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## Comparing Noyce Scholars' Decisions to Teach and Perspectives on Teaching to non-Noyce Scholars

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Scholarships that are designed to combat the teacher shortage problem and increase the number of teachers in high-need fields generally include some financial incentive. The extent to how the financial incentive effects the scholar's decision to become a teacher, or teach in low-income schools, is difficult to measure, but some work has been done to reveal contributing factors. One factor that was found to impact scholars' decisions to accept the funding was the amount awarded. Scholars' were influenced more when the financial incentive covered a higher proportion of their tuition (Darling-Hammond, 2007; Henry, Bastian, & Smith, 2012; Liou & Lawrenz, 2011).

For the Noyce Teaching Scholarship specifically, research has found that many of the Noyce Scholars would have entered the teaching profession regardless of the financial incentive (Bull, Marks, & Salyer, 1994; Liou, Desjardins, & Lawrenz, 2010). However, for those Noyce Scholars who might not have otherwise considered a career in teaching, the financial incentive had a larger impact on their decision to enter the teaching profession (Liou & Lawrenz, 2011).

Competitive scholarships appear to attract individuals with significantly higher academic credentials and higher levels of human capital into teaching, but unless the scholarship programs require recipients to work in high-need schools, they tend to teach in schools and classrooms with more high-achieving and low-poverty students (Henry et al., 2012). The financial incentive offered by the Noyce Scholarship had the most influence on recruiting teachers to high-need schools and toward completing their certification program, but less of an influence on staying in a high-needs school for long periods of time (Liou et al., 2010; Liou, Kirchhoff, & Lawrenz, 2010; Liou & Lawrenz, 2011). Using scholarships as a mechanism to recruit teachers into the education profession and into teaching in high need fields has its own set of challenges. Thus, it is necessary to continue to study these challenges and modify them to meet the needs of the forecasted teacher market.

Though the aforementioned research provides some insight on factors that influence Noyce Scholars' decision to enter the teaching profession and how the financial incentive of the

scholarship impacted their decision to teach, little research has been conducted on characteristics unique to Noyce Scholars. Comparing the perceptions of the Noyce Scholars on various aspects of teaching and the teaching profession with a similar group of teachers that did not receive the Noyce scholarship may shed some light on differences between Noyce Scholars and non-Noyce Scholars. The research questions that guided this study were:

1. How do the Noyce Scholars' perceptions of teaching and of the teaching profession differ from the perceptions of a group of non-Noyce Scholars who were certified from the same teacher preparation program?
2. How do Noyce Scholars' decisions about teaching and of the teaching profession differ from the perceptions of a group of non-Noyce Scholars who were certified from the same teacher preparation program?

The work of the Mathematics Teacher Education Partnership (MTE-P) addresses the significant national shortage of well-prepared secondary mathematics teachers. One focus is the recruitment of students into the teaching profession. Data from this study may inform the Marketing for Attracting Teacher Hopefuls (MATH) research action cluster in their work to recruit students into the profession. Identifying how and when groups of students make decisions to become teachers can help when marketing various teacher preparation programs.

### **Methods and Instrumentation**

For this quasi-experimental study, we applied stratified matched sampling to compare the decisions and perceptions of participants who received a Noyce scholarship to those participants who did not receive a Noyce scholarship. Targeted participants were students who received their secondary mathematics or science teaching certification from a university in the southwestern region of the United States sometime from 2002 to 2014. Additionally, all targeted participants were prepared by the same undergraduate teacher preparation program. The data for this study was generated from one survey, administered electronically, to the 61 participants (29 Noyce Scholars and 32 non-Noyce Scholars) in the summer of 2015.

This survey was adapted from two other surveys; the Schools and Staffing Survey (SASS) created by the National Center for Educational Statistics (NCES, 2012) and the Noyce Scholar Survey developed at the University of Minnesota for the Noyce Evaluation Report (University of Minnesota, 2012). The resulting survey contained 70 questions that were classified into nine sections: Personal Information (PI), Employment Information (EI), Decisions on Becoming a STEM Teacher (DBST), Mentoring and Induction Experiences (MIE), Impressions of Teaching and Current Job (ITCJ), Plans for Graduate Education (PGE), Teacher Preparation (TP), School Climate and Teacher Attitudes (SCTA), and the Noyce Scholarship (NS).

The questions on the survey had a variety of answer types. Some questions used categorical scales, some were ordinal scales, and others were open-ended. Most of the ordinal

scale questions had multi-part statements where participants ranked the statements on four- or five- point Likert scales. The full set of questions used for the survey can be found at [aggioteach.tamu.edu/noyce-monitoring-and-evaluation-project](http://aggioteach.tamu.edu/noyce-monitoring-and-evaluation-project).

## Results

Responses from the survey were analyzed to determine any statistically significant differences between two independent groups of participants, Noyce Scholars and non-Noyce Scholars, across four categories of the survey. The four categories are: Decisions on Becoming a STEM Teacher (DBST), Plans for Graduate Education (PGE), Teacher Preparation (TP), and School Climate and Teacher Attitudes (SCTA). Some questions within categories were analyzed on a statement-by-statement basis and for others latent variables were created via an Exploratory Factor Analysis. For the latent variables, corresponding factor scores were calculated and Mann-Whitney  $U$  tests were used to determine any significant differences between the groups on both the latent variables and the statement-by-statement analysis. The two categories that produced statistically significant differences between groups were DBST and PGE. No statistically significant differences between Noyce Scholars and non-Noyce Scholars were found for the TP and SCTA categories.

**Decisions on becoming a STEM teacher.** The DBST category contained two nominal scale questions. The first question was “Did any of the following help you decide to become a STEM teacher?” A list of nine statements followed this question and participants responded to each statement with “yes” or “no.” Responses to two of these statements were statistically significant. The first of these two was, “I like the flexibility and/or autonomy of STEM teaching.” Results of the Mann-Whitney  $U$  test ( $p = 0.011$ ) indicated that non-Noyce participants were influenced more by the flexibility and/or autonomy of STEM teaching than the Noyce participants. Glass’ effect size value ( $\Delta = 0.863$ ) suggested a high practical significance.

The second statement that produced a statistically significant difference was “I feel that a teaching career is/will be conducive to my family life.”. Results of the Mann-Whitney  $U$  test ( $p = 0.005$ ) indicated that non-Noyce participants were influenced more by a teaching career being conducive to family life ( $M = 0.88$ ,  $SD = 0.336$ ) than Noyce participants ( $M = 0.55$ ,  $SD = 0.506$ ). Glass’ effect size value ( $\Delta = 0.982$ ) suggested a high practical significance.

The second question in the DBST category that produced a statistically significant difference ( $p = 0.033$ ) between non-Noyce ( $M = 1.69$ ,  $SD = 0.471$ ) and Noyce participants ( $M = 1.41$ ,  $SD = 0.501$ ) was “At what point in your life did you decide to become a STEM teacher?” The frequency counts indicate that significantly more Noyce participants decided to become a STEM teacher before the age of 18 ( $n = 17$ ) than non-Noyce ( $n = 12$ ). Additionally, significantly more non-Noyce participants decided to become a STEM teacher between the ages of 19 and

22 ( $n = 22$ ) than Noyce ( $n = 10$ ). Glass' effect size value ( $\Delta = 0.594$ ) suggests a moderate practical significance.

**Plans for graduate education (PGE).** The PGE category contained two nominal scale questions. The first question was "Since graduating from the university have you taken any graduate level classes?" Participants responded with "yes" or "no." The Mann-Whitney  $U$  test produced statistically significant difference ( $p = 0.042$ ) between the two groups. These results indicate that Noyce participants had taken significantly more graduate level classes since graduating from the university than non-Noyce participants. Glass' effect size value ( $\Delta = 0.564$ ) suggests a moderate practical significance.

The second question regarding plans for post-baccalaureate education was "Since graduating from the university have you received any advanced degrees?" and participants responded "yes" or "no." A Mann-Whitney  $U$  test indicated that there was a statistically significant difference ( $p = 0.036$ ) between the two groups. These results indicate that significantly more Noyce participants had obtained a master's degree than non-Noyce participants. Glass' effect size value ( $\Delta = 0.647$ ) suggests a moderate practical significance.

### **What was Learned from this Work**

The Noyce Scholars, in general, made decisions about their future plans at younger ages and for different reasons than the non-Noyce Scholars. Significantly more Noyce Scholars decided to become teachers before the age of 18 than non-Noyce Scholars. Furthermore, external factors like flexibility or autonomy of STEM teaching and conduciveness to family life seemed to be less of an influence on Noyce Scholars' decisions to teach. This may suggest that Noyce Scholars were more actively thinking about their future careers while still in high school. Additionally, Noyce Scholars may decide to become teachers for reasons other than "flexibility or autonomy of STEM teaching" and "conduciveness to family life" for deciding to be a teacher. Noyce Scholars appear to be less influenced during their college-aged years on making a career choice since many of them made the decision before 18. Non-Noyce Scholars, on the other hand, seem to be enter college less decided on a career choice and may be more influenced by external factors when choosing a career. Thus, when recruiting teachers into the profession during the college years, external factors like "flexibility or autonomy of STEM teaching" and "conduciveness to family life" may be good aspects of the teaching profession to highlight to recruit college aged students into the teaching profession or at least to get them thinking about selecting teaching as a career.

Results in the PGE category also indicate that Noyce Scholars decide to invest in their graduate education at a higher rate than their non-Noyce counterparts. This could be due, in part, to the high academic achievement that Noyce Scholars had to demonstrate as an undergraduate to receive the Noyce funding. Noyce scholars may value education, in general,

more than the non-Noyce students. Additionally, receiving the scholarship funds as an undergraduate could have put the Noyce Scholars in a position where they had less student loan debt and thus, more willingness to invest money in graduate studies. This notion cannot be fully supported by the results of this study, but it is something that could be explored in future studies.

## Conclusion

One of the reasons MTE-P was formed was to “address the significant national shortage of well-prepared secondary mathematics teachers who can support their students in achieving the Common Core State Standards for Mathematics” (Association of Public and Land-Grant Universities, ND). The Noyce Scholars are a group of well-prepared secondary mathematics teachers. Discovering any unique characteristics about the Noyce Scholars may give some insight to how better recruit high-achieving students into the teaching profession. This study provides some examples of such insight.

## For More Information

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