, it appears that being “seduced into teaching” through graduate teaching assistantships may not contribute to retention in high need settings.

Only two scholars reported leaving teaching for reasons other than “family” and relocation due to “family,” and their reasons pertained generally to aspects of the “school setting.” It is worth noting that findings from this section are highly tentative due to the small number of scholars. Neither scholar who had left teaching seemed to have a support

network from any source. In other words, for both scholars, lack of “support” overall, both from the teacher education program and the “school setting” were related to their reasons for leaving teaching. Lack of support was generally coupled with other issues related to job dissatisfaction in the school setting, such as student behavior, course teaching assignments that did not appeal to the scholars and being overwhelmed by leadership positions. Leslie reported that lack of disciplinary support from administration, connected with dangerous student behavior affected her decision to leave teaching. In summary, it appears that relocation due to family changes and lack of support coupled with school setting issues affecting job dissatisfaction were related to scholars’ leaving teaching.

Chapter Five, Discussion and Implications

Review of the Study Purpose

As described in Chapter One, the purpose of this study was to address the lack of integration of current understandings of the relationships between recruitment, teacher education, financial incentives and the school environment on the career paths and retention of mathematics and science teachers in high need schools. Although many large-scale studies have investigated who enters teaching and their motivations for doing so, few studies exist which combine personal and contextual influences together to understand teachers' career paths.

Researchers have begun to herald the call for more nuanced investigations and a small body of research about the influences on teachers' career paths has emerged in the past 10 years. However, there is much work to be done to more fully understand the choices teachers make during their careers. Additionally, extensive financial investments have been made by federal, state and local agencies to attract and retain qualified teachers, but little is known about the effectiveness of such policies, other than salary increases.

It is imperative to attract and retain well qualified teachers to high need schools, as teachers play a primary role in equalizing educational opportunities for all students. However, effectively recruiting and retaining quality teachers to high need schools requires that researchers, policy-makers and school officials have a better understanding of why teachers make the choices that they do throughout their careers. The experiences of Noyce scholars in becoming and remaining teachers in high need schools provides a

good example for the study of teachers' career paths and therefore, this study was guided by the question: What are Noyce scholars' reasons for the decisions made on the career path of becoming and remaining teachers in high need schools? Grounded theory methodology was used to analyze the interviews of 38 Noyce scholars in an attempt to shed some light onto the decisions made by Noyce scholars and how those decisions influence their careers over time. The major findings can provide new directions for research as well as directions for more effective policy and teacher education.

This chapter will begin by highlighting the main findings from this study and how they are situated within current research. Then, I will discuss possible lines of future research on science and mathematics teacher career paths in high need schools which emerged from this study. I will briefly discuss policy implications for financial incentive programs such as the Noyce program and conclude with a discussion of implications of the findings of this study for teacher education programs.

Discussion of Major Findings

The major findings from this study supplement the existing research base and shed some light on areas that are currently lacking in empirical support. In this section, I highlight and comment on substantive findings from my study including the complexity of teachers' career paths, the importance of who enters teaching, the important role of geography in teacher career decisions, and the desire for professional growth and convenience in a career. I then juxtapose my findings with the literature on the role of financial incentives and teacher education on teacher career paths and decisions as both of these areas currently have little empirical support.

Complexity of Career Paths

This study and the model that was developed indicate that the scholars' career paths and the influences on their paths were highly complex. The emergence of the three super-categories suggests that there are three main time frames and decision points on the pathway to retention in high need schools. The first time frame includes the decisions involved in choosing teaching as a career. The second time frame includes choosing where to teach and the last time frame involves the decision to remain teaching in high need schools. As the analysis indicated, the decisions involved at these different points in time all interact to have an influence on retention. The reasons that lead the Noyce scholars to choose teaching as a career interacts with the reasons guiding where they chose to teach which interacts with whether they decide to remain teaching in high need schools. It appears that reasons influencing these three main time frames act in concert to contribute to the decision to stay or leave teaching in high need schools, and that one area alone can not be considered sufficient to determine who will remain in teaching in high need schools.

My study extends the existing research base in that it brings together the multiple areas of influence on teachers' career paths and represents them on a single, complex model. Much of the past research has investigated influences singly, (for example, the relationship between collegiality and job satisfaction; e.g. Ingersoll, 2001; Kirby et al., 1999) without noting how the different areas may be interconnected. This study resulted in a rich model which provides a more comprehensive, nuanced and complex understanding of teacher career decisions and paths over time.

Chapman's (1983) model of teacher attrition and the factors that influence it highlighted the fact that the research base has pointed to a complex career path for some time. As my model and Chapman's indicate, personal characteristics such as background and previous career have an influence on career paths and possibly retention. Additionally, Chapman pointed out the importance of initial commitment to teaching. The findings from my study suggest that the scholars in my study had varying levels of commitment to teaching and teaching in high need schools and that the different levels of commitment could influence their retention in the profession. My model and Chapman's model both agree on the importance of "external influences" or the school environment and integration into the teaching/school community through supportive administration and colleagues.

However, my model differs from Chapman's (1983) in that he emphasizes educational preparation equally with other influences on attrition. My study indicated that educational preparation in terms of teacher education had little impact on the scholars' career decisions, especially when compared to other influences. Most of the decisions made by my participants were influenced by other factors such as background, geography, professional goals and family concerns.

The review of literature also indicated that the research community has long recognized the variety of influences on teachers' career paths. For example, studies such as Broughman and Rollefson (2000) and Kirby, et al. (1999), which investigated the role of demographics such as gender and minority status, point to the importance of a teachers' personal characteristics on their career decisions. The literature is replete with

studies suggesting that personal characteristics (gender, minority status, marital status, age; see for example, Hanushek et al., 2004; Stinebrickner, 2002), preferences for certain geographic regions (e.g. Boyd et al., 2005a), and the school environment (e.g. Farkas et al., 2000; Stanford, 2001) have an influence on teacher attrition. My study also supports these various areas and suggests that they played a role in the scholars' career decisions.

More recent work has started to recognize the complexity and interconnectedness of teacher career decisions. For example, Rinke (2007, 2009) noted the complexity of urban science teachers' career paths. Upon analyzing the case study data of her participants, she added "entry into teaching" to her conceptual framework as it emerged as playing an important role in her participants' career decisions. Similarly, in my study the reasons the scholars chose to enter teaching seemed to have a strong bearing on their future career decisions and could possibly influence their retention.

The Importance of Who Chooses Teaching as a Career

The importance of the motivation for teaching on career paths and retention was also evident in my study. Many (e.g. Lortie, 1975; Moran et al., 2001; Richardson & Watt, 2008; Wilson et al., 2004) have suggested that most teachers enter the teaching profession for altruistic or service-oriented reasons. My study corroborated these findings in that the desire to make a difference or give back to the community through teaching in high need schools was prominent. However, my study illuminated that altruistic motivations, although often lumped together in the research literature, can be parsed out into more nuanced reasons which can have an impact on career paths and retention.

Particularly, it was an interesting finding that some scholars were motivated to become teachers because they wanted to make a difference, while others wanted to give back. The “make a difference” group seemed more likely to want to contribute to education in high need settings or contribute to children’s lives by entering a community and environment different from their backgrounds. However, the scholars who were motivated by wanting to “give back,” were often from high need environments themselves and wanted to work to influence students with backgrounds similar to their own. My findings suggest that the scholars who were motivated to make a difference were not more or less likely than anyone else to remain in teaching in high need schools, while those who were motivated to give back seemed more likely to remain teaching in high need schools.

Some studies have suggested that those who enter teaching for altruistic reasons may be more likely to remain teaching than those who enter for extrinsic reasons (e.g. Moran et al., 2001). Additionally, Watt and Richardson (2008) noted that those who were motivated by intrinsic rewards or for reasons related to social utility had higher “planned persistence” than other teachers in their sample. My study extends these findings and suggests that within the group of teachers who want to teach for altruistic reasons, different sub-groups may have different rates of retention and longevity in the profession. Separating different altruistic reasons for entering teaching may be important for further understanding teacher career paths and retention.

The importance of the early career decisions of teachers was also noted by Chin and Young (2007) and some of their findings on teaching candidates in alternative

certification programs are relevant to my study's findings. Both studies noted the importance of a myriad of influences on why people become teachers. For example, my model and their "compatible lifestylers" groups indicate that many people who are married and have children pursue teaching at least partially because they believe it is compatible with their lifestyle and personal priorities. Chin and Young noted the "compatible lifestylers" may not have realistic impressions of the teaching profession and my model suggests that they may not have much longevity in high need schools or the teaching profession either. Additionally, combining the findings of our studies suggests that not only do different groups pursue teaching for different reasons, beyond age, gender and ethnic classifications, but that these motivations can have implications for retention.

Previous career also seemed to have some bearing on the scholars' career paths and in particular, many were motivated to enter teaching because of dissatisfaction with their previous career or because they were seduced into teaching through teaching-related experiences. The motivation of career changers to pursue meaningful work was noted by Lerner and Littleman (2002), however they did not comment on how this motivation might relate to career decisions beyond entry into teaching. In my study, it appears that those who entered teaching because of dissatisfaction related to their previous full-time career and a desire for more meaningful work may be more likely to remain in teaching in high need settings than those who were seduced into teaching. Often, those who were seduced into teaching had held part-time work as graduate teaching assistants or through other informal work in schools and it could be that these limited opportunities gave the

scholars an unrealistic perception of teaching. This could be particularly true for scholars who only had experience teaching or tutoring at the post-secondary level and raises the question of whether enjoyment of teaching at this level is a good indicator of future satisfaction in K-12 education. Salyer (2003) and Chambers (2002) also noted that some career changers have unrealistic perceptions of the work involved in teaching and it could be that some of the scholars in my sample (the ones who were seduced into teaching) were more likely to be dissatisfied with their work and possibly leave high need schools. My study further illustrates that the motivations for teaching are important for teachers' career decisions, career paths and possibly retention.

Additionally, it was interesting to note that many of the career changers in my sample, who held previous full-time positions, often pursued alternative certification routes. This is nothing new to the literature base as Salyer (2003) and Guarino et al. (2006) noted that alternative certification programs often appeal to nontraditional teaching candidates. However, it could be that the enhanced retention rates of alternative certification programs as noted by Guarino et al. could be related to the sub-group of career changers within those programs. Haggard et al. (2002) concluded that career changers are less likely to move because of greater life stability and existing family and financial commitments. The finding that the career changers in my sample were more likely to remain in teaching in high need settings could be related to these reasons as well although future studies are needed to support this conjecture.

The Role of Geography

The role of geography in scholars' career decisions was evident as it has been in other studies (Boyd et al., 2005a). Boyd et al. concluded that most scholars took teaching jobs within 40 miles of their hometowns and that they preferred to teach in schools similar to where they were from in terms of urbanicity. My study adds to their findings in that the scholars in my sample who worked in high need schools near where they lived or had established roots seemed more likely to stay in high need schools. However, the few scholars who had relocated to meet Noyce program requirements reported that they were planning to leave their high need environments for other settings. Therefore, it does not appear that financial incentives such as the Noyce program provide a strong enough impetus to overcome the geographic preferences of teachers.

It does appear that financial incentives such as the Noyce program may be influential in overcoming teachers' urbanicity preferences. For example, my findings suggest that the Noyce program was somewhat effective in encouraging individuals to teach in high need schools as many scholars reported that they were nudged to look for teaching jobs in high need environments because of the Noyce funding. Although they tried to meet Noyce program requirements by staying close to where they had established themselves, they nevertheless were willing to take teaching jobs in high need schools even if it meant a longer commute. Prince (2003) suggested that it is possible that financial incentives may be influential in drawing teachers to schools they might not have considered otherwise and my study indicates that this may be true. Therefore, it appears that financial incentives such as the Noyce program may be influential in overcoming

urbanicity preferences, but not generally influential in overcoming larger geographic preferences.

The Importance of Professional Growth

My participants regularly spoke of the importance of professional growth in their career decisions. They desired to be challenged in their work, either through leadership positions or an appropriate match of the courses they taught to their skills and content preparation. Others (Draper et al., 1998; Quartz et al., 2008; Rinke, 2007, 2009) have also noted the importance of teachers' professional priorities and desire to be challenged and how their priorities affected their career decisions. It appears that my findings, along with these other studies, suggest that many teachers desired to grow professionally. For some, if they felt they were no longer growing or could no longer advance in their career, they would consider other career options either inside or outside of education. Costigan (2005) and Nieto (2003) also support the importance of professional growth and intellectual fulfillment in career decisions.

However, Ma and MacMillian (1999) suggested that feelings of professional growth and challenge were developmental over teachers' careers; beginning teachers were more likely to be satisfied with how they were professionally challenged in their work, while more experienced teachers were less satisfied with how their work professionally challenged them. It is possible that since my sample contained early career teachers with less than six years of experience, they may have been satisfied with their professional growth for developmental reasons, and had yet to experience discontentment that occurs later in the teaching career. It is possible that the desire for challenging work

may in fact lead to discontentment in the future and possibly result in changing roles in the school or leaving teaching entirely.

Some studies have suggested that a desire for a greater sphere of influence leads many teachers outside of the classroom to non-teaching education roles (Olson and Anderson, 2007; Quartz et al., 2008). Although most of the scholars in my study were early career, a few who moved into administrative roles after teaching a short time did express the desire to have a greater sphere of influence. Olson and Anderson's study also noted that many of their participants saw themselves as moving into other realms of education to better meet their professional goals and achieve social justice to a greater degree. Olson and Anderson commented that as UCLA's program is highly selective in whom it accepts and therefore trains, it may be because of selection bias that many of their graduates move out of the classroom; in other words, the program inherently selects individuals capable and desirous of roles extending beyond the classroom. Quartz et al. (2008) further found that UCLA's graduates were very likely to change roles into non-teaching capacities because of social justice commitments. This raises the question as to whether the Noyce programs' emphasis on high need schools and selectiveness of scholars may lead to selecting and awarding scholars who will be likely to move out of teaching as well. Although only a few scholars in my sample changed roles, future longitudinal studies could investigate whether Noyce scholars, like UCLA's teaching candidates, tend to move into non-teaching roles and what motivates this change.

It appears that financial incentives to entice people to enter teaching cannot overcome the long-term desire for differentiated responsibilities that will allow for

continuous growth and challenge. In fact, Thomas (2005) pointed out that changing roles is often encouraged by administrators and colleagues who see leadership potential in a successful teacher and is a form of “sanctioned attrition.” A number of researchers (e.g. Cochran-Smith, 2004; Costigan, 2005; Margolis, 2008; Olson & Anderson, 2007; Quartz et al., 2008; Rinke, 2007; 2009) have highlighted the importance of providing differentiated roles for teachers to entice them to remain in the classroom. For example, Margolis concluded that teachers with 4-6 years of experience desired “regenerative” and “generative” roles as teachers; they wanted to keep learning about teaching, pedagogy and students. They also wanted to expand their influence beyond the students in their own classroom. Some of the most highly satisfied scholars in my sample were those who had opportunities, either as administrators, science/mathematics coaches or professional development leaders, to expand their sphere of influence. These roles also kept the scholars continually learning as they were challenged in new situations and roles.

Quartz et al. (2008) suggested providing communities of practice as a means to increase teacher professionalism and encourage teachers to remain in the classroom. They suggested finding ways to enhance teachers’ responsibilities and influence with their colleagues through informal routes rather than formal routes which would involve leaving classroom teaching. Cochran-Smith (2004) commented on the importance of professional growth for retaining today’s teachers:

To stay in teaching, today’s—and tomorrow’s— teachers need school conditions where they are successful and supported, opportunities to work with other educators in professional learning communities rather than in isolation, differentiated leadership and advancement prospects during the course of the career, and good pay for what they do (p. 391).

However, the emphasis on professional growth and role differentiation raises the question as to whether differentiated roles will indeed keep teachers satisfied in the long-term or eventually lead to burn out. With added roles comes added time investment and there may be a fine line between what is enough to satisfy teachers without overwhelming them. In my sample, two scholars spoke of being overwhelmed by their early leadership roles; perhaps having too many roles or too important roles early in one's career is more detrimental than beneficial for their retention. The impact of role differentiation on teachers' job satisfaction, while often recommended in the literature, is in need of additional empirical support.

Convenience in Career Decisions

Other areas emerged from analysis as having no relationship to retention in high need schools, although relationships may be determined in other research studies. For example, scholars who entered teaching because of financial reasons or concerns for their family did not seem more likely to stay in teaching in high need settings than other scholars. It appears that changes in family circumstances (e.g. moving due to spouse's occupation, marriage, birth of a child) were possibly related to leaving teaching in high need settings or leaving teaching entirely. This finding has been extensively supported in the literature (e.g. Borman and Dowling, 2008; Lortie, 1975; Stinebrickner, 2002) and despite cultural and familial changes over the past 50 years, personal influences continue to play a strong role in teachers' career decisions.

In looking holistically at what influenced some scholars' decisions on their career paths, it appears that many scholars held the notion that teaching was a convenient career. For example, it seemed that some scholars entered teaching because it was convenient for their family or current life situation, took teaching jobs in areas that were convenient for them to travel to and from. Then, when it was no longer convenient, they considered leaving or in fact left teaching or high need schools. Others have noted similar motivations for teaching; Lortie (1975), for example, included material benefits and time compatibility in his list of attractors to teaching and Moran et al. (2001) found that favorable working conditions were motivations for some individuals to become teachers. However, Moran et al. suggested that such extrinsic motivations were not strongly related to career choice and also commented that people who pursue teaching for these reasons may be less likely to remain teaching than those who are motivated by altruistic or service-oriented desires. The finding that some scholars perceived teaching as a convenient or compatible career may hint that some of the scholars may not have accurately perceived the realities of life as a teacher, and specifically teaching in high need schools. For example, a few scholars did not want to live in districts with high need schools because of the cost of living in urban area, or wanting their children to attend non-high need schools. Another scholar found that the schedule of her high need school was incompatible with her child's school schedule in another district. Due to the incompatibility of their careers in high need schools with their desires for where to live and children's education, some either left teaching in high need schools for low need schools or reported that they planned to do so in the future.

The Role and Implications of Financial Incentives

The role of financial incentives, such as the Noyce program, on teacher career paths is an area in need of much research. My study provides some interesting findings regarding how loan forgiveness/scholarship programs influence teacher career paths. For example, my findings suggest that the Noyce program had some influence on the early career decisions of the scholars in my study such as choosing teaching as a career and where to teach. This finding supports Bradley and Loadman's (2005) and Goldberg and Proctor's (2000) findings that loan forgiveness programs were somewhat influential in attracting individuals into teaching and specifically urban environments. Abell et al. (2006) found that specifically the Noyce program was somewhat influential in attracting individuals into teaching. In addition, Peske et al. (2001) found that many participants recommended loan forgiveness programs as a way to entice individuals to enter teaching.

However, Bull et al. (1994) found that scholarship programs often attracted individuals who were already committed to teaching. Liou et al. (in press) also found that scholarship recipients of programs to attract individuals to teaching and high need schools actually influenced recipients in two ways. It was perceived to both help the recipients complete their certification and influence them to teach in high need schools. My study further supports this finding in that most of the scholars in my sample reported that they decided to become teachers and then sought out the Noyce funding to finance their teacher education. Therefore, the program appears to be supporting two types of individuals; those with a natural inclination toward teaching and those who were enticed to become teachers because the Noyce program made it a feasible and more attractive

career option. Chin and Young (2007) also noticed that alternative certification programs enticed people to try teaching as a career and labeled that group “career explorers.”

The retention of “career explorers” or those who were enticed into teaching by the Noyce program is questionable, though my study does not provide definitive findings regarding the longevity of such individuals in teaching or high need schools due to the small number of scholars who fit this criterion. However, of those who suggested they were trying teaching as a career and were highly influenced by the Noyce program to enter teaching, half had either left high need schools or teaching entirely and some of the remaining were very uncertain about their future in education. Despite this, all of the scholars who were currently teaching or had taught and then left, taught in high need schools for two years. This raises the question as to whether attracting new teachers to high need schools and having them stay for only two years is of practical importance for improving the school and student achievement. Rivkin et al. (2005) suggested that years of teaching experience do matter for student achievement, and my study raises the question, is attracting highly qualified teachers to high need settings for the short-term of value compared to attracting committed teachers who may be less qualified, but may stay longer? As the Noyce program seems effective in encouraging teachers to teach in high need schools for at least two years, is a two-year teaching career making a practical difference for the schools and children where the scholars teach?

This raises the importance of “commitment” in attracting teachers to high need settings. As Coladarci (1992) and Day et al. (2005) suggested, teachers’ commitments to education and high need schools matter in terms of retention; thus, selecting and

awarding scholars with strong commitments to teaching and high need schools should be emphasized during recruitment, perhaps even more so than other recruitment and selection criteria. Furthermore, Robinson, Paccione, and Rodriguez (2003) suggest that recruiting individuals with a commitment to social justice and equity is important, rather than trying to change individuals without those commitments. Therefore, the Noyce program may not be influencing retention in high need settings if the initial commitments of scholars were not to teaching in high need schools or even to teaching in general.

This issue also raises the question as to whether financial incentive programs should be attempting to attract individuals to teaching who may not have otherwise considered it as a profession if such individuals may not be likely to remain teaching in high need settings. Although programs such as the Noyce program may attract high quality teaching candidates (e.g. those with majors in the subject area they intend to teach), if they do not remain in schools very long, is it a worthwhile investment or will it simply contribute to the high rates of teacher attrition? My study does not answer these questions, but suggests that further research on financial incentive programs is needed to more effectively guide policy on the recruitment and retention of teachers to high need schools.

Teacher Education Programs

The role of teacher education programs on the scholars' career paths was not very strong when compared to other influences such as motivations for teaching, background characteristics and school environment. However, two areas did emerge as important features of teacher education programs which may contribute to teacher career paths and

eventual retention. First, it seemed that scholars, who had experiences in high need schools, either in practicums or student teaching, or coursework related to working in high need schools, were more satisfied with their jobs in high need schools or seemed more likely to stay. This supports Sleeter's (2001) finding that community-immersion experiences were valuable for preparing White teachers for diverse schools. Quartz et al. (2004) also concluded that specific preparation for high need environments, such as not focusing on deficits of students and schools in high need environments and helping preservice teachers see themselves as "change agents" for students in high need schools may be valuable in preparing and retaining teachers in these settings. Roellke and Meyer (2003) also noticed the benefit of an emphasis on urban experiences during undergraduate preparation for their participants' job satisfaction once they began teaching in urban schools. My study extends the literature in this area by supporting the notion that experiences in and training for high need schools is not only valuable, but may also contribute to teacher longevity in high need schools.

Secondly, scholars who completed their teacher preparation as a member of a cohort were quite positive about their experiences and reported that the cohort played an important role in providing professional and personal support. This supports previous findings about the valued role of cohorts both during teacher education programs and once teachers enter the classroom (Fox & Singletary, 1986; Jorissen, 2003; Knauth & Kamin, 1994). My analysis indicated that the scholars who completed their teacher education programs as part of a cohort also seemed more likely to be satisfied with teaching in high need schools and more likely to remain teaching in high need schools.

Alkins et al. (2006) also noted the role of faculty support in addition to cohort support. They suggested that the university partnerships formed with faculty and cohort members during the preparation phase persisted during the novice phase of teaching and resulted in ongoing and valued support. One scholar in my study reported that graduate coursework taken during her first year provided her with an opportunity to network with and discuss her first-year struggles with other new teachers. Roellke and Meyer (2003) noted that university support in the form of graduate courses was also important and it may be that such courses act as an informal place of support for new teachers in addition to a place to learn more about teaching. Although preparation for high need environments and support from teacher education programs alone do not appear to have a strong influence on the scholars' career paths, they appear to have effects through interaction with the other components of my model, and therefore it does appear that these measures can contribute to job satisfaction and possibly retention in high need schools.

Contribution to Future Research

Perhaps the most significant contribution of this study is the implications of the findings, in particular the model, for future research. The model almost poses more questions than answers in regards to science and mathematics teacher career paths in high need schools. Since the model represents the early career paths and decisions of 38 individuals, specifically Noyce scholars, who were trained to become mathematics and science teachers in high need schools, the generalizability of the findings to a larger population is limited. However, the findings can be used in future research as the proposed relationships can be tested in larger studies or with different groups of teachers.

For example, future studies can investigate how motivations for entering teaching are related to where individuals choose to teach and whether they remain in or leave teaching in high need schools. Are individuals who are motivated by the desire to “give back” more likely than others to choose to teach in high need schools, even without the influence of a financial incentive program such as the Noyce program? For individuals who are motivated to enter teaching because they are seeking a particular lifestyle for themselves and their families, what types of environments are they most satisfied with and most likely to remain in for the long-term?

The career paths of career changers are also interesting and a large body of research exists on who career changers are, and their motivations for teaching and how to best prepare them for the classroom, but less is known about what influences them beyond entry into teaching. Therefore, the relationship between career changers who left their work because they were dissatisfied, completed alternative certification programs and then entered schools is an interesting pathway. The pathway raises the question, is this group different from those who entered teaching because they were seduced into teaching through previous teaching-related experience in schools (such as a tutor, graduate teaching assistant or paraprofessional)? What does one’s orientation toward a previous career mean for how one is influenced by the school environment and then decides to stay or leave teaching? Are people from particular career backgrounds more likely to be satisfied in teaching in high need schools than people from other backgrounds? More detailed studies can further investigate the decisions and influences of people who pursue teaching because they were dissatisfied with their former careers

and desired to “make a difference” and how those decisions interact with their experiences in their teacher education programs and their school environments once they begin teaching. Other Noyce scholars were dissatisfied with their previous career because they wanted more meaningful work, or work that was socially rewarding, and how these motivations influenced their later career is also interesting. These are some of the many proposed pathways in my model which may be useful in guiding future research.

It would also be interesting to use the findings of this study to make comparisons with other individuals who became teachers in high need schools but did not have financial incentives as part of their career paths. A study of this nature would better illuminate the specific role of loan forgiveness/scholarship programs on teachers’ career decisions and paths. It may be that the Noyce funding played a different role in the scholars’ career paths that was not evident in my study as all participants had the funding in common with one another.

The findings from this study also apply only to (mostly) secondary mathematics and science teachers and the model can be used to frame studies with different groups of teachers to see if subject matter areas and teaching level are important for teacher career decisions and paths. Most of the research to date has focused on teachers with all subject areas lumped together with the exception of special education, and has investigated differences in retention and attrition by level of teaching (elementary or secondary). The research which has separated out subject matter areas has generally only focused on the retention of different groups and not how career paths and motivations may differ between different subject matter teachers. This study has provided the research

community with a better understanding of secondary mathematics and science teachers' career paths and it can be compared to results from studies of different groups of teachers to further illuminate how certain aspects of teachers' career paths may vary by subject matter area.

The career paths and decisions made by teachers who left teaching in high need settings for low needs settings or left teaching entirely were also very tentative in my study as the numbers of scholars who were in those categories was very small. Future studies can further investigate the tentative pathways and determine if they are actually valid pathways or whether they were simply the result of a small number of individuals in my study presenting a distorted perspective. For example, it appears that many of the scholars who did not remain teaching in high need schools chose to enter teaching, at least partially, for family or financial reasons. However, some scholars who were motivated by their family or financial situation to become teachers did remain in high need schools. The difference between these two groups was not clear due to inadequate numbers for comparison and future studies can investigate how the school environment or different preparation may interact with teachers who chose to enter teaching for family or financial reasons and why some stay and others leave.

Additionally, the properties and dimensions of the categories which emerged can also be more closely studied. For example, the emergence of the "cohort group" as an important component of support, both as the scholars were completing their teacher education programs and once they began teaching, was quite common within the sample. However, the data provided only shed light on general features of the support of the

cohort which were beneficial, and provides little specific details on how cohorts or social networks can best be utilized to provide adequate support for preservice and new teachers. For example, is the cohort structure really the source of support for the scholars or was the opportunity to discuss with and encourage other teachers in similar teaching situations in a long-term, small group environment the important feature of support? What sizes of cohorts or small groups are more effective at creating a supportive environment? What level of formality of activities best enhance supportiveness within cohorts or small groups? Is it best to assign preservice teachers to smaller, core groups, within their cohorts, or to allow small core groups to form naturally within groups of preservice teachers? What duration of cohort or small group interactions are most beneficial (over a month, semester, year/s)? Future research needs to investigate more closely the features of social networking support, such as cohorts or small groups, which are beneficial to preservice and new teachers.

Additionally, complex, quantitative studies need to be undertaken which combine the various levels of influence, such as personal demographics and motivations, school context and labor market characteristics. My study provided a starting point for further defining certain motivations and influences on teachers' career paths. Surveys which attend to the influences proposed in the model can provide researchers with more nuanced hypotheses to investigate teachers' career paths. Larger and more diverse samples can be explored to determine the validity of certain pathways within a broader group of teachers.

Chin and Young's (2007) ecological study of the person-oriented variables influencing the career decisions of alternative certification program participants provides a good example of how to design and implement a complex study which can shed light on teachers' career paths. Rots and Aelterman (2008) studied how teacher education was related to graduates' entry into teaching and included a variety of variables including motivation to teach and labor market influences. They used regression and path analysis to determine relationships and although they did not use multi-level analyses, their study also provides an example of how complex models have been used to study teachers' career paths. Future studies can be undertaken with larger sample sizes as the influences proposed in this study can be applied on a larger scale and with a wider diversity of teachers.

Policy Implications

This study provides some tentative suggestions for policy involving financial incentives such as scholarship or loan forgiveness programs. The findings revealed the important (but often neglected) nexus between recruitment and retention in high need settings. Ingersoll (1998) indicated that recruitment of teachers into such settings was not the problem; keeping those teachers in such settings was the greater challenge and therefore, financial incentive programs need to be attentive to both recruitment and retention considerations. For example, financial incentive programs need to be able to identify individuals who are highly qualified and also most committed to teaching in high need settings if they are to ultimately influence student achievement in high need schools. By just providing many teachers to high need schools, but not teachers who are

committed to remaining in high need schools, the turnover rate will continue to be high and student achievement associated with teacher inexperience will continue to be low. The goals of financial incentive programs need to be aligned so that they address both recruitment and retention in high need settings.

Additionally, given the limiting role of geography in teachers' preferences, policy initiatives need to be structured so that geographic regions in most need of highly qualified teachers receive the most support. Therefore, teacher education programs in areas with the greatest need should be awarded funding and local recruitment efforts should be undertaken.

Implications for Teacher Education Programs

Preparation Matters

There were limited findings that teacher education programs play a role in teachers' career paths; however, it did appear that the scholars valued the experiences they received in high need schools and to a certain extent, the coursework they received on working with students in high need environments. Therefore, teacher education programs can play a role in teacher career decisions and perhaps their role can become more significant, in particular with regard to future job satisfaction and retention, if there were more focus on intentional preparation for high need environments. A small body of literature has emerged about preparing teachers for working in urban schools or with students in high need schools and this body may better inform teacher educators on how to best prepare students for these environments and perhaps influence teacher retention.

Oakes, Franke, Quartz and Rogers (2002) provided a number of recommendations for successfully preparing teachers for urban environments which seem to resonate with the findings from this study. Oakes et al. provided three main areas which are important the first of which is creating a community of learners. The authors suggested that keeping students in the same cohort for two years during preparation is important for building effective community and allowing preservice teachers to reflect on their teaching together and develop professionally. Oakes et al. also suggested providing spaces outside of coursework or field experiences where preservice teachers can seek and find support and dialogue with others about their practice. Lastly, Oakes et al. suggest having a strong “early career learning community.” They write,

The range of understandings, skills, and dispositions that urban teachers require cannot be fully developed even in 2 years of intensive teacher preparation, nor should they be. Continuous development of these commitments and competencies is a vital part of high-quality professional practice (p. 231).

Additionally, given that the level of commitment to high need schools was not strong for many scholars and that many suggested that the Noyce program was influential in their decisions to teach in high need schools, their *natural commitment* to high need schools may be low. Therefore, they could possibly be more likely to leave high need schools than scholars who were highly committed to and interested in teaching in high need schools prior to accepting the Noyce funding. Therefore, teacher education programs can work to best prepare teaching candidates for the challenges of teaching in high need schools with the knowledge that some may not already have strong commitments to such environments. Promoting a positive experience in high need

schools and best preparing these individuals for high need schools may contribute to teachers' retention beyond their initial commitment. Many recommendations clearly have merit for preparing teachers for diverse, high need settings including instruction on how to create democratic classrooms (i.e., Gay, 2000), education regarding school structure, community and cultural values of the students in their areas (Davidson & Phelan, 1999; Diffily & Perkins, 2002), and how to build cultural connections with the subject matter. Furthermore, extensive experiences in high need schools could be of much value in helping prospective teachers become comfortable in such environments, an indicator of successful future teaching in high need schools (McKinney et al., 2007; Villegas & Lucas, 2002).

Focused Recruitment

Teacher education programs can also play an important role during the recruitment phase as they can focus on recruiting individuals who may be more likely to remain teaching in high need settings. Lyons (2004) wrote "While the recruitment of pre-service teachers is important, it is the focused recruitment of committed and capable individuals to the profession that is needed" (p. 31) and this is precisely the role that teacher education programs can perform by conducting focused recruitment efforts of committed teaching candidates. Teacher education programs can focus on recruiting and awarding teaching candidates who have background and personal characteristics which appear to predict retention in high need schools according to my model. For example, as my analysis indicated that community/location played an important role in whether

scholars stayed or left teaching in high need schools, it may be important to recruit and award individuals who reside in or near communities with high need schools.

Additionally, essays, personal statements and interviews during the application and selection process can do much to reveal the reasons the teaching candidates want to become teachers and are applying for scholarships or to teacher education programs. If the goal is to provide teachers with a greater likelihood of remaining in high need schools, then attention should be paid as to whether the applicants have a desire to give back or make a difference and whether they seem committed to teaching in high need schools, not just teaching in general. Although many of the institutions awarding Noyce funding utilized personal statements (97% of programs) and interviews (73% of programs) (see Lawrenz et al., 2008), these procedures need to be closely analyzed to determine if they are actually detecting potential recipients with strong commitments to teaching in high need schools. The nature of the questions asked in interviews and essays may need to be modified to best elicit statements of commitment and intentions to remain in teaching. Questions such as “Why do you want to be a teacher?” and “Why do you want to be a teacher in high need schools?” may help illuminate potential teaching candidates’ commitments.

Additionally, applicant responses to these measures should be carefully considered and possibly more heavily weighted than some other selection criteria such as GPA. How to best interpret interview responses and personal statements for indicators of commitment is another area of consideration by teacher educators and suggests possible future research. As suggested by some researchers (e.g. Brookhart and Freeman 1992;

Day et al., 2005; Quartz and the TEP Research Group, 2003), indicators of a sense of social justice and moral commitments to teaching may be illuminative and my study suggests that these motivations may be more nuanced than expected and care should be taken to more fully understand applicants' motivations. It is also possible that other indicators, such as volunteer work or previous work experience in high need settings, would be more valuable in determining those candidates with commitments to education in high need settings. Awarding financial incentives and accepting individuals into teacher education programs who appear to have the most potential for retention in high need schools according to the model seems to be a major role that teacher education programs can play in retention in high need schools.

Building Communities of Support

My model suggests that scholars who had a strong social network, such as a cohort with whom they completed preservice coursework at the same time, during the teacher preparation and early in their teaching career, were quite positive about their experiences. They reported that their community of support played an important role in providing for professional and personal needs. The analysis indicated that these scholars also seemed more likely to be satisfied with teaching in high need schools and more likely to stay because they continued to have regular interactions with other cohort members and new teachers throughout their early years in the classroom. The important feature of the valued community of support is that the scholars had regular opportunities to discuss with and be encouraged by other teachers at similar points in their teaching careers. The interactions reduced isolation and encouraged camaraderie and gave the

scholars a different perspective on their current struggles, which induced them to be more positive about the difficulties of their teaching situation.

Although the influence of a community of support likely interacts with other influences on the model including motivations to teach, background characteristics and school environment, it does appear that support structures can contribute to job satisfaction and retention in high need schools. Therefore, teacher education programs can intentionally create opportunities to build community among their preservice teachers through structuring the program as a cohort and/or providing ample opportunities for networking in small groups. These opportunities can begin during preservice preparation, but can also be continued through intentional efforts by teacher education programs to help new teachers network with one another once they begin teaching. For example, graduate courses for new teachers can include community building opportunities and teacher education programs can use Web-based methods such as blogs, discussion boards and social networking sites to foster relationships between novice teachers.

Limitations

A number of limitations have been implied throughout this chapter and they deserve specific attention before concluding this work. Although this study was not longitudinal in that the scholars were not followed throughout the early years of their teaching careers and data was not collected over a long time period, the scholars were at different points in their teaching careers. Some scholars were completing a teacher education program while others had been teaching or in K-12 education for six years. The various points in time on the scholars' career paths included an array of experiences and

the single time points together were used to construct a model of the pathway to retention in high need schools which represented the early career paths of the scholars. However, it is worth noting that the study was not longitudinal and was both retrospective of the decisions the scholars made in the past and prospective as they were asked to describe what would influence their decisions in the future. Both retrospective and prospective data pose challenges for the strength of the data and findings. Scholars may not have accurately remembered their decisions from the past and retrospective reports of their decisions may not be completely accurate. The scholars' reports of their decisions and motivations in the future also pose a problem as they may not actually be carried out, or other reasons not perceived at the time of the interviews may actually influence their future career moves. A longitudinal study which involved data collected at the time decisions were actually made would be much stronger and therefore, the findings of this study are limited by the difficulties just described.

Additionally, the most teaching experience reported by any of the scholars was six years with most having less than three years of experience, and therefore, the study only represented the early career decisions of the scholars. Prospects of the participants' long-term retention in high need settings is highly tentative and was only be based on the scholars' perceptions of their future plans in teaching and what would influence their career moves. Since the Noyce program began in 2002, including participants in this study with more experience was not possible and the focus on Noyce scholars inherently limited the number of years the participants could have been teaching. Richer studies

which include teachers with more years of experience could further illuminate the later career decisions and career paths of teachers in high need schools.

In addition, a number of the relationships proposed in the model were tentative due to a small number of individuals in certain groups (e.g. those who had left high need schools for low need schools). It could be that the scholars who agreed to participate in the interviews were positively biased toward the Noyce program and had positive teaching experiences and therefore, those who did not have positive teaching experiences did not want to be interviewed. Nevertheless, the scholars who had left teaching or left high need schools were small in number which limits the strength of the findings for those groups. Having a more diverse sample would strengthen the conclusions regarding why some teachers leave high need schools or teaching entirely. In addition, it would allow for more accurate comparisons to be made between those types of scholars and the scholars who remained teaching in high need settings.

Conclusion

This study resulted in a model of the pathway to retention in high need schools based on the perceptions of the early career experiences and decisions of 38 Noyce scholars. Grounded theory methodology revealed that the early career paths of the scholars were complex and that the decisions made throughout their early careers were influenced by a variety of motivations which interact to influence later career decisions. In particular, this study noted that the reasons the scholars chose teaching were important for their later career decisions including where they decided to teach, if they were satisfied in their school environment and with their teaching career, and whether they

decided to remain teaching in high need schools. The reasons for choosing teaching as a career were more nuanced than has often been reported in the literature and suggests that future research needs to more closely investigate the reasons for teaching and the role they play in teachers' future career decisions.

This study is also significant because the model proposed a variety of relationships which deserve attention in future research. The interactions between the reasoning involved and the decisions made on teachers' career paths has not frequently been studied and should be undertaken to more fully understand the career paths of mathematics and science teachers in high need schools. Gaining a better understanding of teachers' career paths can shed some light on whom to recruit and how to best retain mathematics and science teachers in high need schools, thereby improving the educational opportunities of all students.

Author note: This material is based upon work supported by the National Science Foundation under Grant No. REC0514884. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

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Appendix A: Scholar Interview Protocol

Question 0: What are you doing now? This can happen as a conversation, but the following tree gets you to the right question:

- Teaching/not teaching
- if not teaching: got certified/didn't finish program
- if teaching: teaching high needs/not high needs
- if not high needs: have taught high needs/have not taught high needs
- if teaching high needs: teaching as part of the commitment/beyond the commitment?

People who leave the certification program

- What led you into teaching?
 - Why did you choose high needs? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE for unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Describe to me the day you decided to leave the program, what happened how did you feel, what was it like?
- What experiences led up to the decision? Describe them to me
- What are your reasons for leaving the teacher certification program
- What types of experiences might have encouraged you to stay in the program?
- What kind of support did your teacher prep program provide for you? PROBE for mentoring experiences either from prep program or district
- What kind of support would you have liked to have seen from your teacher prep program?
- How do you feel your content area preparation affected your teaching preparation experience?
- Did you consider other careers that would use your content area training?

- Why did you choose teaching over X? (whatever career they mention)
- What role did the Noyce money play in your decisions throughout the process? (Becoming a teacher? Leaving the program?)
- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar. Is there anything else important you think we've left out?

People who choose not to teach after being certified

- What led you into teaching?
 - Why did you choose high needs? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs ...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE for unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Describe to me the day you decided not to teach after the program, what happened how did you feel, what was it like
- What experiences led up to the decision? Describe them to me
- What are your reasons for choosing not to teach
- What types of experiences might have encouraged you to take a teaching job?
- Probe for: perceptions of students, fellow teachers, administrators
- What kind of support did your teacher prep program provide for you? PROBE for mentoring experiences either from prep program or district
- What kind of support would you have liked to have seen from your teacher prep program?
- How do you feel your content area preparation affected your teaching preparation experience?
- Did you consider other careers that would use your content area training?
 - Why did you choose teaching over X? (whatever career they mention)
- Is there any particular role that the Noyce money played in your decisions throughout the process? (Becoming a teacher? Leaving the program?)

- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar. Is there anything else important you think we've left out?

People who choose not to teach at a high needs school

- What led you into teaching?
 - Why did you choose high needs initially? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs ...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Describe to me the day you decided to take a job that wasn't at a high needs school, what happened how did you feel, what was it like
- What experiences led up to the decision? Describe them to me
- What are your reasons for choosing not to teach at a high needs school
- What types of experiences might have encouraged you to take a job at a high needs school?
- Probe for: perceptions of students, fellow teachers, administrators
- What kind of support did your teacher prep program provide for you? PROBE for mentoring experiences either from prep program or district
- What kind of support would you have liked to have seen from your teacher prep program?
- How do you feel your content area preparation affected your teaching preparation?
- Did you or do you consider other careers that would use your content area training?
 - Why did you choose teaching over X? (whatever career they mention)
- Is there any particular role that the Noyce money played in your decisions throughout the process? (Becoming a teacher? Leaving the program?)

- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar and as a teacher. Is there anything else important you think we've left out?

People who leave teaching in a high needs school

- What led you into teaching?
 - Why did you choose high needs? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs ...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Describe to me the day you decided to leave teaching at a high needs school, what happened, how did you feel, what was it like
- What experiences led up to the decision? Describe them to me
- What are your reasons for leaving teaching in a high needs school?
- What types of experiences might have encouraged you to continue to teach in a high needs school
- Probe for values, incentives, rewards, educational opportunities, leadership opportunities (broadly construed), adequate time to work, collegiality, administrative support, indication of potential burn out, etc.
- What kind of support did your teacher prep program provide for you? PROBE for mentoring experiences either from teacher prep program or district
- What kind of support would you have liked to have seen from your teacher prep program?
- How do you feel your content area preparation affected your teaching preparation?
- Did you or do you consider other careers that would use your content area training?
 - Why did you choose teaching over X? (whatever career they mention)

- Is there any particular role that the Noyce money played in your decisions throughout the process? (Becoming a teacher? Leaving the program?)
- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar and as a teacher. Is there anything else important you think we've left out?

People who are teaching at a high needs school as part of the commitment

- What led you into teaching?
 - Why did you choose high needs? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs ...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Did you receive mentoring experiences from your program or district? If so, describe them to me.
- Pick an interaction you had with a colleague and describe it to me.
 - What does that interaction mean for your relationship with them?
- Pick an interaction you had with an administrator (principal, assistant principal) and describe it to me.
 - What does that interaction mean for your relationship with them?
- Think of a positive interaction you have had with a student and explain it to me
- How long do you foresee teaching in a high needs school? (specifically, through the end of the commitment/beyond the commitment?)
- Probe for values, incentives, rewards, educational opportunities, leadership opportunities (broadly construed), adequate time to work, collegiality, administrative support, indication of potential burn out, etc.
- What factors will influence how long you continue teaching in a high needs school?
- What kind of support does your teacher prep program provide for you now?

- What kind of support would you like to see from your teacher prep program?
- How do you feel your content area preparation affects your teaching experience?
- How does your content area degree or the content knowledge help you teach or help you in your teaching?
- Did you or do you consider other careers that would use your content area training?
 - Why did you choose teaching over X? (whatever career they mention)
- Is there any particular role that the Noyce money played in your decisions throughout the process? (Becoming a teacher? Leaving the program?)
- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar and as a teacher. Is there anything else important you think we've left out?

People who stay in teaching at a high needs school past the commitment

- What led you into teaching?
 - Why did you choose high needs? (Probe to see if they wanted high needs settings from the beginning or what led them to high needs settings, i.e. if they got the Noyce scholarship, then decided to go into high needs ...)
- When did you receive the Noyce scholarship/stipend? (Probe for semesters/years such as 2004 during junior year).
- Can you briefly describe your teacher prep program? PROBE unique attributes
 - What did you really like about your program?
 - What do you think is different about your program? (compared to other teacher prep programs you know of?)
 - What high needs preparation did you receive? (probe for classes, practicum, student teaching...)
- What experiences during your teacher preparation program, if any, were extra because you were Noyce scholar?
 - Was there anything different for you as a Noyce scholar compared to other students in your preparation program?
- Did you receive mentoring experiences from your program or district? If so, describe them to me.
- Pick an interaction you had with a colleague and describe it to me.
 - What does that interaction mean for your relationship with them?
- Pick an interaction you had with an administrator (principal, assistant principal) and describe it to me.
 - What does that interaction mean for your relationship with them?
- Think of a positive interaction you have had with a student and explain it to me
- What are your reasons for continuing to teach in a high needs school?

- Probe for values, incentives, rewards, educational opportunities, leadership opportunities (broadly construed), adequate time to work, collegiality, administrative support, indication of potential burn out, etc.
- How long do you foresee teaching in a high needs school?
- What factors will influence how long you continue teaching in a high needs school?
- What kind of support does your teacher prep program provide for you now?
- What kind of support would you like to see from your teacher prep program?
- How do you feel your content area preparation affects your teaching experience?
- How does your content area degree or the content knowledge help you teach or help you in your teaching?
- Did you or do you consider other careers that would use your content area training?
 - Why did you choose teaching over X? (whatever career they mention)
- Is there any particular role that the Noyce money played in your decisions throughout the process? (Becoming a teacher? Completing certification, taking a job at a high needs school? Fulfilling commitment? Staying past the commitment?)
- How would things have turned out if you did not receive the Noyce money?
- Finally, sometimes we don't know how to ask the most important questions about your experience as a Noyce scholar and as a teacher. Is there anything else important you think we've left out?

Appendix B: Scholar interview codes

Level 1	Level 2	Level 3	Level 4	
Background				
College (8)*				
Family (23)	Influence decision to teach and where to teach (9)	desire to give back (1)		
		teachers in the family (4)		
		teaching=compatible with family (3)		
	Influence staying or leaving (13)	teaching=support for family (3)		
		marriage and kids (13)		
Status (20)		married (7)		
		married w kids (7)		
		single (5)		
		single w kids (1)		
Hometown or state (3)				
Personal Characteristics (5)	Ethnicity (1)			
	Moral decision (6)			
	Personality (2)			
Previous career (14)	Education (6)			
	Industry (8)			
Decisions				
Accepting & applying for Noyce (1)	Unintentional (1)			
Choosing Teaching (25)	Convenience, flexibility, finances (7)	compatible with family (4)		
		doable (1)		
		financial need (3)		
	Dissatisfied with career (6)	did not like work (2)		
		finances (1)		
		incompatible with family (1)		
		meaning and value (2)		
	Educational role models (8)	family members taught (6)		

		influential teacher (2)
	Made for teaching (1)	
	Moral reasons (16)	
	Non-educational youth work (2)	
	Previous teaching/education experience (10)	informal educational opportunities (4) paraprofessional (1) substitute teaching (1) undergraduate or graduate level teaching or tutoring (4)
	Trying it out (8)	
Role played by the Noyce money (27)	Affirmation (2)	
	Extra support (3)	
	Financial support (28)	
	Noyce recommendations (4)	
	Nudged to high needs (6)	
	Reason for teaching (6)	
	Relieved financial burden and could focus on preparation (5)	
	Research activities (1)	
	Would have taught regardless (8)	
	Staying & leaving (26)	Administration (8)
disciplinary support (4)		
general support (2)		
	Attacks on character (1)	

Challenged, growth (11)	challenged by course assignments (3)
	challenged by leadership (2)
	challenged by pedagogy (5)
	desire to continue growing (2)
Colleagues (4)	different beliefs about students (1)
	like coworkers (2)
	team environment (1)
Couldn't find job (2)	
Dissatisfied with small town living (2)	
Familiarity with school/environment (5)	familiar with how the school works (3)
	past HN experiences (2)
Finances-pay, benefits (6)	
Gratifying work, impacting students and colleagues (5)	impact students (5)
	impact teachers (1)
Lack of resources (2)	
Life changes, marriage, family (7)	
Like HN students (2)	
Loan forgiveness program (1)	
Pursuing higher education (7)	administration (2)
	curriculum & Instruction (2)
	other education pursuits (1)

	teacher education (3)
School close to home (4)	
School environment (8)	not receptive (1) pressure without support (1) strong admin presence (1) structure and follow through (5) supportive environment (1)
Support or pressure from parents (5)	lack of parental support (3) positive support (1) pressure to pass (1)
Where to teach (18)	Couldn't find job elsewhere (4) Diverse student body (3) General school characteristics (1) Influenced by location (8) Not committed to high need settings (3) Past high need experience (3) Prep program requirements (2) Variety in work (1) Wanted urban, high needs (3)
Descriptive features of scholars	
Current status (38)	
Length of Noyce Support (19)	
Future plans (21)	Family plans (6) Long term plans (15)
Teacher preparation/certification program	

Cohort (7)		
Content area preparation (26)	Related to teacher prep (3)	valued content background of cohort (2)
		valued specific methods coursework (3)
	Related to teaching (24)	aided curriculum design (2)
		better explanations for students (5)
		content is not a concern (5)
		help colleagues (2)
		improve pedagogy (3)
		improved confidence (4)
		Interdisciplinary (1)
		previous career and real world examples (4)
		stay on top of new knowledge (1)
		willing to try different pedagogies (3)
Noyce extras (25)	Action research (1)	
	Additional classroom hours (1)	
	Extra advising or attention (3)	
	Meetings, workshops, PD (9)	
	Nothing extra (11)	
	Online resources (2)	
	Recognition (1)	
Preparation for high needs settings (15)	Coursework emphasizing high need settings (5)	

	Faculty with high need settings expertise (1)		
	Placements in high need settings (6)		
	Poor or no training for high need settings (5)		
Program description and features (18)	Unique aspects (9)	cohort, small class size (1)	
		coursework during teaching (1)	
		faculty, expertise, approachability (4)	
		HN emphasis (1)	
		in depth preparation (3)	
		laboratory experience (1)	
		mentoring (1)	
		science as inquiry (2)	
Teacher preparation/certification program support (29)	Formal support (16)	after certification (8)	equipment and resources (1)
			I know I'm not alone (2)
			monthly (2)
			teaching or content support (5)
			weekly (1)
		during certification (11)	yearly (2)
			cohort (1)
			supervisor liaison, faculty (7)
			workshops, coursework (3)
	If I need anything I know where to go (4)		

	Informal support (12)	faculty, staff (10)	affirmation, encouragement (3)
			availability (5)
			social (1)
		peer network, cohort (6)	
		research project (2)	
		social events (1)	
	No support after program (7)		
	Desired support (21)	actual classroom experience (2)	
		continuation (8)	
		job or practicum placement assistance (2)	
		lesson planning resources (4)	
		no changes (2)	
		pragmatics (1)	
		university mentor (1)	
<u>School/district setting</u>			
Administration (23)	Approachability (13)		
	Management skills (2)		
	Teaching philosophy (2)		
	Teaching, professional support (8)		
	They back me up (9)		
	Trust, Respect (6)		
Colleagues (21)	Collaborate, Discuss teaching, students (12)		
	Dept. support (1)		
	Discuss personal stuff (3)		

	Extensive contact (6)	
	Formal support (3)	
	Friendly (2)	
	Frustrations (7)	
	Grant writing (2)	
	Team support (4)	
Comparison to low need school (4)		
Leadership (13)	Committees (2)	
	Dept chair (4)	
	Leader of professional development, teacher training (3)	
	Leader of student groups (2)	
	Administration (3)	
New teacher support (16)	Classroom management support (2)	
	Desired support (2)	
	Don't need support (2)	
	English-language learner support (1)	
	Good mentoring (2)	
	No formal support (1)	
	Poor mentoring (7)	lack of structure, accountability (2)
		not in content area (1)
		unsupportive personality (2)
	Pragmatic support (4)	
	Sought out own support (4)	
Parental support (5)		
Salary (11)	Extra duties pay (1)	

	“I can afford to teach” (1)
	Influences where to teach (2)
	Not motivating factor (3)
	Other financial incentives (3)
	Well paid (5)
philosophy of education (12)	Commitment to collaboration (2)
	Commitment to kids (1)
	Commitment to reform-based teaching (3)
	Expectations for students (3)
	Going the extra mile (3)
Resources (4)	
Security (3)	
Students (22)	Academic success (2)
	Change in attitude, effort, success (3)
	Connecting with students (11)
	Excited about subject (4)
	Parental relationship (1)
	Poor relationship with students (1)
	Putting in extra effort (2)
	Respectful behavior (2)
Us~them language (10)	

Note. Numbers in parentheses represent the number of participant responses coded in each code. The numbers are not out of 38 for all codes as not all participants were asked every question in the interview protocol due to different protocols based on participants’ statuses and modifications to the protocol throughout data collection.

Appendix C: Categories, properties and dimensions

Table C1: Categories, properties and dimensions related to “Choosing teaching as a career”

Category	Properties	Dimensions	
Family	Marital status	Single	
		Single with children	
		Married Married with children	
	Concerns— time/effort	Compatible with family/children Incompatible with family/children	
	Concerns—finances	Support family/children Doesn't support family/children	
	Educational role models	Family members	Immediate family Extended family
Past teachers			
Past work experience	Education	<i>Ordered according to extensiveness</i> Full-time K-12 work (paraprofessional) Full-time non-K-12 youth work (informal education, social work, boys/girls clubs) Part-time K-12 work (substitute teaching) Part-time non-K-12 work (tutoring @ college level, graduate teaching assistant, youth ministry)	
		Industry	Full-time industry work (engineering, lab work, etc.) Part-time industry work (graduate research assistant)
			General feelings about past work
Personal skills and motivations	Science content preparation	Higher level education (masters, Ph.D) Bachelor's level education	
	Desire to “give back”	Strong Weak	
	Desire to “make a difference”	Strong Weak	

Table C2: Categories, properties and dimensions related to “Teacher education program”

Category	Properties	Dimensions
Support	Original source of support	<i>Ordered according to value/prominence in the interviews</i>
		Cohort Faculty Self-I know where to get help None
	Formalness of support	Informal support Formal support program/meetings
	Frequency of interactions	Daily
		Weekly
		Monthly
		Yearly Never
Type of support-personal	<i>Ordered according to value/prominence in the interviews</i>	
	Encouragement-“I’m not alone” Affirmation Social Unapproachable/unavailable	
Type of support-professional	<i>Ordered according to value/prominence in the interviews</i>	
	Education resources (lesson plans, classroom management tips)	
	Classroom pragmatics (how to acquire lab materials, using gradebook)	
	Equipment Job placement assistance	
Timing of support	During certification/preparation	
	After certification/preparation	
Value of support	Highly valued	
	Not valued	
Preparation for high need settings	Intensiveness of preparation	<i>Ordered from most to least intensive</i>
		Placements/student teaching in HN setting
		Faculty with expertise/experience in HN settings
		Coursework emphasizing HN settings and students with special needs Poor or no HN training
Program characteristics		

Table C3: Categories, properties and dimensions related to “community/location”

Category	Properties	Dimensions
Community/location	Proximity to family/friends	Near
		Far
	Cost of living	High
		Low
	Distance between home and work	Close
		Far
	Schools	Low need
		High need
	Values about education	Supportive
Unsupportive		
Teaching vacancies	Many	
	Few	
Familiarity with community culture	Very familiar	
	Unfamiliar	

Table C4: Categories, properties and dimensions related to “School setting”

Category	Properties	Dimensions
Support	Source	<i>Ordered according to proximity</i>
		Colleagues
		School-level administrators Parents/caregivers District-level administrators Larger community
Type of support		<i>In no particular order, as all seemed highly valued by the scholars</i>
		General (respect, trust, approachability)
		Academic (lesson planning assistance, provide opportunities to grow in teaching) Disciplinary (back up teacher’s decisions, follow-through, organized discipline plan, classroom management tips and training)
Frequency of support interactions		Daily
		Weekly
		Monthly
		Every few months (e.g. 3 classroom observations per year)

	Formalness of support	Informal (teacher next door, department chair) Formal (new teacher induction program)
Students	Feelings about/ impression of quality	Positive Negative
	Need level	High need, minority, ELL, SPED Low need, non-minority
	Aspects of student relationships	<i>In no particular order</i> Parental/supportive aspects (seeing students “grow,” making a difference, being there for them) Academic/subject area aspects (seeing students change attitude, effort, success; students excited about subject) Poor relationship with students
Leadership opportunities	Type of opportunity	<i>Ordered from highest to lowest level of influence</i> Science coach, professional development leader across district Department chair Committee member Coach/leader of student group
	Feelings about role	Positive (challenged by role, broaden influence) Negative (overwhelmed, unprepared for role)
Salary	Feelings about	Sufficient for effort, education level Insufficient for effort, education level
Resources	Availability/perceptions of	Sufficient Insufficient
Class teaching assignment	Overall perception of	Challenging, stimulating Unchallenging, boring
	Role of subject taught	Important Unimportant
Philosophy of education	Role of pedagogical challenges	Important Unimportant
	Match with community, administration and colleagues	High (similar values, expectations) Low (dissimilar values, expectations)

Table C5: Categories, properties and dimensions related to “Noyce scholarship program”

Category	Properties	Dimensions
Noyce scholarship program	Financial support	Important Unimportant
	Commitment to high need settings	Important Unimportant
	Outcomes—personal	Affirmation/recognition Nothing
	Outcomes—related to preparation program	<i>Ordered according to value/prominence in interviews</i> Allowed for faster, focused preparation due to not having other job during program Extra meetings, workshops, professional development opportunities Extra advising, attention Online resources Nothing extra

Appendix D: Scholar Characteristics

Pseudo-nym	Career changer	Status at time of interview	Future plans	Leadership	Teacher education program	School level/subject area
Aiden	No	Not teaching, couldn't find job	Teaching in HN	NA	Post-bac	NA
Amy	Yes	Administration in HN ^b , beyond Noyce requirement	Administration	Y	Alt cert	MS ^d
Ben	UK ^a	Teaching HN, fulfilling Noyce requirement	Teaching in HN	Y	UK	HS ^e Mathematics
Brenda	Yes	Teaching HN, beyond Noyce requirement	Teaching in HN	Y	Alt cert	MS Science
Cara	Yes	Teaching HN, beyond Noyce requirement	Teaching in HN	N	Alt cert	HS Science
Celeste	Yes	Teaching HN, beyond Noyce requirement	Teaching in HN	N	UK	HS Mathematics
Cindy	No	Still in teacher education program	Teaching in HN	NA	Alt cert	MS Mathematics
Conner	Yes	Teaching not HN, left after Noyce requirement	Teaching in Non-HN	N	Post-bac	HS Mathematics
Dirk	No	Teaching HN, beyond Noyce requirement	Teaching in HN	Y	Post-bac	HS Mathematics
Emma	Yes	Administration in HN, beyond Noyce requirement	Administration	Y	Alt cert	HS
Gabby	Yes	Teaching HN, fulfilling Noyce requirement	Teaching in HN	N	Post-bac	HS Science
Garrett	Yes	Left teacher education program	NA ^c	NA	Post-bac	NA
Holly	No	Teaching HN, beyond Noyce requirement	Leave teaching	Y	Post-bac	HS Mathematics
Ian	No	Not teaching, couldn't find job	Teaching in HN	NA	Post-bac	HS Mathematics

						and Science
Jana	No	Teaching HN, beyond Noyce requirement	Non-HN teaching	N	UK	HS Science
Jason	Yes	Teaching HN, beyond Noyce requirement	Teaching in HN	N	UK	HS Mathematics
Jessica	Yes	Teaching HN, beyond Noyce requirement	Other	N	Alt cert	HS Science
Karen	Yes	Teaching HN, beyond Noyce requirement	Unsure	Y	Alt cert	HS Science
Kayla	No	Teaching HN, fulfilling Noyce requirement	Teaching in HN	Y	Undergrad	HS Science
Kim	Yes	Teaching HN, beyond Noyce requirement	Teaching in HN	N	Post-bac	Elem Science
Lei	No	Teaching HN, beyond Noyce requirement	Teaching in HN	N	Post-bac	HS Mathematics
Leslie	No	Not teaching, left after Noyce requirement	NA	NA	Post-bac	NA
Lisa	No	Teaching HN, beyond Noyce requirement	Graduate School	Y	Undergrad	MS Mathematics
Lucy	No	Not teaching, left after Noyce requirement	NA	NA	Post-bac	NA
Mark	No	Teaching not HN, left after requirement	Unsure	N	Post-bac	HS Mathematics
Melanie	UK	Not teaching, left after Noyce requirement	Graduate School	Y	UK	NA
Mindy	No	Teaching not HN, left after Noyce requirement	Unsure	N	Post-bac	HS Science
Mitch	No	Not teaching, couldn't find job	Unsure	NA	Post-bac	NA
Parker	No	Teaching HN, beyond Noyce requirement	Teaching in HN	N	UK	HS Mathematics
Paul	No	Teaching HN, beyond Noyce requirement	Leave teaching	Y	UK	HS Science
Penny	Yes	Teaching HN, beyond Noyce requirement	Other	N	Alt cert	HS Science
Rachel	No	Left teacher education program	NA	NA	Undergrad	NA
Renee	UK	Teaching HN, beyond Noyce requirement	Teaching in HN	N	Undergrad	MS Science
Sean	No	Administration in HN, beyond Noyce	Unsure	Y	Post-bac	HS

		requirement				
Serena	No	Teaching HN, fulfilling requirement	Unsure	N	UK	HS Mathematics and Science
Stacy	No	Not teaching, left after requirement	NA	Y	Post-bac	NA
Terry	Yes	Teaching not HN, left after requirement	Teaching in Non- HN	N	UK	NA
Vienna	No	Teaching HN, fulfilling requirement	Teaching in HN	N	Post-bac	HS Mathematics

^a Characteristics which were not able to be classified from the interview data are entered as “UK” for “unknown”

^b For purposes of saving space “high need settings” is represented as “HN”

^c “NA” represents “not applicable”

^d “MS” represents middle school and includes grades 5-8

^e “HS” represents “high school” and includes grades 9-12