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Kindling the fire: Fueling Preservice Science Teachers' Interest to Teach in High-Needs Schools

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Abstract

This study applies psychological models of interest and motivation (i.e. a model of interest-development, Hidi and Renninger, 2006; and self-determination theory, Ryan and Deci, 2000) to the experiences of six pre-service science Noyce scholars who participated in a teacher preparation program. The National Science Foundation's Noyce grant aims to incentivize mathematics and science majors to teach in high-needs school districts. Through this interview study, we sought to understand how Noyce scholars' pre-existing interests and their experiences in the Noyce program interact to develop individual commitments to teach in high-needs school settings. Case studies reveal that scholars had no prior experiences in high-needs schools, abstract ideas about teachers, students, and resources in these contexts, and varying degrees of initial connectedness (Ryan and Deci, 2000) to teaching in high-needs school settings. Scholars found that site visits to diverse high-needs schools (i.e., rural and urban) triggered their interest to teach in similar contexts. Preservice science teachers' emerging interest and level of commitment to teaching in high-needs schools following the teacher preparation program was dependent upon context-specific mastery experiences and autonomy within their long-term clinical field experience. This study offers implications for teacher educators who are recruiting and preparing students to teach in high-needs school contexts.

Keywords

Teacher preparation, Interest development, Motivation, High-need Schools, Teacher recruitment

Introduction

In an effort to address the many national concerns regarding the quality of the United States' science, technology, engineering, and mathematics (STEM) workforce (see National Academy of Sciences, 2011; National Research Council, 2012; President's Council of Advisors on Science and Technology, 2010), many have turned their attention to preparing highly-qualified teachers (see Ingersoll & May, 2016). However, within the field of teacher education, there has been a historic challenge in recruiting and retaining highly-qualified individuals to teach mathematics and science, especially in high-needs school settings where the challenge is exponentially more difficult (Darling-Hammond, 2000a; Darling-Hammond & Sykes, 2003).

The National Science Foundation's (NSF) definition of a high-needs school local educational agency follows that of the Higher Education Act of 1965:

an elementary or secondary school located in an area which is characterized by at least one of the following: a. a high percentage of individuals from families with incomes below the poverty line; b. a high percentage of secondary school teachers not teaching in the content area in which they were trained to teach; or c. a high teacher turnover rate.

(Higher Education Act of 1965, 20 U.S.C. 1021)

It is important to note that the NSF does not refer to specific schools as high needs but rather school districts as high needs if the district includes one or more schools that satisfy the descriptors above.

Many explanations have been posited for the difficulty in recruiting teachers to teach in high-needs settings such as teachers' perceptions of safety, resources, administrative structures, and overwhelming demands of having multiple and diverse course preparations (Darling-Hammond, 1997; Ingersoll, 2003). Thus, with the shortage of mathematics and science teachers,

programs and financial incentives are available to recruit, prepare, and incentivize individuals who are willing to commit to teaching STEM subjects in high-needs school settings.

Teacher education programs are charged with carefully considering the specific elements that can support preservice teachers as they develop both the skills and commitment to teach students in high-needs school settings. However, identifying the programmatic elements that can support preservice teachers to teach in high-needs school is an understudied area (Anderson & Stillman, 2013; Burant & Kirby, 2002; Cornbleth, 2010). For example, the research is quite unclear about why preservice teachers consider teaching in high-needs schools, and how their perceptions of programmatic elements in teacher preparation programs develop their interest and commitment to teach science in high-needs schools. In this regard, psychological models of motivation might be useful in that they can outline the process of proceeding from a tentative interest to a robust commitment in an area.

Four Phase Model of Interest Development

Hidi and Renninger's (2006) four-phase model of interest development provides a theoretical foundation for understanding how teacher educators might spark preservice teachers' interests to teach in high-needs schools, and then proceed to fan the flames of that spark to develop those interests into a firmer commitment. Hidi and Renninger argued that "interest is the outcome of an interaction between a person and a particular content. . . . This means that interest is always content specific and not a predisposition that applies across all activities" (p. 112). Thus, in relationship to developing interest to teach science in high-needs schools, preservice science teachers must be provided with situational experiences of learning about and teaching science in high-needs schools. Interest, as it develops, passes through four phases. Interest development begins with a spark or *triggered situational* interest, which can be

developed into a *maintained situational interest* if the appropriate fuel can be provided to sustain the initial spark and allow it to grow (Hidi & Renninger, 2006). Over time, maintained situational interest, with appropriate external supports, can become an *emerging individual interest*, which Hidi and Renninger described not only as a psychological state (the way that situational interest is conceptualized) but also as the "beginnings of a relatively enduring predisposition to seek repeated reengagement with particular classes of content over time" (p. 114). Over time, individuals can finally develop their interests into what Hidi and Renninger called *well-developed individual interests*, which are interests that can be entirely fueled and sustained on the individual's own accord.

Regarding preservice teachers considering jobs in high-needs schools, it would be useful to know what specifically moves people from situational interests to individual interests. Unfortunately, the specific mechanisms that facilitate progression from one phase to the next are not fully understood. However, some studies provide some clues. First, salient experiences and predispositions can be considered people's pre-existing *individual interests*--the ones that they carry into a teacher education program even before it begins and can serve as a resource that people draw on when tasks are uninteresting or difficult (e.g. teaching in high-needs schools; Chen et al., 2016; Katz, Assor, Kanat-Maymon, & Bereby-Meyer, 2006; Tsai, Kunter, Lüdtke, Trautwein, & Ryan, 2008). Preservice teachers who have, for example, enjoyed being summer camp counselors with low-income students might be more likely to have a strong individual interest for teaching in high-needs schools because they have had positive experiences interacting with students who live in communities with lower socio-economic status, and therefore are now willing to seek out opportunities on their own accord. On the other hand,

preservice teachers who have never interacted with students from low-income backgrounds are more likely to require different types of support to develop that individual interest.

Further, individual interests are associated with students' likelihood of being engaged in future tasks related to those individual interests, their task-specific self-efficacy, and their sparked and maintained situational interests (Chen et al., 2016; Durik & Harackiewicz, 2007; Hidi & Harackiewicz, 2000). For recruiting preservice teachers into a teacher education program, this entails appealing to potential candidates' past experiences and interests through outreach efforts that connect the program's goals to their past experiences and interests (Delong, 1987; Haberman, 1996; Javornik Krecic & Ivanus Grmek, 2005; Parkay, Stanford, & Gougeon, 2010).

Incorporating Self-Determination Theory and Self-Efficacy

In addition to individual interest, there are features of the learning environment (rather than stable individual resources) that can facilitate the progression from one phase to the next. These are the features over which teacher educators and teacher education programs have a bit more control. From a self-determination theoretical view, Ryan and Deci (2000) posited that progressing from one phase of interest to the next requires (1) providing learners with meaningful choices (i.e., *autonomy*); (2) building learners' feelings of *competence* in relevant tasks; and (3) developing learners' feelings of *social connectedness* with people who are relevant to that social milieu.

Autonomy. Teacher education literature suggests that preservice teachers need autonomy-supporting experiences to develop their understandings of themselves as teachers (Fives, Hamman, & Olivarez, 2007; Deci & Ryan, 2010). In fact, Ryan and Deci (2000) argued that, "support for autonomy allows individuals to actively transform values into their own" (p.

74). For example, if a teacher educator shows preservice teachers a range of options for equitably maintaining classroom discipline in a diverse classroom, but then leaves the choice for what specific strategies to use, these preservice teachers are more likely to take on the values of equitable classroom discipline.

Competence beliefs (self-efficacy). When considering how to build preservice teachers' beliefs about their capabilities to teach science in high-needs schools, it is important to ask: How do people develop their self-efficacy? Bandura (1997) hypothesized four main sources of self-efficacy. The most influential source is called *mastery experiences*, which occur when people interpret their past performances as being successful. When preservice teachers see specific pedagogical moves translating into student gains in performance, their self-efficacy improves. When preservice teachers have had little to no actual experience in teaching students, they must rely on other sources of self-efficacy such as the *vicarious experiences* of watching others teach whom they perceive to be similar to themselves. The power of role models, therefore, is critical in providing these vicarious experiences. In a similar vein, *social and verbal persuasions* can be quite powerful in developing self-efficacy. For preservice teachers, social persuasions might be exemplified by the support and validation from mentors in the program, their cooperating teacher, or from students with whom they are working. Research reveals that the role of the cooperating teacher in clinical field placements is critical to the development of preservice teachers in how they develop their skills for feeling, thinking, and acting like a teacher (Bacharach, Heck, & Dahlberg, 2008; Graham, 2006; Roberts, Benedict, & Thomas, 2014; Sims & Walsh, 2009). Besides modeling best practices, the verbal and nonverbal messages that cooperating teachers communicate can influence their preservice teachers' self-efficacy.

Finally, the *physiological or emotional state* that an individual is in, affects self-efficacy. Positive emotions directed toward a task can improve one's self-efficacy, whereas negative emotions and physiological states such as anxiety can diminish self-efficacy. Although this last source of teaching self-efficacy has been the least studied, it is an area ripe for further exploration (see Morris, Usher, & Chen, 2016).

Connectedness. Deci and Ryan (2008) describe connectedness as feeling a sense of belonging to others. For K-12 students, this is seen in the relationships developed between peers and teachers that positively influence learning. For preservice teachers, strong connections to peers and instructors, cooperating teachers, students, and communities are factors that contribute to future notions of where they will be successful teachers (Moore, 2008). Cooperating teachers have the ability to forge connections between preservice teachers and the students and community that the school serves. Supporting these social connections can certainly be considered an act that, according to Ryan and Deci, is "centrally important" (p. 73) in learners adopting the values of that social group and developing long-term individual interest.

Finally, we acknowledge that *choosing a career* is different from being self-efficacious or interested in a field. However, career choice is certainly correlated with interest and beliefs about capability (e.g., Lent et al., 2008). Similarly, self-determination theoretical constructs can also relate to career choices. For example, Diekman, Brown, Johnston, and Clark (2010) showed that women tend to perceive STEM careers as not communally focused (i.e., focused on working with or helping people), which stands in contrast to women's endorsement of communal goals. This speaks to the fact that women's need for social connectedness is an important factor in career choice.

With this in mind, in the present study we drew from three rigorous theories of motivation (i.e., Hidi and Renninger's (2006) interest development, Ryan and Deci's (2000) self-determination theory, and Bandura's (1986; 1997) social cognitive theory, which have been widely used and tested in the educational psychology literature. These theoretical frameworks guided our investigation into how six preservice science teachers considered their nascent interests and developed more robust long-term commitments to teaching science in high-needs schools. Given the great need for designing teacher education programs that develop preservice teachers' interest to teach in high-needs schools, we were able to generate some preliminary evidence regarding which aspects of our NSF-funded Robert Noyce program were perceived as important in our participants' decisions of where to teach (high-needs school versus non-high-needs school). Doing so can provide scholars and practitioners with insights into which programmatic elements seem to hold promise in developing emerging individual interests to commit to teaching positions in high-needs schools.

Overview of the Present Study and Research Questions

For this project, funded by the National Science Foundation's Robert Noyce program, we focus on developing a model for triggering and maintaining preservice teachers' interests to teach science in high-needs schools. Through this interview study, we sought to understand how Noyce scholars' pre-existing interests and their experiences in the Noyce program interact to develop individual commitments to teach in high-needs schools. Given the goals of our project and the theoretical frameworks that undergird our study, the following research questions guided our inquiry: First, what salient pre-existing interests and experiences do Noyce scholars possess when they enter the program? Because our first research question dealt with factors that are largely outside of the control of a teacher education program, it led us to our second question:

What elements of our Noyce program triggered and maintained our participants' interests to teach science in high-needs schools? Third, we asked how our participants interpreted programmatic experiences, as it relates to the development of emerging individual interests.

Context of University Noyce Program

The Robert Noyce Teacher Scholarship is a federally-funded initiative directed by the National Science Foundation (NSF). The goal is to recruit people who have majored in a STEM content area, and provide these Noyce scholars with the opportunities and professional training to become highly-effective teachers in high-needs educational agencies. Noyce program projects fall into one of four tracks: 1) providing scholarships to STEM majors or stipends for STEM professionals to prepare them to teach mathematics and science; 2) supporting teaching fellowships and salary supplements for STEM professionals who will receive a teacher certification; 3) developing master STEM teachers who are currently in the field, including mentorship, professional development, or additional degree development; and 4) researching effectiveness and retention of teaching in high-needs local agencies (National Science Foundation, 2017, Program Description section, Paragraph 1).

Collaborating with a team of colleagues from science disciplines, we were awarded a Track 1 grant to build on our teacher preparation program at a small liberal arts university in a small suburban town in the Mid-Atlantic region of the United States. Our teacher preparation program attracts mostly students who are pursuing Master's in Education degree with a specialty in science teaching. The university is located 30-60 minutes (driving time) away from districts that contain high-needs schools. Prior to the Noyce award, we had traditionally placed preservice teachers in suburban schools close to the university with teachers with whom we have developed strong relationships. The Noyce scholarship grant has allowed our program to form

more collaborations between our university and districts that contain high-needs schools. In these districts, teacher placements are made through the central office administration based on the quality of their cooperating teacher and the desire of those teachers to mentor a student in our program. As a result, preservice teachers are placed in districts that contain high-needs schools, but the specific school where our Noyce scholars are placed is not necessarily a high-needs school.

Noyce scholars participate in our 12-month teacher preparation program, taking coursework over a summer session and during the academic school year. During the summer of the program, preservice teachers take foundational coursework and research methods. During the Fall, they take coursework in science teaching methods, technology, and special education and spend about 60 hours with their cooperating teachers (i.e. visiting once-twice a week, teaching lessons, and working with students). In the Spring semester, preservice teachers complete five weeks of intensive coursework including a behavior management course and a second science teaching methods course, which includes 20 additional practicum hours with their cooperating teacher, an assessment course, and a family collaboration course. Following this, they take on all responsibilities of teaching for ten consecutive weeks in the field (i.e., long-term clinical field experience). Below, we provide additional information about key elements in our Noyce program to recruit and prepare preservice teachers to develop an interest in teaching science in high-needs schools.

Prestigious scholarships and fellowships. Sometimes individuals have to surmount financial obstacles to pursue a teaching career (Berry, Montgomery, & Snyder, 2008). Furthermore, for some, especially in our context, individuals are attracted to programs that seem prestigious (Berry, Montgomery, & Snyder, 2008). For this reason, we believed that one

important way to spark an interest in students to teach science in high-needs schools would be to (1) offer a large scholarship (\$10,000); (2) offer a paid summer internship; (3) advertise the program as one that is funded by the National Science Foundation (a prestigious, federally funded program); and (4) offer \$3,000 per year for three years following graduation to scholars who teach in a high-needs school.

Practicum to visit high-needs schools. In addition to the requirements of our teacher education program, we developed a practicum course for Noyce scholars in which our participants spent the day as a cohort in a high-needs school. The instructor for this course (a project member on the Noyce grant) took our participants to four different high-needs schools, which represented those in rural, urban, and suburban contexts. Each of the four schools showed students the diversity of high-needs schools that exist. The instructor chose these specific schools because of relationships that teachers, administrators, and faculty from our School of Education had cultivated. Our hope for these visits to high-needs schools was to broaden our participants' conceptions of what a high-needs school could look like and help them picture themselves being successful in such a context. The instructor of the practicum facilitated discussions among cohort members that allowed participants to reflect on their experiences observing students, teachers, and administrators in high-needs schools. Through reflecting on these experiences, we hoped that our participants would see themselves as being capable of succeeding in a high-needs school, thereby bolstering their self-efficacy for teaching in a high-needs school.

Opportunities for professional development. Another way we sought to develop the interests of our preservice teachers was to offer them many opportunities to engage in professional development. Our program paid for these opportunities, so it was free to our students. One opportunity was an alternative winter break to observe urban public schools in

Washington D.C. and interact with teachers and K-12 students in this context. This opportunity was a credit-earning course that consisted of readings, discussions, and experiences designed to prepare prospective teachers and educational researchers/policy makers with an understanding of the complexities and practicalities of public urban education. Through these experiences and discussions, the instructor focused on issues of inequity, including its causes and strategies to mitigate it. Students discussed cultural and political characteristics of schools, school reform, the role of schools in a democratic society, race and racism, gender, class, social justice, educational equity, diversity, and teacher pedagogy.

Finally, our Noyce program supported students to attend state-level and national science teacher association conferences. Attending these conferences allowed our participants to present their programmatic experiences at a regional and national level, develop their pedagogy (Ingersoll, Merrill, & May, 2014). This opportunity also allowed them to network with other teachers and researchers who were also interested in recruiting, preparing, and retaining promising individuals to teach science at high-needs schools. We thought that this opportunity would both present our participants with an opportunity to take a leadership role in teaching science in high-needs schools, as well as immerse them within a social and professional network that could allow them to share ideas about teaching.

Summer intern experiences. The Noyce Program supported students to participate in a 10-week paid summer internship to gain informal teaching experiences with K-12 students. Working with the Office of Community Engagement, we identified experiences for preservice teachers to work in science camps, professional development with teachers and students, science museums, and summer school programs. These experiences were intended to diversify the experiences that preservice teachers had teaching diverse learners.

Long-term clinical field placement in a high-needs school district. Our university is located near large school districts that serve both high-needs schools and non-high-needs schools. Our primary goal has been for our preservice teachers to be paired and mentored by experienced vetted cooperating teachers (Gay & Howard, 2000). Although all preservice teachers have experiences visiting and observing high-needs schools, not all Noyce scholars are able to be placed in a high-needs school for student teaching given the availability of science teachers in those schools who are qualified (i.e., three years of experience) or able to mentor a student teacher. Our preservice teachers are told that they do not have to teach in a high-needs school after graduation, but they do have to teach in a high-needs school district (i.e., school district that has at least one high-needs school).

Methods

Participants

Six Noyce Scholars participated in the study: Nancy, Jocelyn, Adam, Anders, Sasha, and Kelly (all pseudonyms). All of them were graduate students pursuing their Masters in Secondary Science Education. Table 1 shows the background of these six participants, whether they were placed in a high-needs district or a high-needs school during the program, and where they accepted their first teaching position. Three of our six students did their clinical field placement in a high-needs school (Anders, Sasha, and Kelly), whereas the others were placed in nearby districts that contained high-needs schools (i.e., high-needs school district).

[Insert Table 1 about here]

Data and Analysis

Participants volunteered to complete an interview that lasted between 30-45 minutes about five weeks into the program after they had oriented themselves to their cohort, professors, and routine of taking classes. The interviews were performed in person by a graduate assistant who assured all participants that their responses would remain confidential. In the initial interview, participants were asked to reflect on what led them to the university's Noyce Program, their beliefs regarding the subject that they saw themselves teaching and the context in which they saw themselves teaching (e.g., high-needs school, non-high-needs school, rural, urban), and how they perceived the initial Noyce experiences to support their preparation. The participants were interviewed again during the final two weeks of the program.

We note here that the first author of this study taught all of the science education students throughout the whole program, including a science teaching methods course in the fall semester, and a curriculum, planning, and assessment course during the spring semester. She also advised the students, had close relationships with their cooperating teachers, and observed them teach at least once during the year. She serves as Co-PI on the Noyce grant and met regularly with the team to report strengths and challenges faced by each of the six Noyce scholars in this study. She kept in regular contact with the participants post-graduation. The second author taught all of the participants for this study in one of the foundational education classes, had a strong mentoring relationship with the students, and collaborated on the Noyce grant. By having a graduate assistant interview the preservice teachers, we hoped to alleviate interview bias (Creswell & Miller, 2000). However, the researchers coded the research as insiders who knew more details of students' experiences than the interview alone captured (Kanuha, 2000). We feel

that this relationship contributed to a richer understanding of the participants as individuals, their experiences, and their abilities than just in our analyses of their interviews (Fay, 1996).

The primary data from this study come from the interviews but are also supplemented with notes and discussions with the participants following the program once they had accepted teaching positions in schools. We transcribed and read through all interviews in their entirety. Using the initial interviews, we used an open-coding method to summarize background experiences and beliefs that characterized our participants and their positionality to teaching science within a high-needs school. We used a constant comparative method (Strauss & Corbin, 1990) and discussion to identify codes regarding the individual interests and prior salient experiences with which they entered the program. These codes were identified in the first interview and included: (1) experiences with or interest in STEM; (2) teaching and mentoring experiences; and (3) commitment to equity/service. For example, one participant discussed her passion for marine biology. This was coded as an *experience with or interest in STEM*. Some participants discussed their enjoyment of explaining science to others and helping students to understand science. These responses were dual coded as *interest in STEM* and also *teaching and mentoring experiences*. These codes were compared between researchers to reach 100% interrater reliability.

Next, using Hidi and Renninger's (2006) model of interest development as a guide, we analyzed the pre-interviews and selectively coded statements as "triggered" or "maintained" situational interest. We applied these codes both to programmatic elements and other experiences that either generated (i.e., triggered) or fueled (i.e., maintained) a person's interests related to STEM, teaching/mentoring, or equity/service. This varied for each individual depending on their previous experiences. For example, for preservice teachers who had few

experiences in low-income schools, field trips to high-needs schools were generally a “triggered” interest as compared to teacher candidates who had a pre-determined commitment to work in high-needs schools and these visits were characterized as a “maintained situational interest”.

In coding the data, we also drew from Deci and Ryan’s (2000) self-determination theory. The majority of these codes occurred during the second interview, as teacher candidates reflected on their experience in the program. These codes included instances of autonomy and choice, experiences that developed competence, and perceptions of connectedness. When teachers’ discussed increased competence in teaching abilities or working in high-needs schools, Bandura’s sources of self-efficacy were applied as codes to these statements (i.e., mastery experiences, vicarious experiences, and social persuasions). In this interview, we continued to code for “maintained situational interest”. We created a matrix to show a progression of interest, self-efficacy, and commitment to teaching science in high-needs schools between individuals. We describe six cases (Yin, 2013) to illustrate different starting points of interest and experiences related to teaching in high-needs schools. We grouped two pairs of the cases together (i.e., Adam’s and Jocelyn’s cases are described together, and Sasha’s and Kelly’s case are described together) to illustrate similarities in the progression of their interests over the year. Although their cases are described together, the way that they discuss sources of motivations and their commitments are different.

Findings

Using the following individuals’ case studies, we describe how six preservice teachers drew on their pre-existing interests as resources when interacting with programmatic features. For each case, we describe programmatic elements that may have triggered interest to join the Noyce program, experiences that maintained this interest, and how preservice teachers describe

the development of their individual interests, self-efficacy, and commitment related to teaching in high-needs contexts and schools. Following the cases, we discuss how preservice teachers approached the choice to teach or not to teach in a high-needs school. We describe how these scholars report their experiences with elements of the Noyce program in relation to their commitment to teach in a high-needs school after graduation.

Nancy: Pre-existing interest in high-needs schools but apprehensive about teaching

Pre-existing interests. Nancy had previous experiences serving disadvantaged communities through volunteer work, and stated early in her program experience that she hoped to directly serve high-needs schools. Nancy was a career switcher, who was “not fulfilled” in her first year as a biomedical engineer. She stated that the job did not allow her to embrace her “service-oriented nature” and “desire to save the world,” both of which were consonant with what she did prior to college, as a member of the peace corps, and as a humanitarian. Nancy had no teaching experiences, which made the commitment to a Master’s Degree in Education a “really big shift” for her, and a financial concern. Nancy wanted “to teach without being sad about spending a lot of money on something [she] didn’t know how it was going to go.” Thus, the Noyce Scholarship allowed Nancy to mitigate part of the risk involved in switching careers. Nancy also sought after and was awarded another scholarship that committed her to teach in an inner-city, high-poverty, urban school for three years. Nancy discussed her justification for accepting this scholarship early in her journey through the Noyce program:

I think to successfully teach in a high-needs school is to be willing to be a part of the high-needs, like being a part of their community and being willing, not just to let your influence stop at your classroom door. . . . your influence needs to be throughout the school. That's something that I want to do because the teachers I

really want to be were involved with my school community. I want to be a coach, or I want to be involved in a club or I want to be someone they see not just in my classroom.

In contrast to most of the other Noyce scholars in our program, Nancy was firmly committed to teaching in high-needs schools. However, for her, the idea of teaching physics was overwhelming, as she described here in her first interview:

I think this past week in my practicum has been kind of scary for me ... I like seeing what [students] can create from [physics] but seeing all the different methods for teaching it is really hard because now I am unsure how I can do it and what's the best way to do it.

Thus, given Nancy's pre-existing individual interests and experiences serving marginalized communities, working in high-needs schools was not as much of a problem as was the idea of actually teaching students physics.

Programmatic elements that maintained interest. Because Nancy had already decided to teach in an urban high-needs school after the program by accepting the other scholarship requiring this commitment, she used experiences in our Noyce program to connect herself with the teaching profession by pursuing additional professional development opportunities that connected her to a larger community of teachers. For example, Nancy participated in a paid, winter, field-based, course experience to visit schools and policymakers in the nation's capital and to engage in critical discussions about equity in teaching and learning. She described this experience as follows: "I felt like I saw so much motivation there to get things done ... you feel like you're doing something valuable." Noteworthy in this quote is Nancy's description of how

she felt a strong sense of connection to people who were highly motivated to do work that she considered meaningful.

Although feeling connected is important, equally important is feeling as if one has a say in the direction one's career takes. In this respect, Nancy's cooperating teacher provided her with a great deal of autonomy in managing the classroom and teaching lessons, which Nancy describes as follows:

I just felt like I had a lot of freedom. . . . My cooperating teacher left me alone a lot which was really nice. . . . I think that helped me in terms of my classroom management because I didn't have another person to bolster me.

Rather than seeing the large amount of freedom she was given as paralyzing, her excitement for teaching only strengthened.

Emerging individual interest. We should note that Nancy was placed in a large suburban high-needs *district*. However, her specific clinical field placement was not considered a high-needs school. Further, in her student-teaching placement, she taught Grade 11, honors and advanced placement physics classes in classrooms that were filled mostly with upper-middle-class students. Although Nancy was not in a high-needs context, she sought ways to transfer learning from her student teaching experience to her future in high-needs schools. One lesson that she gleaned from her cooperating teacher was about being resourceful:

My cooperating teacher has cultivated all these supplies over the years and like she has a really supportive science league in her city that helps her get all these things that she needs and like I'm a first-year teacher and I'm going to have like nothing in the room except for some paper plates. I'm going to have to make it work, which I feel is one thing that's going to stand in the way but also at the

same time I like making something out of nothing. So, like in student teaching I made this lab out of like cardboard box lids and scissors and paper and like I know like I can make stuff out of a few materials and I can beg and borrow and steal and get it all as I need it.

This quote is especially significant because her sense of efficacy seems to emanate both from her own ability to be resourceful, but also from the vicarious experience and social persuasions from her cooperating teacher describing specific strategies for succeeding.

Following the program, Nancy accepted a math and science position in an urban high-needs middle school, and rented a home near the school. It was clear that Nancy entered the program with significant individual interest in equity and community service. She actively sought out opportunities to engage in teacher professional development as a means to connect with teaching as a profession. Mastery experiences with students during student teaching and vicarious experiences with her cooperating teacher were significant to the development of Nancy's competence in teaching and the development of her emerging interest in teaching physics in high-needs schools. The parallel development of Nancy's interest in teaching at a high-needs school and the development of her self-efficacy to teach in that context is in-line with previous research on the relationship between self-efficacy and the phases of interest development (see Chen et al., 2016).

Adam & Jocelyn: Committed to career in teaching but few experiences with diverse students

Pre-existing interests. Adam and Jocelyn shared a pre-existing interest in teaching Biology. Adam was inspired by his high school Biology teacher, and began coaching high

school students when he came to college. Jocelyn was a career-switcher but unlike Nancy she had extensive experiences in informal marine science education and she noted, “I confidently know that I can lead a classroom.” Jocelyn hoped that by committing to a teacher preparation program, she could transfer her successful informal experiences into a formal classroom setting. Both students sought scholarships to support their future goals to earn a Master’s degree and teaching certification in Biology.

Both Adam and Jocelyn were less certain about their initial desire to teach in high-needs schools.

Adam explained that his apprehension stems from the fact that his own educational experiences were so different from what he perceived to be the experience of students in high-needs schools:

I’m definitely not quite as passionate about teaching in high-needs schools as opposed to teaching biology in general. I think part of that uncertainty comes from my background was very much not a background in high-needs schools.

For Adam, the salience of his previous experiences appeared to create a high threshold for successfully triggering his interest in teaching at high-needs schools.

Whereas Adam drew from his experiences as a swimming coach, Jocelyn drew on her experiences and successes in writing grants for informal science education as a skill that she could leverage as a teacher. Although she believed “all students deserved to learn about marine science in school,” like Adam, she was not certain at the beginning of the program if she “fit” as a teacher in high-needs school. She tentatively described her pre-existing interest in working for a high-needs district in the first interview:

I see myself working in some kind of high-needs [district], I don’t necessarily think school, but like a district is where more or less I see myself. . . . I do want to work with

students that maybe are low income but also in an area where there's just a lack of resources.

We took Jocelyn's statement as evidence that she was leaning *away* from teaching at a high-needs school. Unlike for Adam, we did not have specific evidence for what Jocelyn's salient experiences were that set a high threshold for creating a spark large enough to trigger an interest in teaching at high-needs schools. Nevertheless, what was clear to us was Jocelyn's and Adam's firm interest at the start of the Noyce program in teaching, but also their apprehension about teaching in high-needs schools.

Programmatic element that sparked and maintained interest in high-needs schools.

Although Jocelyn and Adam had few experiences working with students from marginalized communities, they both noted how pleasantly surprised they were to see high-needs schools in a new light when they visited diverse schools as a part of their coursework. For both Jocelyn and Adam, this began with a site visit to a rural school. Jocelyn, who grew up in a rural community and attended rural schools, noted that she felt "drawn to help get things to them." When she and Adam visited a high-needs rural elementary school, Adam stated that the experience sparked "a preference for rural settings" because the teachers were "doing great things in the classroom." Similarly, Jocelyn found the experience of visiting high-needs schools as a vicarious experience that developed her interest in teaching in high-needs schools. Reflecting on the field experiences in the second interview, she shared:

They increased my interest [to teach] in high-needs schools ... just seeing like that I could fit in and that I could be doing what those people are doing and almost to the point where it's like they need better teachers and that would encourage me to go there.

Navigating individual interest and context-specific self-efficacy. Due to logistical challenges in the program, Adam and Jocelyn were not placed in a high-needs school for their student teaching. Adam was placed in a high school on the outskirts of a rural/suburban area with a student population that was predominantly middle to upper middle class, and white. He was assigned to teach honors and advance placement courses. Even though Adam taught in advanced classes, he frequently compared his placement and his perception of the community's value of education to his own high school experience in a large, wealthy, suburban school district. For example, during his first interview, he observed:

I feel like the school has a great sense of community, but I feel like that community could probably band together a little more to like push for higher expectations, become a little more career or goal oriented. . . . I feel like a lot of students are very complacent.

Noteworthy here is Adam's deficit view of the school and community where he is placed, which appears to crowd out any opportunities for a "spark" to be triggered, much less be maintained and then developed into an individual interest.

Like Adam, Jocelyn's student-teaching placement was in a non-high-needs school. The school was located within a mid-sized suburban district. Jocelyn's cooperating teacher freely offered all responsibilities of his classroom to her for the entirety of spring semester and Jocelyn student-taught well past the end-date of student-teaching. Here, she described the experience of being "handed over the reins":

The best thing to me was just teaching, like running the classroom, like that was really awesome and I did that for probably like six or seven weeks in the past 10 weeks of student teaching. I was the teacher that planned everything and most of the time my

cooperating teacher was in another room or out sick or not there and so it really felt like my classroom and so that to me has been the most rewarding thing because it really was insightful to see what it's like. . . . He just let me be me and do my thing and he supported me.

Clearly, for Jocelyn, having the autonomy of teaching a class for herself reinforced her interest for teaching science in a formal classroom setting.

Although the Noyce program sparked an interest for both students to teach in a rural high-needs school, there was no evidence of this spark being supported. For Adam, not having any experiences teaching in a high-needs school was a major factor in him feeling uninterested in teaching at a high-needs school, as he noted here:

[The Noyce project team] needs to make sure that teaching environments are truly high need. . . . So, like if I were placed in a high needs environment and it was very hard . . . and I didn't like it, then maybe I would have regrets [about] joining the program, but on the reverse of that is if I was put in a very non-high needs, very easy-going environment, there was no way I would know [if I was interested in teaching in high-needs schools].

When we examine that previous quote with Adam's admission that, "I wouldn't say that I've done it," referring to teaching in a high-needs school, we started to notice how important it was for someone like Adam to be provided authentic mastery experiences (see Bandura, 1997) teaching in a high-needs school. In some sense, this was a missed opportunity to both spark and sustain an interest in teaching in high-needs schools. Following the program, Adam was hired to teach Biology in a suburban non-high-needs school, in the same geographic area in which he grew up. He explained why this was his ideal position: "I want a job where I have a connection to somewhere I've been before, somewhere I know people." Thus, his feelings of being

connected to a community where he grew up (see Ryan and Deci, 2000) appeared to have a powerful reinforcing effect on his interests in teaching within that context. Absent any experiences within high-needs schools, and absent any opportunities to feel connected to communities served by high-needs schools, those individual interests with which he entered the Noyce program appeared to have the casting vote in his decision of where to teach.

Like Adam, Jocelyn accepted a position in a non-high-needs school. This school was located within the same school district where she did her clinical field placement. In her first year there, she became Teacher of the Year for the district and continues to be involved in professional development programs. In her post-interview, Jocelyn reflected aloud that the extracurricular experiences provided through Noyce “increased [her] interest in high-needs schools.” Jocelyn described her experience in the Noyce program as a social network that “supports her interest in teaching science and teaching in high-needs schools.” Jocelyn reflected that she could in fact see herself in a high-needs school because “they need better teachers.” Although Jocelyn did not have the experience of teaching in a high-needs school, she felt that the program supported her interest in serving all students, which she described here:

Being an advocate for students is something that I really want to be. . . . Helping them when there’s issues or speaking out for them or supporting them academically or just being a listening ear. . . . It was something I did as a student teacher and something that also I value.

Of course, there is no way to know whether student-teaching at a high-needs school could have maintained Jocelyn’s situational interest and nurtured it into an emerging individual interest for teaching in a high-needs school. Jocelyn entered the program hesitant about the prospect of teaching in a high-needs school. Her prior experiences working with students consisted mostly

of facilitating informal science learning at a marine institute. Although she saw her skills in obtaining grants as an asset, especially for high-needs schools, she had no experiences applying her skills and developing her interests within high-needs schools. Given how much time and energy Jocelyn invested in student-teaching at the district and school where she was placed, it is not surprising that she pursued and accepted a teaching position in that same district. Other factors such as job security and life circumstances and commitments (i.e., Jocelyn had a permanent home in this district) also likely played a role in her decision. Ultimately, without any compelling experiences in high-needs schools to develop their self-efficacy, their feelings of autonomy, and feelings of connectedness to these settings, Adam's and Jocelyn's pre-existing individual interests appeared to have the casting vote in their decision to teach in non-high-needs schools.

Anders: A spark unkindled by tensions in efficacy and autonomy in high-needs schools

Pre-existing interests: Anders always wanted to teach; in his first interview, he said, “teaching is something that I’ve been drawn to for a long time and since I was in elementary school I can remember wanting to teach.” Like many of his peers, he had no prior experiences being in a high-needs school, but was sparked by the challenge that the Noyce program offered him:

I’m definitely enthusiastic about the challenge of engaging students in physics, who may not be interested in [when they] come in. And in addition to that, maybe [engage] students who have more challenges outside of school, and trying to serve as a mentor and offer guidance when they want it.

He viewed the Noyce scholarship as an opportunity to learn how to teach in a high-needs school; he believed that the Noyce-specific experiences would prepare him to be a better teacher

regardless of where he accepted his first teaching position. Anders was most concerned about his ability to be able to motivate students who were not naturally interested in the subject:

I would like to try to emphasize some enjoyment of what they're doing and some purpose beyond just passing the class and I'm not sure how capable I would be at this point of doing that for students who are not interested in the school aspect.

For Anders choosing to pursue a teaching career was the fulfillment of a desire he had for quite some time.

Triggered situational interest to teach in high-needs school. Similar to several of his Noyce peers, visiting high-needs schools as part of coursework seemed to spark his interests to teach in a high-needs school. During one particular school visit, he pointed to what could be called the beginnings of a feeling of connectedness to a community that he had very little familiarity with. He described this during his second interview:

I was very impressed with the first [Fall practicum] visit. We went to [name omitted] elementary school, which was more of a rural school, and I really like the community at that school ... even though they didn't have that many resources and the students they were saying was coming from much poorer backgrounds, they seemed to be having just a very nice warm and productive climate there.

Noteworthy here is the fact that Anders expressed a bit of surprise in being able to see a high-needs school that, to him, appeared to have a “warm and productive climate.” He felt like he could connect and relate with the school community—an important aspect of taking on the values of teaching in a high-needs school, and thus, proceeding from more transient situational interests to more robust individual interests.

Throughout the program, Anders emphasized that he was “not picky about where I work” but hoped to find a school culture where he could be successful. He explained, “I’m open to living in different types of places as long as I have a good feel for it when I go.” Thus, Anders expressed his need both to feel a sense of connectedness, and his need to feel self-efficacious in teaching within a high-needs school context.

Navigating situational experiences to maintain interest in high-needs schools.

Anders developed a strong rapport with the students and described successful interactions with them. For example, he recalled:

I have gotten good responses from students so far in terms of them being engaged. . . . I can see that especially when I’m speaking with a smaller group and having them reflect on activities that we’ve done. I can see the growth and understanding as we go through. Yeah, certainly a lot of things I still am going to be developing on, but I’m happy with how I’ve progressed so far.

Unlike his peers, Anders described feelings of being disconnected with his cooperating teacher. For example, he had to negotiate with his cooperating teacher on many occasions to try out new activities that differed from traditional lecture-style classes. He described feeling “constrained” and having to work within “her structure” and the “structured framework of the school.” Anders frequently questioned whether he was meeting the expectations of his cooperating teacher and desired more feedback from her. He explained, "I wasn't sure if I was imposing or whether there was something that I could do better."

The context of Anders’ school placement is significant. Anders completed his student teaching during a time when the urban school in which he was placed was in jeopardy of losing accreditation. Teachers were required to turn in detailed weekly lesson plans to administrators

and Anders's cooperating teacher was actively involved in the school-side accreditation process. This experience was challenging for Anders. He noted that he could not see himself succeeding in a climate where administrators would overly constrain the instructional choices he wanted to make, as he expressed in the following:

When schools are having trouble ... I guess [they] kind of understandably try this no-risk strategy where they just do everything to this minimum standard. I see the motivation for that, but I don't think that that is necessary in terms of the students' educational well-being. I would like to see a situation where someone is willing to take a risk and do some of the structural things that could be done. But that's difficult.

Following his clinical field experience, Anders was offered two teaching jobs, one high school physics position in a high-needs school and one in a magnet high school that was *not* a high-needs school. The magnet school boasted small class sizes, and provided students with a good deal of autonomy. It also offered teachers quite a bit of autonomy regarding their curricular decisions. Anders committed to the magnet school and described why:

I think I'll have a lot of freedom as a teacher to kind of do some of the things I want to do. I have a good feel for the administration—very collaborative. It seemed like a place where I can kind of develop my teaching skills in a more original way rather than to necessarily fit a template that's been given by some other schools. . . . Really the only thing that it doesn't have is being in a high-needs setting because I think that my completely ideal position would be to have some sort of model like this for high-needs students.

Anders claimed that he wants to pursue teaching in a high-needs school in the “long-term” after he gets some time to “experiment with my teaching and become more confident in that style. I think that I can bring something to a high-needs school later on in my career.” Due to the situational experience of teaching in a high-needs school under the constraints of a scripted curriculum and a cooperating teacher who had a didactic teaching style, Anders was not able to develop the self-efficacy to navigate the institutional structures of a school that is at risk of losing accreditation—a situation that many high-needs schools face (Darling-Hammond, 2010b). Of course, we have no way of knowing what Anders would have chosen to do if he had been placed with a cooperating teacher who provided Anders with sufficient autonomy, or taught him how to navigate the social and political landscape of a school to accomplish instructional goals his own way. However, Anders does point to those feelings of disconnectedness from his cooperating teacher, his lack of autonomy in making instructional decisions, and his lack of self-efficacy in navigating a high-needs school at-risk of losing accreditation as salient experiences that failed to translate an early spark into maintained situational interest and eventually into individual interests for teaching in high-needs schools.

Sasha & Kelly: Creating a spark that grows into a commitment to teach in high-needs schools

Pre-existing interests. Sasha and Kelly entered the program with an interest in teaching but few to no experiences with students from marginalized communities. Like Kelly, Sasha entered the Noyce program expressing a strong interest in teaching science: “I like biology and science in general, but what really gets me excited is teaching and I don’t think it’s any fun to just know it myself.” Sasha purposefully pursued experiences in teaching prior to college—she participated in high-school teaching internships,

participated in peer-mentoring opportunities, and tutored in college. When she found the Noyce scholarship online, she recalled that she “never really had thought a whole lot about teaching in a high-needs school.” Although Sasha had not previously considered teaching in a high-needs school, she demonstrated a determination to learn how to teach in a high-needs school. In her first interview, she shared:

Students deserve really committed, qualified, excited teachers that are passionate about wanting to teach them. I feel like a lot of times in these high-need schools they’re kind of forgotten about or teachers don’t want to go there because they’re afraid that it’s kind of a more difficult setting or they’re afraid that they’re not going to get the support that they need or they’re just not sure if they can do it or have the capacity to reach these students and connect with them in a way that they could be successful teachers. But I am excited to do it. . . . I just want to serve in a high-needs school and put forth my very best effort.

Thus, Sasha entered the program very interested in teaching science, and hesitant but open to teaching in a high-needs context.

Kelly did not consider the possibility of teaching until her senior year as an undergraduate biology major. However, the encouragement that she received at the university’s teacher preparation recruiting event excited her and the possibility of receiving a scholarship convinced her to pursue a teaching career. Like Sasha, Kelly had no experiences with working in a high-needs context. Whereas Sasha expressed some openness to the idea of teaching in a high-needs school, Kelly expressed ambivalence and anxiety toward working in high-needs schools:

I don't have any experience with high-needs schools. I am a little nervous, a little scared to work in high-needs schools just because you only hear things on the news and what you read on the internet and things like that about high-needs schools.

Clearly, the narratives that Kelly had internalized gave her the impression that high-needs schools are an unfavorable place to teach. Given Kelly's and Sasha's pre-existing individual interests, what factors could have triggered and maintained a situational interest to teach in high-needs schools?

Triggered and maintained situational interest to teach in high-needs schools. Like Adam and Jocelyn, Sasha and Kelly describe the early field experiences to high-needs schools as important to developing their interest to teach in high-needs schools. For Sasha, she described the importance of meeting teachers who were committed to their urban school and the surrounding community. Kelly was sparked by the experience of seeing functioning high-needs schools with compassionate and organized classrooms; here she considers how she began to develop a clearer understanding and connection to high-needs schools:

I think the [Fall] practicum portion kind of opened my eyes to what high-needs actually means because I think everyone was a little scared at the beginning. . . . you hear bad rumors about all these schools that are not doing so well and it makes you a little nervous about teacher dropout rates, and why are all these teachers getting burned out and everything. So, I think the practicum experience really opened my eyes.

Following this triggered situational interest, Sasha's and Kelly's interests were maintained through their experiences with their cooperating teachers in different urban high-needs schools. They both regarded their cooperating teachers very highly and hoped to emulate many aspects of their cooperating teacher's teaching philosophies and practices. Sasha spent

many hours “observing how her cooperating teacher did things” and Kelly shared that her cooperating teacher “gave me feedback on my teaching and was very open to trying new things and helping me own it.” Both Kelly’s and Sasha’s cooperating teachers shared their resources with the teacher candidates to scaffold the experience of taking over a classroom. Sasha noted that, “I really did jump right in and take on a lot of teaching responsibilities ... for the classroom early on.” Sasha perceived her cooperating teacher as “a support system” who would be a long-time friend and colleague. Kelly described her relationship with her cooperating teacher by saying:

I have the greatest relationship with my cooperating teacher. Before I even met her, she sent me a Google Drive link with all of her resources on there and my cooperating teacher is very young and she’s been teaching four or five years, so she hasn’t been teaching very long herself, but she’s very open and she gives me feedback on my teaching and is very open to try new things in the classroom.

Clearly, for Sasha and Kelly, having a cooperating teacher to help them “own it” by providing the necessary autonomy was a clear leap in the development of their interests to teach in high-needs schools. Furthermore, their cooperating teacher’s supported the development of their self-efficacy to teach effectively in a high-needs school setting.

Emerging individual interests. As they continued in their student-teaching, Sasha and Kelly both pointed to how important it was for them to feel a strong sense of connection to their students and the community in which they taught. This was a clear theme that emerged from their interviews, which Sasha recalled here:

I guess what I enjoy most is the atmosphere that they have created at their school where everybody- teachers, staff, students, parents, the community, everybody

feels like they are a valued part of the school and I really really enjoy that. The culture of the school you can tell that everybody is just very comfortable with one another and that includes students with teachers and students with administrators. Students know that everybody at that school is in it because they want to see them excel and do the very best that they can, and with that also students know and I don't really know how to describe this component of the school culture, but students know and feel safe and able to just be themselves and express themselves.

Here, Sasha clearly indicated that she experienced a great deal of connectedness to her school environment. This seemed to have been a powerful experience, which likely fueled her interests and allowed them to develop into enduring individual interests.

Prior to the clinical field experience, Kelly had spoken very little about equity or social justice in teaching. She revealed how her initial fears of being able to manage a classroom of students in a high-needs school subsided as she realized that she could see herself teaching in a high-needs school. Kelly's follow-up interview reveals that she had reflected on her role as a teacher in a high-needs school and had a deep commitment to working with underserved communities. She shared:

I don't want to be like the White teacher savior, but at the same time you think like these students do need a good teacher just as much as the other districts that can hire top notch students coming out of education programs or teachers that have been teaching for 20 to 30 years that are amazing at their job. I definitely think there is a social part. . . . I want to teach because I make great relationships with those students that I have at my school.

Kelly felt deeply connected to the students whom she was teaching. The students liked and respected Kelly and even had a going-away party for her at the end of her clinical teaching experience. She described the validation from her students and the connection that she developed with them as follows:

Positive feedback from the students absolutely just makes your heart feel happy when you hear the students say you're a good teacher, we really like you, why are you leaving. Like that to me is probably the best part of teaching is that the students have a positive reaction to you being in the classroom.

As Kelly and Sasha approached the end of the program, they applied only for positions in high-needs schools. Sasha accepted a seventh-grade teaching position in the same middle school where she completed her long-term clinical field placement. Similarly, Kelly accepted a job offer in another high-needs school in the same urban district as her clinical field placement. For both teacher candidates, the Noyce program seemed to provide them with an early spark for considering teaching in an urban high-needs school context. Furthermore, through strong cooperating teachers and mastery experiences within their clinical field placement, their interests seemed only to flourish. Their feelings of competence in their field placements, autonomy in their instructional decisions, and connectedness to their students and community seemed to deepen those interests.

Limitations

Before we discuss the findings, we acknowledge that there are limitations to our study. First, we drew from a small sample size. Therefore, instead of making suggestions about causality, we hoped to provide descriptions of particular people's experiences with our Noyce program in hopes of providing enough details that readers can learn some important lessons,

which we discuss in our next section. Second, our data capture our participants' experiences over one academic year. However, we do not have much data documenting our participants' experiences now that they have been teaching for more than two years (as of this writing). Thus, our findings capture only a limited snapshot in time. Researchers would be wise to conduct future studies that explore changes over much longer periods of time because the maintenance of interest and development of a firm commitment to teaching in a high-needs school certainly can take place over long periods of time. Finally, we acknowledge the fact that our institution draws its students from a population that is largely White, female, and socioeconomically advantaged. Although this might be somewhat reflective of the overall field of teaching, it is certainly not representative of the general population. Generalizing these findings to a different demographic, therefore, is unwarranted.

Discussion

These limitations notwithstanding, we believe there are important lessons to be learned from the six cases described in our findings, especially when considered vis-à-vis Hidi and Renninger's (2006) four-phase model of interest development. In this section we discuss the power of prior individual interests, how feelings of autonomy and connectedness appeared to be important fuel for initial sparks of interest, and the importance of context-specific self-efficacy.

The Power of Prior Individual Interests

Prior individual interests can be a powerful resource for those who find themselves involved in tasks that are not what they had ideally sought out. For example, Nancy was able to draw on her prior individual interests serving people in marginalized communities as a resource to pursue opportunities to learn from her cooperating teacher and other opportunities provided through the Noyce program, even though she was not placed in a high-needs school for her long-

term clinical field placement. This supports prior research that prior individual interests can be a significant resource for individuals as they go through uninteresting or difficult tasks (Chen et al., 2016; Katz, Assor, Kanat-Maymon, & Bereby-Meyer, 2006; Tsai, Kunter, Lüdtke, Trautwein, & Ryan, 2008). Our findings add to this literature, especially in the field of teacher education, by showing that for someone like Nancy, her strong previous interests serving in high-needs communities appeared to be a motivational resource that helped her seek out other opportunities to prepare her for teaching in high-needs schools.

However, individual interests are a double-edged sword. People are not endlessly malleable lumps of clay. The case of Adam illustrates this well. Adam did not report any salient experiences working with students of color or students from low SES households, and expressed reservations about teaching in a high-needs school. Adam's schooling experiences were as he described "very much not a background in high-needs schools." This prior individual interest, given Adam's background, colored his Noyce experiences. One notable example mentioned earlier is Adam's observation that the students in the school where he did his student teaching "are very complacent," and that the school community "could probably band together a little more to push for higher expectations" and "become a little more career or goal oriented." Clearly, Adam's own background growing up in a wealthy suburban area, and his individual interests of being a swim coach with students from this community strongly guided how he experienced the activities in the Noyce program, including his student-teaching experience, which was not even in a high-needs school. Our findings are in-line with the literature showing how prior individual interests have an effect on the tasks that people choose and how interested and self-efficacious they are in future tasks (see Chen et al., 2016). Our findings add depth to this body of literature by illustrating concrete examples of how particular individuals' prior

experiences and interests can act as adaptive resources in a teacher preparation context (e.g., Nancy), as well as a significant challenge for teacher education programs whose missions are to recruit, prepare, and retain individuals to teach in high-needs schools.

Connection and Choice: Factors That Helped to “Really Own it”

We draw attention to the fact that all of our Noyce participants’ initial interests to teach in high-needs schools were rooted in mostly *abstract* ideas of advocacy rather than in concrete experiences—none of our participants had significant concrete experiences teaching or learning in high-needs schools. As mentioned earlier, there is a long and pervasive history of people seeing high-needs schools as being unattractive places to work because they perceive such schools as having: (a) unsafe conditions, (b) lack of parental support, and (c) lack of administrative support (see Darling-Hammond, 2010). This image of high-needs schools as an undesirable context to work was certainly a pre-existing conception for some of our Noyce scholars. This was evident in Kelly’s initial apprehension about teaching in a high-needs school because of the image she held of high-needs schools as being a place where teachers are consistently unhappy and burned out.

Although prior individual interests certainly do color the experiences of preservice teachers, there are factors that teacher educators and teacher preparation programs do have some control over. During the Fall semester, our particular Noyce program incorporated a practicum in which Noyce scholars would spend a day visiting various high-needs schools, which ranged from rural to urban contexts. This allowed our participants to see that high-needs schools are not a monolith—they can be found in a variety of contexts. The instructor for the course made connections with partners in different school districts, and vetted them to ensure that the visits would showcase both the diversity of high-needs schools as well as the fact that there are highly

functional high-needs schools where our participants could potentially feel connected to. Although this practicum course helped make concrete our participants' abstract notions of advocacy, this was not the only programmatic element we created to scaffold our participants' interests to teach in a high-needs school.

Sleeter (2001) suggested that student-teaching in a high-needs school is a critical component for developing preservice teachers' culturally inclusive pedagogy and ability to see themselves working in high-needs schools. This was certainly the case for Kelly and Sasha, who student-taught in an urban high-needs school, and ended up accepting jobs in an urban high-needs school. However, we caution readers not to assume that merely placing preservice teachers in a high-needs school will boost their interest in teaching in such a context. Instead, we point to the formation of meaningful social connections and the ability to make meaningful instructional decisions as key drivers of interest development. For example, Kelly, as mentioned earlier, spoke about how her cooperating teacher provided ample opportunities for Kelly to make meaningful instructional decisions by herself, thereby helping Kelly to "really own it." As Ryan and Deci (2000) noted, "support for autonomy allows individuals to actively transform values into their own" (p. 74). Kelly and Sasha noted that their cooperating teachers gave them opportunities to make instructional choices on their own, which allowed them to wrestle with what it means to run a classroom in a high-needs school. As Ryan and Deci (2000) hypothesized, this likely allowed them to negotiate their experiences in a high-needs school "with respect to their other goals and values. Such deep, holistic processing is facilitated by a sense of choice ... and freedom from excessive external pressure toward behaving or thinking a certain way" (p. 74). In contrast to Kelly, Anders felt overly constrained in making instructional choices. This conflict, for Anders, seemed to hinder his ability to "actively transform values into [his] own" (p. 74).

In addition to feelings of autonomy, Ryan and Deci (2000) hypothesized that feeling connected to a person or community is critical for people to transform the values of that person or community into one's own. In the present study, we saw this when Kelly and Sasha described their cooperating teacher as someone to whom they felt they could relate. Sasha, as mentioned earlier, also described the whole school community as one that fostered a sense of care and warmth—something that seemed to facilitate the development from situational to individual interests. In contrast, for Adam, toward the end of the program, he noted that, “I want a job where I have a connection to somewhere I've been before, somewhere I know people.” Throughout the Noyce program, Adam never had the opportunity to develop meaningful social connections to people and communities in high-needs schools.

Anders also expressed feeling disconnected from the culture of the school where he was placed. He pointed to larger systematic problems at the administrative level. Anders saw the constraining nature of his context to be an obstacle to him being able to commit to teaching at a high-needs school. Schools are complex social systems, often mired in bureaucracies that can impede the collective actions of teachers and students. As Bandura (1997) has argued bureaucracies are often designed to benefit the people who run these systems rather than benefit the people that such systems are purported to serve. Countering such forces is far outside of the scope of teacher preparation programs. Yet, it is a critical part of attracting individuals to teach in high-needs schools, as shown by Anders, and seems to be especially critical to retaining teachers in high-needs schools.

Self-Efficacy and Context-Specificity

Ryan and Deci (2000) pointed to competence beliefs as an important component of developing a robust individual interest. For this reason, Bandura's (1997) hypothesized sources

of self-efficacy are especially relevant because developing self-efficacy can also cultivate interests in a class of activities (see Chen et al., 2016; Hidi & Reninger, 2006). We note, however, that for development of self-efficacy to translate into development of interests, it is critical to heed Bandura's (1997) admonishment to attend to *context*: "Self-efficacy beliefs should be measured in terms of particularized judgements of capability that may vary across realms of activity ... and under different situational circumstances" (p. 6). Thus, to develop self-efficacy (and consequently interest) in teaching science in high-needs schools, preservice teachers must feel competent *working directly within high-needs school contexts*. For example, although Jocelyn and Adam developed their self-efficacy for teaching science, it was not in a high-needs school context. Adam's admission that "I wouldn't say that I've [taught in high-needs schools]" reveals just how important feeling successful within a high-needs school context is in the development of self-efficacy and interest.

Finally, we acknowledge that individuals do not live their lives in isolation—they are intertwined within large networks of people and other institutions. This is certainly true with teaching, where teachers must rely on others within the school and even whole communities to realize desired outcomes. As a case in point, although Anders student-taught in a high-needs school, his experience feeling powerless to navigate the administrative constraints placed on teachers likely detracted from his self-efficacy to accomplish the goals he set for himself as a teacher. Thus, Anders felt capable in teaching science well, but did not feel capable navigating the social and political contexts of a high-needs school that was at risk of losing accreditation. This issue of preparing preservice teachers to work together with others in order to realize desired outcomes (i.e., developing collective efficacy) presents teacher preparation programs with a serious challenge because preparing preservice teachers to work within complex social

and political networks often falls well outside of the scope of many of these programs.

Researchers would do well to extend this line of inquiry by exploring ways to develop preservice teachers' collective efficacy for achieving desired outcomes.

Conclusion

Recall that the following three research questions guided our inquiry:

1. What salient pre-existing interests and experiences do Noyce scholars possess when they enter the program?
2. Which elements of our Noyce program triggered and maintained our participants' interests to teach science in high-needs schools?
3. As it relates to the development of individual interests to teach in high-needs schools, how do our Noyce scholars interpret programmatic experiences?

Regarding the first research question, we found that our Noyce scholars entered the program with no prior experiences in high-needs schools, and had mostly abstract notions of teaching within these contexts. Noyce scholars had a wide range of experiences, which related to teaching/mentoring youth outside of formal educational settings (i.e., coaching swimming, or informal science teaching in a marine science institute). These prior interests and experiences appeared to color their experiences in the program.

Regarding the second research question, we found that, given our Noyce scholars' preconceptions of high-needs schools, the practicum experience in which they visited four very different high-needs schools throughout the Fall semester was an important factor that triggered their situational interest for teaching in high-needs schools. But to maintain that situational interest and develop it into a more robust interest to teach in high-needs schools, we found that one critical factor was for our Noyce scholars to feel connected to their cooperating teachers, to

the school community, and to the student body where they did their student-teaching. Another critical factor was for our Noyce scholars to feel like their cooperating teacher trusted in them enough to “hand over the reins” to them. For our Noyce scholars, feeling this sense of autonomy helped them “own it,” as Kelly aptly put it—an invaluable part of taking on the values and also developing the self-efficacy to teach in a high-needs school.

Our third research question concerned the development of individual interests, and deciding whether to accept a position at a high-needs school. We found evidence that, absent any strong pre-existing individual interests to work in high-needs schools, developing the self- and collective efficacy to teach in a high-needs school setting was especially important in continuing to develop our Noyce scholars’ interest for teaching in high-needs schools, and for them *choosing* to do so after the program. Self-efficacy is highly context-specific, so developing the competence and efficacy beliefs to teach specifically in high-needs school settings must be a high priority for programs whose missions are directed toward that endeavor.

In summary, this study suggests that when recruiting and retaining highly qualified preservice teachers to pursue jobs in high-needs settings, teacher educators should take an in-depth look at prior experiences to determine how to best support preservice teachers in finding experiences for autonomy, self-efficacy, and social connectedness to high-needs schools. For the population of preservice that our institution attracts, student teaching experiences should occur in high-needs school contexts with cooperating teachers who are relatable and supportive of preservice teachers’ nascent skills in teaching in such a context.

More important, in order to recruit and preservice teachers for teaching in high-needs settings, they must genuinely see strengths in the communities in which they teach. During this experience, preservice teachers rely on resources like strong cooperating teachers to help build

the strengths-based mindset and skills to succeed at teaching in a high-needs school context. Given the necessity strengths-based mindsets of preservice teachers, scholars interested in extending this line of inquiry should certainly explore the ways in which preservice teachers develop strengths-based perspectives. However, we know less about how to help preservice teachers feel socially connected in a meaningful way to communities that are completely unfamiliar to them. This is a ripe area for further inquiry, given the importance of connectedness in preservice teachers adopting values of a social community.

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