7-2-2017

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In recent years, the United States has focused a great deal of attention and resources on increasing the number qualified elementary and secondary teachers in STEM (science, technology, engineering, and mathematics) fields. In 2011, former president Barack Obama announced the goal of adding 100,000 STEM teachers by 2021 (White House Office of the Press Secretary, 2011). However, according to a recent report from the Education Commission of the States (2016), staffing challenges in science and math remain, and teacher production in has failed to meet the demand.

The National Science Foundation Authorization Act of 2002 established the Robert Noyce Teacher Scholarship Program with a $20 million allotment for programs to attract and prepare mathematics and science teachers. Common elements of Noyce programs include internships, scholarships, and support systems embedded in teacher preparation programs and extending into the first years of teaching. As the country strives to meet the need for elementary and secondary STEM teachers, it is important to understand whether or not the investment of resources in programs such as Noyce are effective in recruiting talented STEM students into teaching.

In order to better understand the influence of particular Noyce Scholarship program elements on decisions to teach, it is important to examine the decision-making paths and motives that compel individuals to pursue STEM teaching careers. Identifying the types of motives that underlie teacher candidates' career decisions may prove essential to retaining more teachers, since some motives may lead to a long-term commitment (i.e., desire to remain in a teaching career) while others lead to a short-term commitment to teaching. Darling-Hammond and Sykes

(2003) suggest that in order to increase the number of highly qualified teachers in high-need schools, scholarships should be "allocated both on the basis of academic merit and indicators of potential success in teaching, such as perseverance, capacity and commitment" (p. 32). Other researchers also report a significant relationship between commitment and teacher retention and job satisfaction (Coladarci, 1992; Day, Elliot, & Kington, 2005). This suggests the importance of developing a rich understanding of the connection between motives, commitment, and perseverance in teaching careers.

The goal of this research study is to provide a deeper examination of career decision-making paths of Noyce scholars to determine underlying motives for pursuing teaching, seeking funding, and working in high-need schools. Understanding such motives can help characterize findings of large-scale studies of the Noyce program, identify and refine additional research questions, and improve scholarship programs and support systems.

Analyses of Noyce scholars' comments written in their applications and their answers in later interviews suggest that the scholarship was not effective as a recruiting tool, but that it did ease financial burdens, thus enabling recipients to focus more on their studies. The scholarship program was instrumental in getting STEM teachers in high need school districts for a short time, but it did engender a longer-term dedication to remain in high need schools.

Review of Literature

The Noyce Scholarship program has uneven results in significantly increasing the number of highly qualified STEM teachers working in high-need schools, yet the funding appears to positively influence `scholars' perceptions of becoming a teacher (Bobronnikov, et al., 2014; Mervis, 2015; Lawrenz, Bowe, Braam, Kirchoff, & Liou, 2010). Liou, Kirchhoff and Lawrenz (2010) surveyed 555 Noyce scholars about their perceptions and experiences with the

Noyce Scholarship Program. Data from 427 scholars, representing 37 different programs, were analyzed to determine the influence of the scholarship program on participants' decisions to become teachers and on their decisions to teach in high-need schools. Research participants perceived the Noyce program more as a means to completing a teacher certification program than as a factor influencing their decision to become teachers. Additionally, the scholarship did influence participants' initial decisions to teach in high-need schools, but provided less motivation to remain in that type of setting. These findings suggest that the Noyce scholarship supports those who are already committed to teaching, but does not necessarily motivate them to teach in high-need schools. It is important to note that Noyce scholars' perceptions of the influence of the scholarship varied according to several factors -- the percentage of tuition covered by the scholarship, the recipient's race and career path (*i.e., non-whites and career changers tended to perceive the scholarship as more influential*), and the recipient's preparation for teaching in high-need schools. Liou & Lawrenz (2010) note the need for more research on the specific motivations underlying recipients' decisions to seek out funding.

Impact of Noyce Program Components

The scholarships offered through the Noyce Programs are complemented by elements designed to expose STEM undergraduates to teaching careers, such as internships. The primary goal is to provide meaningful experiences in educational settings that spark interns' interest in teaching as a career. Schuster (2013) investigated this component of the Noyce Scholarship Program by using a two-part questionnaire to gather data from two cohorts of summer interns (n = 15) about the impact of the summer internship experience on their decisions to pursue teacher certification in a STEM field. Schuster administered the questionnaire to both cohorts at the beginning of their internships, at the end of the internships, and three months after the

completion of the internships. Data indicate that the impact of the summer internship program was minimal – i.e., interns' desire to become a teacher remained the same or decreased as a result of the internship program.

While the effectiveness of internships to recruit new teachers has not been established, developing strong peer networks through programmatic elements appears to reinforce decisions. Kirchhoff and Lawrenz (2011) conducted semi-structured telephone interviews with 38 out of 291 Noyce Scholars to determine their reasons for becoming teachers in high-need schools and for persisting in that career. The researchers asked participants why they decided to become teachers and why in high-need schools. Findings indicate the importance of a supportive peer network or cohort on participants' career paths. Additionally, participants who felt supported by teacher preparation faculty were more likely to stay in high-need schools. Other studies indicate that a well-developed support system is essential for retaining students from underrepresented groups. For example, programs that develop a cohesive and supportive community among students, which provides academic support and a sense of identity, are successful in graduating women or other underrepresented groups in STEM (Seymour & Hewitt, 1997; Whitten, Foster, Duncombe, Allen, Heron, McCullough, Shaw, Taylor & Zorn, 2004).

Past experiences in K-12 schools and present experiences in a teacher preparation program are also important factors in the development of a teacher (Eick & Reed, 2002; Furlong, 2013). Both kinds of experiences may contribute to pre-service teachers' motivations for pursuing STEM teaching as a career; characterizing these motivations may help in understanding teachers' commitment to the teaching profession.

Motives for Teaching

A number of factors may influence an individual's decision to become a teacher. The research on motivation suggests three general types of motives: (1) intrinsic motives, (2) extrinsic motives, and (3) altruistic motives (Fokkens-Bruinsma & Canrinus, 2012). The Factor Influencing Teaching Choice (FIT-Choice) theory, developed by Watt and Richardson (2007), defines five major factors in the decision to become a teacher: socialization influences, perceptions of task, perceptions of self, values related to teaching, and teaching as a fallback career. Fokkens-Bruinsma and Canrinus (2012) used the FIT-Choice theory as a basis for identifying adaptive and maladaptive motives for becoming a teacher. They examined the motives of 136 Dutch preservice teachers in an educational master's degree program or in an educational minor program at the University of Groningren in the Netherlands. The participants, 58% of whom were female with an average age of 25, completed a questionnaire on their motives for becoming a teacher and their expected effort, involvement in, and commitment to the teaching profession. Fokkens-Bruinsma and Canrinus (2012) define adaptive motives as those that are related to a higher level of effort, involvement, and commitment in relation to the teaching profession. In contrast, maladaptive motives are negatively related to these constructs. Findings suggest that adaptive motives for becoming a teacher are expertise, social status, teaching ability, intrinsic career values, job transferability, shaping the future of children/adolescents, enhancing social equity, making a social contribution, and working with children/adolescents. Maladaptive motives include social influences and teaching as a fallback career. For the participants in this study, the most important motives for choosing teaching as a career are teaching abilities, intrinsic career values, and making a contribution to society, while teaching as a fallback career and social influences are the least important (Fokkens-Bruinsma &

Canrinus, 2012). Table 1 summarizes the findings from this study by showing the constructs

associated with the FIT-Choice model and factors identified as adaptive (A) or maladaptive (M).

Table 1

Adaptive and Maladaptive Motives in the FIT-Choice Model (Fokkens-Bruinsma and Canrinus, 2012)

Socialization Influences	Perceptions of Task	Self-Perceptions	Values	Fallback Career
Social dissuasion Prior learning and teaching experiences Social influences (M) (i.e., positive influence of significant others)	Demands ● Expertise (A) ● Difficulty Returns ● Social status (A) ● Salary	Teaching ability (A)	Intrinsic career values (A) Personal utility values ● Job security ● Time for family ● Job transferability (A) Social utility values ● Shaping future children/adolescents (A) ● Enhancing social equity (A) ● Making social contribution (A) ● Work with children/adolescents (A)	Teaching as a fallback career or default option (M)

In another study, Fokkens-Bruinsma and Canrinus (2011) examine the motives of 1177

in-service teachers and the relationship between motives, professional commitment, and teaching

self-efficacy. Fokkens-Bruinsma and Canrinus report that work with children, which is

identified as an adaptive motive in the 2012 study, isone of the motives frequently mentioned for

becoming a secondary teacher. Teachers motivated by work with children rated their affective

professional commitment (i.e., positive feelings about the profession and a desire to remain in a

teaching career) higher than did teachers who viewed teaching as a fallback career.

To better understand science teachers' motives for teaching, Eick (2002) studied the autobiographical writings of 19 teachers who had completed a science education program. At the beginning of the program, the teachers wrote autobiographical papers describing their reasons for wanting to become teachers. They re-wrote their papers for the research study, explaining why they still wanted to be science teachers. Comparison of these papers yields several themes related to reasons for becoming or remaining teachers. Those who initially chose to major in science and later switched to science education demonstrated an interest in science from a young age, saw a need to develop scientific literacy in others, believed that teaching science is a way to continue learning science for themselves, and saw teaching science as hands-on and fun. On the other hand, participants who initially chose science education as a major focused more on their desire to shape students through their guidance and teaching. They chose teaching as a career because of a desire to teach others and to see them learn. For all participants, the reasons for remaining in teaching revolved around their care and concern for students' growth and development. Individuals who initially chose to major in science were able to sustain their career, in part, because they were able to view their teaching as an opportunity to "continue to learn science and share this learning with others" (Eick, 2002, p. 366).

Other studies focus on pre-service and in-service teachers' intrinsic motivations for teaching. Candidates in teacher preparation programs bring with them deeply rooted values and beliefs that have developed over the years through various life experiences. These values and beliefs create the foundation for early teacher role identity and may be factors in a candidate's decision to pursue teaching as a career (Kagan, 1992; Knowles, 1992; Knowles & Holt-Reynolds, 1991).

The purpose of this study is to determine whether any of the components of a Noyce program, including scholarships, affect students' decisions to teach or to not teach in a high-need school. In particular, we are interested in developing a deeper understanding of the motives for pursuing STEM teaching careers and characterizing the influence of specific components of a Noyce program on students' ability and commitment to teach in high-need schools.

Methods & Methodology

The setting for this case study was a regional comprehensive institution in the southeastern United States that implemented a Noyce Scholarship Program funded by the National Science Foundation (Grant No. 1136356). Serving roughly 8400 students (50% white, 38% black, 7000 undergraduates), the institution produces teachers for a high-needs school district in a community with a metropolitan population of just under 200,000. The Noyce program awarded the first scholarships in Fall 2012 at the institution. Eligibility requirements included full-time enrollment; junior, senior, or post-baccalaureate class standing; and a minimum grade point average of 3.1. Successful candidates demonstrated a dedication to teaching and an ability to complete the academically rigorous program. Award recipients are required to teach for two years in a high-need school district for each year they held the scholarship and to fulfill this commitment within eight years of their graduation. Scholarship recipients who do not meet these commitments are required to repay the scholarship funds. This particular Noyce program utilized internships and scholarships available to math and science majors, a mentoring program, and Noyce Teaching Connections Seminars. In the monthly Teaching Connections Seminars, mentors and scholars participated in activities and programs that allowed Noyce Scholars to discuss issues related to teaching in high-need schools.

Participants

At the time of this study, eighteen students had been awarded a total of 23.5 academic years of scholarship to pursue a degree in math or science while also completing requirements for a secondary teaching certificate. To avoid potential conflicts of interest, we excluded any scholarship recipients who were in their first year of receiving a possible two-year award (renewal requires application and selection), leaving nine potential participants. The nine students included four graduates who were completing their commitment to teach in a high-need school district, two graduates who at some point decided to pursue non-teaching careers, two undergraduates who were in the Noyce Scholarship program, and one undergraduate who declined the scholarship to pursue a non-teaching career. After conducting a thematic analysis of data from the scholarship applications and a questionnaire that focused on motives for teaching, we selected two case study participants that we believed could provide more detailed and richer information related to the prevalent themes we observed in the data. Both participants are white males in their mid-twenties

Data Collection

We collected initial data from the scholarship applications of the nine scholars described above. The application prompts the applicant to "discuss why you want to become a math or science teacher." Next, we distributed a questionnaire to all nine scholars to determine if there were any changes in their motives since their initial scholarship application. The questionnaire consists of one open-ended question, "Please discuss why you want to be a math or science teacher, or why you have decided that you no longer want to do so." Only five scholars completed and returned the questionnaire: two were from current students and three had graduated and were teaching.

After selecting two case study participants based on our analysis of data from the initial application and the follow-up questionnaire, we developed an interview protocol and interviewed each participant to better understand his motives for teaching and whether any Noyce Program components influenced his decision to teach or to teach in a high-need school. The semi-structured, 45-minute interviews included the following questions, but allowed for additional questions to clarify participant remarks:

- Can you describe the path that led you to consider teaching science (or math)?

- Describe how your family and friends felt about your consideration of teaching as a profession.

- Did you have any informal (pre-teaching) teaching experiences before you began teaching? Did any of these involve working with high-need students? If so please describe them.

- For undergraduates only: Please describe how you envision yourself as a future teacher. How do you picture your first classroom?

- For graduates: How did you picture these prior to teaching. Has this vision changed? If so, how has it changed?

- Did you ever have any hesitation about going into teaching? If so, please describe.

- Please discuss how certain you were that you wanted to go into teaching at the time you first applied for a Noyce scholarship.

- Please discuss the influence, or lack thereof, that the CSU Robert Noyce Teacher Scholarship had on your decision or capability to go into teaching.

- Please describe the influence, if any, of the four scholarship program elements listed above on your plans to teach in a high needs school. (listed above in the questionnaire, these were:

    1. Received financial resources

    2. Met regularly with an assigned faculty mentor

    3. Participated in the *Connections Seminar*

    4. Engaged in service activities.

Method of Analysis

Thematic analysis allows researchers to identify prevalent themes across data sets, and then delve deeper into those themes by analyzing patterns within data items. We selected thematic analysis since it is a method that provides the flexibility to search for patterns across a data set and within data items, without being tied to developing grounded theory (Braun & Clarke, 2006). In contrast, grounded theory analysis aims to generate a useful theory that emerges from the data, which was not the goal of this research (Flick, 2009; Strauss & Corbin, 1990). Our initial goal was to develop a better understanding of career decision-making paths by identifying common patterns across our initial data set, which includes scholarship applications and a questionnaire, and then selecting particular cases for interviews to probe deeper into the themes we identified in the initial data set. This method allowed us to "both reflect reality and to unpack or unravel the surface of 'reality' (Braun & Clarke, 2006, p. 81). Thematic analysis enabled the flexibility to examine the teaching motives of the broader pool of applicants, identify common motives or decision making paths, and then use two cases to explore those motives and paths in greater detail to determine if any of the Noyce Program components had an impact.

Code Development

We coded the initial scholarship applications separately after an initial meeting that reiterated and clarified the goals of the study, and then established inductive coding procedures. We decided that codes would not be constrained to fit within any framework, such as adaptive/maladaptive motives, but would be developed inductively from the text (Flick, 2009). At subsequent meetings, we compared, validated and refined the codes by revisiting the data, then organized them into prevalent themes based on a semantic approach that looked only at explicit meanings in the text. Initial coding and theme development did not attempt to interpret what participants wrote. We identified themes as prevalent when they occurred in at least three applications, with subthemes used to provide finer details.

Next, we coded data from the questionnaires based upon the constructed themes and subthemes, but coding was not restricted to previously developed themes. For additional validation of the coding process for the questionnaires and applications, we separated all the coded phrases from their narratives to check for consistency and returned multiple times to the narrative to verify the meaning of the phrase in the context of the original narratives. After we reached a consensus on the meanings of coded phrases, we refined all themes and subthemes. In addition, we reviewed the themes to determine their prevalence among the data set and to observe patterns, if they existed.

Following the interviews, we transcribed and analyzed participants' responses, first with respect to the themes that emerged from the analysis of the applications and questionnaires, and a second time after reviewing constructs from related literature. At this point, our analysis began to frame each individual's account in the context of current theory, moving from a semantic to a latent approach that examined how self-described individual accounts of motives for teaching

could be interpreted as adaptive or maladaptive (Flick, 2009; Fokkens-Bruinsma & Canrinus, 2012). This process enabled us to characterize factors that influence the decision to teach in the context of current theory, but without constraining the analysis to only the factors identified in the literature.

Results

Applications and Questionnaires

Since we were dealing with just nine undergraduates specializing in math or science teaching, we took additional precautions to protect the identities of the participants. For example, the cases contained only one male pursuing mathematics teacher certification. Since participants were undergraduates in the program and being supervised in on-campus employment by members of the research team, non-supervising members of the research team removed all references to math or science and replaced them with the term "science." This enabled the team to discuss cases and data with all the research team, but also maintain the confidentiality with respect to the identity of the case study participants. Therefore, we will refer to all content as "science" for the purposes of this research.

The themes most commonly identified in the data as influencing decisions to teach, and their associated subthemes, include the following:

- Socializing influences: historical experiences such as informal teaching or tutoring (mentioned by 7 out of 9 cases), inspiring teachers (5 out of 9 cases), or familial experiences (1 out of 9 cases)

- Initial decision path: A spectrum that ranges from an initial interest in a teaching career followed by the choice to teach STEM, to an initial interest in STEM content fields with a teaching interest emerging later (All 9 described their path along this spectrum)

- Anticipated rewards: Comments in this theme are not mutually exclusive and range from altruistically motivated statements discussing impacting others ("[science] allows the students to impact the world;" 3 out of 9 cases), to statements emphasizing self-fulfillment through intrinsically motivated statements describing personal gratification ("I get so much enjoyment when the kids get excited;" 4 out of 9 cases.)

- Image of future self as teacher: Images include working with high-need students (1 case), anticipating the challenges of teaching (3 cases), using active learning or engaging instructional strategies (4 cases), connecting concepts to the world (3 cases)

- Desired outcome for students: inspiring love of subject (6 cases), inspiring students to value education and hard work (6 cases)

We further explored these themes and subthemes in the subsequent interviews with our two case study participants.

Case Studies

To develop a better understanding of how Noyce program components influenced career decisions, we wanted to compare three case types: a Noyce scholar who graduated and was teaching, a current scholar, and a prior recipient who subsequently decided against a teaching career. This would allow us to capture perceptions during different times in the careers of our scholars, but also examine perceptions of components that did not lead to a teaching career. Unfortunately, of the three scholarship students who left the program, none returned their questionnaire, which limited our case study to an undergraduate who was completing his final year in the teacher preparation program (pseudonym: Adams), and a graduate in his first year teaching at a high-need school (pseudonym: Ford). We selected Adams from the two possible undergraduate recipients because of the richness of the data present in the application and

questionnaire, which provided multiple points of data available for thematic coding. We selected Ford because of his candid essay responses that offered insight into his thought processes. In addition, Ford's narratives had commonalities and distinct contrasts with Adams in thematic coding. We wanted to explore those contrasts in greater detail.

Case 1: Adams – A Current Scholar. The first case study followed Adams, a current student and Noyce Scholar who loves science. Adams applied for and received the Noyce Scholarship prior to fall semester of his senior year, with plans to student teach and graduate the following spring. He entered college with no desire to pursue a teaching career but found himself on a path leading to a teaching certificate and a job in a high-need school.

For Adams, who entered college determined to earn a science degree, there was one specific catalyst that moved him to make a change: tutoring peers on campus. In his case, tutoring began as just a job, a means for earning a little money to make things easier. Tutoring was a good fit because he loved the content and knew it well, but he had no idea that becoming a science tutor would "change [his] life." Adams enjoyed sharing his content knowledge with other students and was most pleased by the positive evaluations he received as a tutor, which he states were "the first and main reason why I want to be a science teacher." Within this narrative, he provided insight into his perceived teaching ability, saying "It wasn't until I started tutoring there that I had a real knack for teaching, and that's what led me to change my major." His pre-teaching experience, along with strong science teacher mentors from high school, put him on the path to a degree in science with secondary teacher certification. Adams credited strong high school STEM teachers as being influential in his decision to pursue a degree in science or science education. He mentioned three by name and admitted that these teachers were more

influential than his parents on his career choice. His mentors "constantly challenged me, filled my head full of interesting questions, and opened my eyes to this whole new world."

Adams maintained that he firmly made the decision to teach prior to applying for the scholarship. While he did not credit the scholarship with motivating him to try education, he did say it made the decision easier. The financial benefit, one component of the scholarship, allowed him the freedom to commit more time to his education. He stated, "It made it easier to just focus on all my education courses, and it really has been a blessing." He also credited the scholarship with having a positive effect on his capability to pursue teaching, by academically preparing him to teach in a high-need school. Adams thought the Noyce Teaching Connections Seminars helped him more than the teacher education curriculum alone to see "the different aspects of what it is like to have your own classroom and teaching." He "definitely" would not have thought about high-need children when designing lessons if he had not participated in the seminars. "[In the Noyce program] we talk about giving those high-need students the same right to learn, so you always want to incorporate them and be thinking about them when you are [lesson] planning."

Though excited about pursuing a teaching certificate and firmly committed to teaching at a high-need school to fulfill his obligation to the Noyce Scholarship program, Adams does not believe his future is in education. He stated, "I do not wish to pursue education at all….teaching for me has really only been, I don't want to say the 'back up plan' because I like teaching, but at the same time I'm getting a teaching degree for job security." Adams planned to teach for only the required amount of time and then move on to pursue a Masters in Science degree and a career outside of education. If the pursuit doesn't go as planned, he knows he can "always go back to teaching science and that doesn't bum me out at all." Interestingly, his scholarship application

emphasized his love of science and excitement over a teaching career. He wrote, "How could I pursue any other job when there exists a career that allows me to work with a subject I love and also gives me the chance to inspire and change the lives of other people?"

Case II: Ford – A Noyce Graduate. Ford successfully completed his degree and was in his first year of teaching at a high-need secondary school in the same state as the university he attended. Ford loved science, but teaching was always a consideration, not an afterthought. While he did consider teaching, it was not his first endeavor when it came to higher education. He chose a degree path in research science because there were many options: "I could go to med school, I could go to vet school, I could go into teaching, or work in industry, with an undergraduate degree." As in the case with Adams, it was an informal teaching experience that brought teaching to the top of his list.

While completing a required science course, Ford was approached by his professor, who was involved with the mathematics and science teacher preparation program. This professor encouraged him to explore a teaching career by enrolling in an introduction to teaching course. Since tuition for the course was reimbursed with a passing grade, Ford thought "why not?" and took a step toward a career in teaching. While Ford had no doubt in his mind that he would one day turn his love of science into a career, he needed the push to explore the world of science education. He solidified his commitment to teaching through an internship experience in which he conducted science labs for homeschooled middle school students: "It was then that I realized, I really wanted to go into teaching, because I thought it was really cool to see students learning content." Ford also credited encouragement from strong STEM mentors as a motivation to pursue teaching. He desired to become a STEM teacher mentor to others and "hopefully [have] a positive impact on students, like my former science educators had on me."

As a first year teacher, Ford encountered challenges of working in a high-need school. He worked to find ways to effectively handle discipline problems and learned how to pace lessons as he moved through the curriculum. As a first year teacher, he struggled to find support at the school. "The support wasn't really there. I could always ask my department and they would, hands down, whatever I needed, give it to me, but sometimes I wouldn't know what to ask. So I would run into all these little blocks and these setbacks." However, he did find support from one of his Noyce mentors: "[The program] is there to support you for two years, and I would constantly be emailing [my mentor], calling her, telling her about what happened in my classroom, how I can fix it or what she would do in this situation, what she would do in that situation." Ford perceived the Noyce program as helpful in preparing him for his first year of teaching and providing support as he began his career as a teacher.

Ford applied for and was awarded the Noyce Scholarship during his last year in the teacher preparation program. With a firm commitment to teaching at that time, he did not believe the scholarship influenced him to become a teacher. Instead, he credited the seminars for preparing him to teach in high-need schools and the scholarship for supporting him financially so he could "really focus" on his student teaching.

> "The money was essentially there to help me…pay for any other expenses and it is really what got me through student teaching. That was one of my worries that I had. How am I going to pay for student teaching because that is five or six months that you can't work?"

While Ford loves his content area, it is most important to note that teaching was always a consideration when he thought about possible future careers. For him, science and teaching go hand-in-hand and are not separate career paths. He believed his "passion for science fueled [his]

desire to become an educator," but it was with equal passion that he approached education. After completing his obligations to the Noyce Scholarship, Ford intends to pursue a Masters of Education degree and continue to educate himself in ways that will help him best serve his students.

Analysis

Utilizing the scholarship applications to develop themes allowed us to select two cases that provided valuable illustrations of adaptive and maladaptive motives. However, our interpretations of those motives would not be valid if constructed solely upon the narratives provided on the applications, since the applicants were highly motived to convey the merits of a teaching career when competing for scholarship funds. Therefore, the thematic analysis within the interviews provides a more accurate characterization of the motives of the two Noyce Scholars. The most prevalent themes identified in the interview responses include the students' decision paths as well as the socialization influences of informal teaching experiences and high school mentors.

With respect to their decision paths, both participants in this study initially chose to major in a STEM field and later narrowed their career options (Ford) or shifted their career path (Adams) to teaching, as opposed to deciding first to become teachers and then deciding to teach in a STEM field. Similar to cases in Eick's (2002) study, the participants demonstrated a strong interest in science and expressed the desire to deepen their own content knowledge.

In terms of socialization influences, informal or formal teaching experiences were major catalysts for both participants in their decisions to pursue teaching. For one participant, it was peer tutoring that moved him toward teaching while the other participated in early teaching experiences through an introductory STEM teacher education course and an internship. In

addition to teaching experiences, both participants mentioned having high school STEM teachers who served as mentors for them and were highly influential in their decision to pursue a degree in a STEM field and/or in teaching. These socialization experiences were more important in the participants' decision to pursue teaching than was the Noyce Scholarship, and their narratives of their historical experiences revealed multiple adaptive motives.

Adams had a very strong perception of his teaching abilities and was motivated by his high school mentors. Mentors also motivated Ford and inspired his decision to major in STEM and pursue teaching as a career. Fokkens-Bruinsma and Canrinus (2012) characterize social influences as a maladaptive motive; however, Ford had other adaptive motives for choosing a teaching career that may lead to a long-term commitment to the profession. His description of his pre-teaching experience reveals his interests in working with children and a desire to impact their futures, both adaptive motives (Fokkens-Bruinsma and Canrinus, 2012). Ford envisiones his chance to influence students to make social contributions of their own. He stated, "I want them to know that, with hard work, they can achieve anything they really want in life." In addition, Ford placed importance on his expertise in science, another adaptive motive, as indicated by his future plans for graduate school. On the other hand, Adams also displayed the maladaptive motive of teaching as a fallback career and indicated he would only teach for the duration of his commitment. While the scholarship was successful in securing Adams' commitment to fulfill his obligation in a high-need school, continuing in a teaching career beyond the commitment was unlikely.

Discussion

Both participants in this study expressed a strong interest in science and a desire to continue their learning. Eick (2002) posits that the ability to continue learning about science and

share new understandings with students might support persistence in teaching careers for some individuals. Since an implicit goal of teacher preparation programs is to produce individuals who pursue life-long professional improvement of both pedagogical and content knowledge, there may need to be a greater emphasis in recruitment efforts on the opportunities available in STEM teaching careers for enhancing personal knowledge in science and mathematics.

For the two participants in this study, the Noyce Scholarship was not a major factor in their decision to teach. However, both participants mentioned that the scholarship allowed them to focus on their development as teachers during the last two years of their teacher preparation program. Additionally, similar to the findings of other research studies (Kirchhoff & Lawrenz, 2011; Seymour & Hewitt, 1997; Whitten, et al., 2004), both participants mentioned the importance of experiences such as the seminars and the support system that helped to prepare them for teaching in a high-need school. These are important considerations when studying the impact of the Noyce Scholarship program and should not be overlooked.

When considering the merits of the Noyce Scholarship as a recruitment tool, these case studies suggest that the timing of the scholarship award mitigates its effectiveness as a recruitment tool for teaching careers, in general. Eligibility requirements for scholarship award include the stipulation that students must be within two years of completing a degree in math or science with secondary teaching certification. The case study interviews presented here reinforce previous research findings that students are firmly committed to teaching at the point of scholarship application and, therefore, the scholarship is not an effective recruitment tool, as found by Liou, Kirchhoff and Lawrenz (2010). Since students must be reached earlier for successful recruitment, strategies such as tuition-reimbursed courses that introduce students to teaching and other informal teaching experiences (e.g., internships, peer tutoring) may be far

more effective. The participants in this study described the potential value of informal teaching experiences, found here to be the most relevant factor in the decision to pursue teaching as a career. For these two individuals, the Noyce Scholarship incentivized each to commit to work in high-need schools, but the likelihood of long-term careers at those schools is highly questionable. While the scholarship was not found to be an effective recruiting tool, it did provide critical financial support. Funding provided to scholars served to mitigate their financial burdens, with both students noting that the scholarship allowed them to focus more on developing as teachers during this critical phase of their education.

Recommendations

The scholarship program may be an important tool for retaining students in STEM teacher preparation programs and supporting them in their professional development. Our findings suggest that Noyce Scholarship programs should not be viewed as extrinsic enticements to pursue careers in teaching, which could easily support maladaptive motives of individuals seeking teaching as a fallback career option. Alternatively, Noyce programs should be viewed comprehensively, as providing funding that strategically supports activities designed to fuel adaptive motives and to provide social support systems that help new teachers navigate challenges in high-need schools. Our findings suggest envisioning Noyce programs as providing financial incentives to engage scholars in activities such as the following:

- Exploring teaching through tutoring, field work, or internships that allow scholars to share their love of science with children

- Developing a support network of professionals devoted to enhancing social equity through education

- Learning critical strategies needed to improve their ability to teach in high-need schools.

This qualitative analysis provides a basis for longitudinal research that would follow both participants to determine the influence of the Noyce Scholarship and associated educational supports (Teaching Connections Seminars, internships, and mentoring). To date, our scholarship program is too young to provide data beyond the years that scholars teach to fulfill their agreement to the scholarship. While graduates have been successfully placed in high-need schools, as of the time of the interviews, none had enough time to fulfill their teaching commitment or to demonstrate long-term commitments to teaching careers or teaching in high-need schools. An extended study is essential since retention in high-need schools is typically low. Past Noyce Scholarship studies have shown that while the desire to satisfy the teaching obligation does ensure these students are placed in high-need schools, it is less of a factor in their decision to stay beyond their obligation (Liou, Kirchoff, & Lawrenz, 2010). We would like to investigate why. Will there be a difference in career persistence that can be linked to initial career paths or other factors? Could teacher preparation programs create interventions or programs that support the development of adaptive motives in teacher candidates, and support sustainable teaching careers in high-need schools?

In addition, valuable information can be gained by exploring the most effective use of Noyce Scholarship funds. Since this study suggests that the scholarship may be ineffective in recruiting students that have not previously made the commitment to teach, a revised timeline may need to be considered. To serve as an effective recruitment tool, the scholarship program should strive to reach students prior to their junior year, when many are still deciding on a career path. Because early teaching experiences were major catalysts for the participants in this study,

more research should be conducted on the impact of programs that provide support for these types of experiences.

      While these two individuals did not report that the scholarship influenced their decision to teach, they believe the financial benefits made them more capable of reaching their goals. Additional research is needed to identify the level of academic and financial support required as well as a timeline for optimizing the impact of the scholarship.

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