

Comparison of Alternative and Traditional Teacher Certification Programs in Terms of Effectiveness in Encouraging STEM Pre-Service Teachers to Teach in High Need Schools

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***Abstract:** Central to the debate regarding the effectiveness of alternative and traditional teacher certification programs is the question of providing high quality teachers for high need schools. The Robert F. Noyce Teacher Scholarship Program, funded by the National Science Foundation, supports both alternative and traditional routes to teacher certification nationwide and has similar requirements for all teacher candidates. It, therefore, provided a unique opportunity to compare alternative and traditional programs in terms of their perceived effectiveness in encouraging potential STEM teachers to teach in high need schools. Data came from a comprehensive, mixed methods evaluation of the Noyce Program and included 434 surveys completed by Noyce scholars, and 19 interviews with school district representatives. Comparisons between alternative and traditional programs were made based on scholars' demographics, affective characteristics, background experiences, and beliefs about teaching. Results demonstrated that Noyce scholars from alternative and traditional programs were similar in*

demographic and most affective characteristics but different in background experiences and beliefs about teaching. Moreover, the data suggest that alternative routes might attract more candidates who are more likely to teach in high need schools.

Key Words: *Alternative certification, traditional teacher preparation, STEM teachers, high risk schools.*

There is a debate in the teacher certification literature regarding the effectiveness of alternative and traditional teacher certification programs in producing highly qualified teachers. Providing high quality teachers for high need schools is paramount for teacher training programs because there is a lack of highly qualified teachers to staff the increasing numbers of high need schools (Ingersoll, 2001, 2002). Several legislative efforts have been proposed to help provide more highly qualified teachers for high need schools. Examples of these include a reauthorized Academic Improvement and Teacher Quality programs' office and the allocation of specific funds to alternative certification programs. Both of these are under *Title II*, and part of the No Child Left Behind Act of 2001 (No Child Left Behind Act, 2001). A third example is the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2007, which allocated funds to teachers intending to teach in high need settings as well as to teacher certification programs for licensure in the specific content areas of science, technology, engineering, and mathematics (STEM), and critical foreign languages (America COMPETES Act, 2007). A fourth example of a legislative effort occurred in 2009, in which the National Science Foundation's (NSF) Robert F. Noyce Teacher Scholarship Program (Noyce program) received specific funding under the stimulus package. The Noyce program commenced in 2002 and continues to provide funding for STEM teachers who are committed to teaching in high need schools for a specified amount of time. The fact that all of these efforts support both alternative and traditional teacher certification programs raises the question as to how different alternative and traditional programs are in their effectiveness for preparing quality STEM teachers for high need schools. Importantly, if both types of programs are equally effective in providing quality teachers that meet the pedagogical, content knowledge, and personal affective characteristic requirements of high need schools, then perhaps because alternative programs tend to be shorter and cost less, they might present a more efficient route to teacher certification. Other major concerns exist within the alternative pathways, such as retention of teachers in high need schools.

Both alternative and traditional certification programs have strong arguments supporting their implementation. A literature review conducted by Legler (2002) found that the main supporting argument for alternative programs is that they require less coursework and requirements before becoming the teacher of record; thus they make the teaching profession more accessible to career changers and candidates who are interested in teaching but do not have adequate funds to pay for prolonged education. Legler also found that alternative programs may increase the number of minority teachers, increase the number of teachers in shortage areas, produce teachers that demonstrate similar

classroom performance and student outcomes to traditionally certified teachers, and provide intensive mentoring and support, which contributes to the development of alternatively certified teachers.

However, the main supporting argument for traditional certification programs is that the extensive coursework, field experiences, and mentoring required before becoming the teacher of record produces teachers who are more qualified and confident about their preparedness to teach (Darling-Hammond, 2003). Similarly, Guyton, Fox, and Sisk (1991) found that teachers who had completed traditional certification programs were perceived by principals and themselves as better prepared to teach than those who had completed alternative certification programs. In addition, Darling-Hammond (1999) found that traditional certification programs seem to have higher entry and retention rates compared to alternative certification programs and that they actually cost less when considering the costs of certification, recruitment, induction, and replacement resulting from attrition.

However, arguments can be made against both types of programs. Negative aspects of alternative certification programs, summarized by Legler, are that alternative programs can allow unqualified people to assume total responsibility for classrooms; they give inadequate attention to curriculum development, pedagogical knowledge, and classroom management; and that their teacher candidates do not have the ability to learn content knowledge “on-the-job”. Furthermore, alternative certification programs do not increase the retention rate of teachers in comparison to traditional certification.

The main argument against traditional programs is that their additional requirements do not necessarily provide teachers who are better prepared for the classroom. For example, Hess (2001) drew attention to the fact that many traditional education programs do not have a screening process like other academic programs such as medicine or law, thus, they provide little protection against weak or incompetent pre-service teachers who complete the teacher preparation regime. Finn (2003) pointed out that alternative programs, such as Teach for America and Troops to Teachers, often prepare teachers who are just as capable inside the classroom as compared to others who went through more “professional” teacher certification programs.

To help elucidate the debate surrounding alternative and traditional teacher certification programs and to make more sound comparisons between the two, it is important to describe the characteristics and perceptions of preservice and in-service teachers who pass through these programs and determine any similarities and differences between them. In particular, Hess’s argument cited above regarding strong versus weak teacher candidates entering the profession highlights the importance of determining what type of teacher candidate each program attracts in order to make fairer comparisons between alternative and traditional programs. Furthermore, in these comparisons, it is necessary to pay particular attention to characteristics and perceptions that are known to be important in teacher recruitment, retention, and attrition.

It has been argued that studies comparing alternative and traditional programs may have yielded contradictory results because there are variations in the definitions for alternative and traditional teacher certification programs (Miller, McKenna, & McKenna, 1998; Tozer, O'Connell & Burstein, 2006). A commonly accepted definition for alternative programs is as follows:

Alternative programs vary from short summer programs that place candidates in teaching assignments with full responsibility for students after a few weeks of training to those that offer 1- or 2-year post-baccalaureate programs with ongoing support, integrated coursework, close mentoring, and supervision. (Darling-Hammond, Chung, & Frelow, 2002, p. 287)

A commonly accepted definition for traditional programs is as follows:

Traditional programs are generally offered through a college of education as four-year undergraduate degrees. A traditional teacher preparation program curriculum typically combines subject matter instruction, pedagogy classes, and field experience....Teachers in training typically go through a period of student teaching, which is generally unpaid, and often are required to take a battery of assessments before they receive their degrees. (US Department of Education, Office of Postsecondary Education, 2005, p. 6-7)

Using these definitions as a guide and capitalizing on when the teacher candidate becomes teacher of record, this study defined alternative programs as those that had their teacher candidates become teacher of record before or during the first half of their certification program. Accordingly, traditional programs were defined as those that had their teacher candidates become teacher of record after completing at least the first half of their certification program due to limitations of the survey response options as discussed in the conclusion.

The aim of this study was two-fold. The first was to compare teacher candidates enrolled in alternative and traditional programs on certain personal characteristics that pertained to their likelihood of being appropriate teachers in high need schools. These personal characteristics included sex, race/ethnicity, age, and affective characteristics because they have all been determined to be important variables related to high need schools (Haberman, 1995; McKinney, Berry, Dickerson, & Campbell-Whately, 2007; Salinas, 2002). The likelihood of being a good teacher is also influenced by level of commitment to teaching (Haberman, 1995); therefore, the teacher candidates were also compared on their commitment to become teachers as well as their commitment to teach in a high need setting. The second purpose of this study was to compare the teacher candidates on their perceptions of the effectiveness of their programs in preparing them to teach in high need schools.

Data for this study came from a comprehensive 4-year mixed methods evaluation of the Noyce program. The Noyce program is a nationwide teacher incentive-based program funded by the NSF and is aimed towards supplying highly qualified STEM teachers to high need schools. For the purposes of this study, “highly qualified teacher” was defined as those possessing a strong content background and having gone through a quality certification program. Also, the term “high need” indicated that the school met at least one of the Title II requirements for either teacher attrition rates, percentage of students eligible for free and reduced lunch, or percentage of teachers without a bachelor or graduate degree in the content area in which they did most of their teaching (No Child Left Behind, 2001).

The Noyce program supplies highly qualified STEM teachers to high need schools by partnering with teacher certification programs nation-wide and providing funding to teacher candidates. In turn, the teacher candidate fulfills a two-year requirement of teaching in a high need school for every year of support after completing his or her certification program. Thus, the evaluation of the Noyce program provided a unique opportunity to examine the similarities and differences among scholars enrolled in alternative and traditional certification programs because all of the teacher certification programs the Noyce program partnered with (a) received funding, (b) had similar high need teaching requirements of their candidates, and (c) selected only teacher candidates with high quality content knowledge in their proposed teaching area. Consistent with the aims of the study mentioned above, the two research questions were:

1. How do teacher candidates enrolled in alternative and traditional programs compare on selected personal characteristics?
2. How do these teacher candidates differ in their perceptions of their preparation programs?

Data Collection

Data Sources and Instruments

Data were collected from three sources: the ORC Macro International, Inc. Noyce program monitoring database (ORC database), Noyce scholars using web-based surveys, and school district representatives using structured interviews.

ORC database. The ORC database contained 1504 Noyce scholars, which is the entire population of Noyce scholars during the reporting period from 2003-2007. Data found in the ORC database were provided by the principal investigators (PI) and were entered during the 2003-2007 monitoring period. This database provided the sex, race, and content majors of the scholars.

Scholar survey. The web-based scholar survey contained six sections. Items included questions about what influenced them to become teachers, and perceptions about their teacher certification programs. The survey was customized so that the items would be applicable to scholars in different stages of their careers (e.g., still enrolled as a

student, graduated and teaching, etc.). Four hundred thirty four of the 555 survey responses could be matched with the ORC database and were used for this study.

Factors identified on the survey. Due to the large number of items in the scholar survey (83 items), it was important to combine and reduce the survey items into factor scores for analysis. Through a cross-validation study, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to identify underlying conceptual constructs/factors and create factor scores to represent the survey responses. More detailed information about the EFA and CFA procedures can be found in Kirchoff, Lawrenz, and Bowe (2010) and Bowe, Liu, and Lawrenz (2009).

The EFA and CFA showed that the scholar survey contained eight factors that measured some aspect of the scholars' background experience, commitment to teaching, beliefs about teaching, and perceptions regarding the effectiveness of their certification programs. These factors were called: (a) influence of the Noyce program on scholars' commitment to become a teacher, (b) influence of the Noyce program on scholars' commitment to teach in a high need school, (c) preparation for high need schools, (d) path to teaching, (e) district/school high need environment, (f) personal beliefs towards teaching, (g) school teaching environment, and (h) mentoring experience. Factor scores for these eight factors were created and used in the analyses. The factor scores were standardized on a normal distribution with a mean of zero and a standard deviation of one.

Explanation of factors. The first factor, influence of the Noyce program on scholars' commitment to become a teacher, included three items that measured the scholars' perceived commitment to becoming teachers. The higher the score, the more influence the scholars perceived the funding had on their decisions to enter the teaching profession, therefore the less committed they were to becoming teachers before being a part of the Noyce program. The second factor, influence of the Noyce program on scholars' commitment to teach in a high need school, included three items that measured the scholars' perceived commitment to teaching in a high need school. The higher the score, the more influence the scholars perceived the Noyce funding had on their decisions to teach in a high need school, therefore, the less committed they were to teaching in a high need school before being a part of the Noyce program.

The third factor, preparation for high need schools, included the scholars' responses to 13 items regarding how prepared they felt for teaching in a high need school. The higher the score, the more prepared scholars felt for teaching in high need schools. The fourth factor, path to teaching, included the scholars' responses to seven items regarding various aspects of courses they took, at what time in their academic or career life they decided to become teachers, and their previous career status. The higher the score, the older they were, the more STEM classes they would have taken, and the more likely they would have been career-changers. The fifth factor, districts/schools high need status, included five items about the district/school high need status. These indicated scholars' perceptions of the percentage of students receiving free or reduced lunch, the percentage of teachers lacking sufficient training in the academic area they do

most of their teaching in, and the percentage of teacher attrition over the last three years. Higher scores corresponded to districts/schools meeting more Title II requirements for being considered high need.

The sixth factor, personal beliefs towards teaching, included nine items to which the scholars responded. Higher scores corresponded to higher levels of job satisfaction, opportunities for professional growth, and higher self-efficacy towards teaching. The seventh factor, school teaching environment, included five items regarding collaboration, support, and the availability of materials at their schools. Higher scores on this factor indicated that the scholars perceived their environment as being more collaborative and supportive. Finally, for the eighth factor, mentoring experiences, the scholars were asked six questions regarding mentoring experiences they might have received during and after their teacher certification program. Higher scores for this final factor indicated that the scholars reported more mentoring experiences.

School district interviews. Interviews were conducted with representatives from school districts that partnered with Noyce teacher certification programs. There were 19 district interviews conducted from January to July 2008 and these interviewees represented 19 districts. The 19 interviewees held a variety of positions in the districts in which they were employed. Nine (47%) held positions in administration, such as principal, superintendent, human resource director, and assistant superintendent of teaching and learning. Eight (42%) were employed as science or mathematics specialists, such as instructional coaches or content/curriculum supervisors. The remaining two (11%) were high school science classroom teachers who were not mentors but district representatives for the Noyce program. The length of time involved with the Noyce program or scholars varied from one through six years. The interview protocol included questions regarding general background information, district representatives' perceptions of Noyce scholars, hiring of Noyce scholars, mentoring practices within districts and schools, knowledge of the Noyce program, and how the Noyce program has affected districts and districts' relationships with the teacher certification institutions.

Classification of Alternative and Traditional Programs

The Noyce program is situated nation-wide and partners with various institutions; therefore, its scholars come from a number of alternative and traditional programs. Scholars were classified as belonging to either an alternative or a traditional program based on the time they became the official teacher of record in the classroom. Scholars who became the teacher of record at the beginning, after a brief introduction to the program, or during the first half of the program, were classified as attending alternative programs, whereas those who became the teacher of record during the second half or upon completion of their program were classified as attending traditional programs. With this classification scheme, 103 scholars were categorized as attending alternative programs and 331 were categorized as attending traditional programs. The 103 scholars were from 30 different alternative programs, and the 331 scholars were from 47 different traditional programs.

Analyses

All analyses included a quantitative or qualitative comparison of scholars enrolled in alternative and traditional programs. Pearson's Chi-square tests of independence were used for categorical data and independent *t*-tests were conducted for continuous data to compare the scholars on demographics, affective/personal characteristics, background experiences, level of commitment to becoming teachers, level of commitment to teaching in a high need school, beliefs about teaching, and their perceptions regarding the effectiveness of their certification programs. Select variables from the ORC database provided the demographic information, select items from the scholar survey measured their affective/personal characteristics and levels of commitment, and finally, the factor scores (for factors c through h) provided measurements on their background experiences, beliefs about teaching, and perceptions of their certification programs. It should be noted that the results for factors a and b were not reported because these factors were analogous to the survey items that measured the scholars' levels of commitment. Due to the exploratory nature of this research, a Bonferroni adjustment was not made on the family-wise error rate; thus, the alpha level of significance for all tests remained at $p = .05$.

To analyze the qualitative interview data, coding completed using grounded theory in the larger evaluation of the Noyce program were used to identify trends between the two groups. The codes represented various findings, including district perceptions of the affective characteristics of Noyce scholars. These perceptions were compared for similarities and differences between the two groups.

Results

Demographics

The Noyce scholars held various STEM content area majors. Overall, 39% of the Noyce scholars were mathematics majors, 52% were science majors, 5% were both science and mathematics majors, and 4% were engineering or technology majors. The alternative and traditional programs were compared on four scholar demographics; sex, percent of minorities, age, and race/ethnicity (Table 1). Overall, the Noyce scholars were 65% female and 35% male. Further, there were 68% white and 32% non-white participants. Chi-square tests revealed there was no difference in the distribution of percents between type of program and sex ($\chi^2(1, N = 434) = 0.048, p = .827, \phi = -.011$) or race ($\chi^2(1, N = 434) = 0.375, p = .540, \phi = .030$). However, a student's independent group comparison *t*-test revealed that scholars in alternative programs were significantly older ($M = 32.5$ yrs) than those in traditional programs ($M = 29.9$ yrs), $t(148.5) = 2.44, p = .016, d = .302$.

Table 1

Age/Sex/Race/Ethnicity of the Noyce Scholars		
	Alternative	Traditional
Age*	32.5yrs	29.9yrs
Female Male Ratio	64:36	65:35
Race		
Whites	68%	66%
Blacks	12%	11%
Asians	8%	10%
American Indians	0%	1%
Native Hawaiians	0%	1%
Missing	13%	12%
Responses		
Ethnicity		
Hispanic	8%	9%
Non-Hispanic	69%	63%
Not reported	23%	27%
Total	103	331

Note. $N= 434$. Numbers may not sum to 100% due to rounding. Statistical analyses of the different groups were not appropriate due to small sample sizes in some of the groups. * $p < .05$.

Affective/Personal Characteristics

On the survey, the scholars were asked to indicate which affective/personal characteristics influenced them to become teachers. They were given a list of seven choices and asked to check all that applied. Figure 1 demonstrates that the four most commonly selected choices were that they liked working with young people, they felt as if teaching allowed them to “make a difference” in the world, they liked sharing their subject with others, and that they felt they had a talent for teaching STEM. Scholars enrolled in alternative and traditional programs displayed similar patterns and there were no statistical differences on any of these, suggesting that they shared similar affective/personal characteristics that motivated them to become teachers.

Interview data from district representatives were also analyzed for perceived affective characteristics of the Noyce scholars. Interviews were conducted with district representatives who partnered with either alternative programs or traditional programs. Counts of the codes were carried out to determine the degree to which they were more or less representative of alternative and traditional programs. If certain perceptions were cited at a fairly equal rate, it was interpreted as a similarity between scholars enrolled in alternative and traditional programs. Conversely, if certain perceptions were cited at a

more disparate rate, then it was interpreted as a difference between the scholars. The interview data revealed that many of the district representatives' perceptions of Noyce scholars from alternative and traditional programs were similar. Comments pertaining to scholars from both types of programs were that they demonstrated maturity, were strong in their content knowledge, demonstrated leadership skills, and that they had a focused preparation in education. For example, interviewees were asked whether or not the typical Noyce scholar was more or less attractive as a hire compared to any other new teacher. A district representative who partnered with an alternative program said:

The candidates like the one we're seeing this year, the one working with us, I have no questions about her content, it's excellent. And we're already thinking about offering her a position for next year. The other thing is that she's a proven commodity. She's been working with our kids and we know that she can do it.

Similarly, a district representative who partnered with a traditional program said:

For sure more attractive. Because they've, they typically have a very strong math/science background. So they're typically more attractive in terms of their knowledge of math and science and their understanding of how you can apply it in the real world.

**Did any of the following help you decide to become a STEM teacher?
(Mark all that apply)**

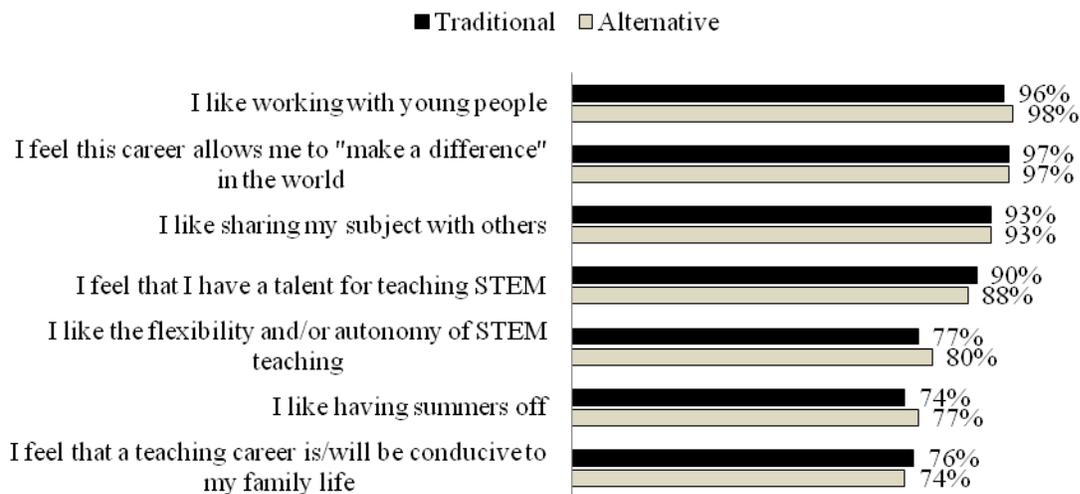


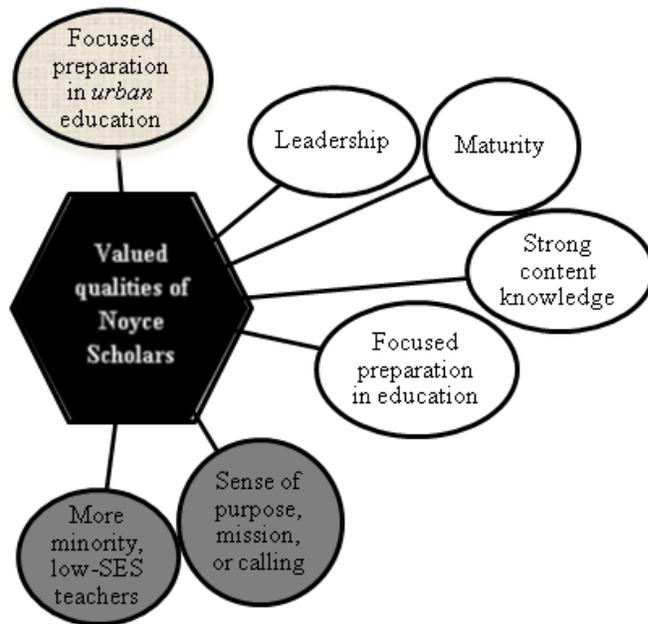
Figure 1. Affective/Personal characteristics of Noyce scholars, Alternative and Traditional

Along with the similarities, the interview data also revealed three differences. Representatives who partnered with alternative programs more often stated that they were receiving more minority and low-SES teaching candidates. For example, one

representative said “Minority students that otherwise would not be able to afford the cost of the education are involved.” Secondly, representatives partnering with alternative programs more often stated that their teaching candidates had more of a sense of purpose/mission/calling. The third difference was that representatives who partnered with traditional programs more often suggested that their teaching candidates had teacher preparation more focused on urban education. For example, one representative said:

Well, when they sign the contract, they come in mentally prepared and content prepared to work with children in high needs areas. So all the time that they are working on their certification they know what the end result will be. Working in a district with high needs students.

A summary of the similarities and differences is presented in Figure 2. It should be noted, however, that the district interviews represented only 12 teacher certification programs (five alternative, seven traditional) therefore any perceived qualitative differences between scholars enrolled in alternative and traditional programs may be due to the strength of individual programs rather than alternative or traditional program structure.



KEY:

Light grey circle – More often said by district representatives who partnered with traditional programs

Dark grey circles- More often said by district representatives who partnered with alternative programs

White circles- Things said by district representatives that were common to both alternative and traditional programs

Figure 2. Similarities and differences in district representatives’ perceptions of Noyce scholars from alternative and traditional programs.

Commitment to Becoming Teachers and Teaching in a High Need School

On the survey instrument, there were two categorical items that served as proxies for measuring scholars’ commitment to becoming teachers and their commitment to teaching in a high need school, respectively. For these items, the scholars were asked to indicate “no”, “possibly”, or “yes” as to if they would have become teachers without the Noyce funding, and also if they would have taught in a high need school without the Noyce funding. If scholars indicated “yes”, they would have become teachers even without the Noyce funding, this was interpreted as scholars having a higher commitment to becoming teachers. Conversely, if the scholars indicated “no” or “possibly”, then this was interpreted as scholars possibly having a lower commitment to becoming teachers. The same interpretation held for the item measuring scholars’ commitment to teaching in a high need school. Figures 3 and 4 display the responses of the scholars to these two items. Overall, a visual inspection of the percentages for “no”, “possibly”, “yes” in both figures suggests that in general, the Noyce funding may have been more influential on scholars decisions to teach in high need school rather than in their decisions to become teachers because in both groups the majority of the scholars indicated “yes” they would have become teachers regardless of the Noyce funding. In contrast, less than 50% of them indicated they would have taught in a high need schools regardless of the Noyce funding. Scholars in traditional programs had more of a tendency to indicate they would have become teachers regardless of the Noyce funding (79% compared to 74%), whereas alternative scholars had more of a tendency to indicate they would have taught in a high need school even without the Noyce funding (41% compared to 36%), although chi-

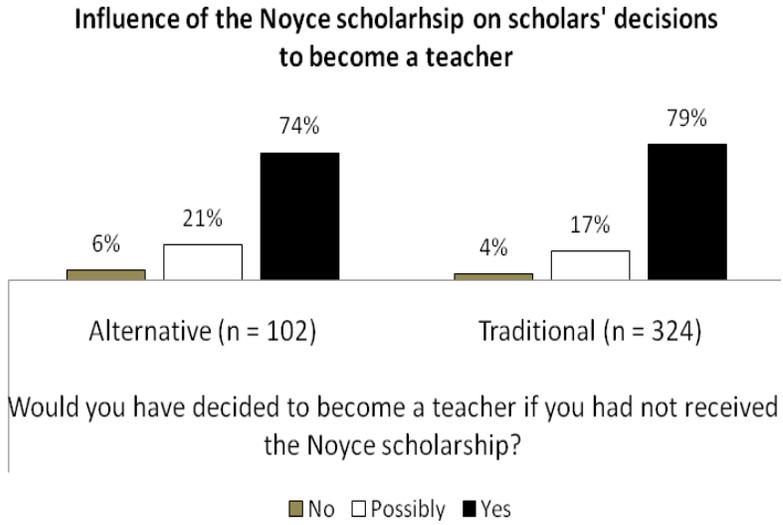


Figure 3. Comparison of scholars in alternative and traditional programs on their commitment to become teachers

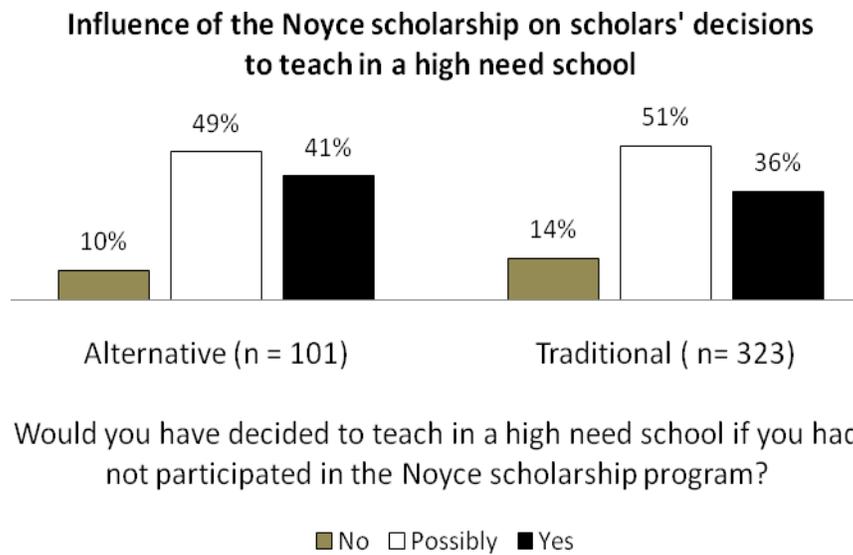


Figure 4. Comparison of scholars in alternative and traditional programs on their commitment to teach in high need schools

square analyses revealed that there was no difference in the distribution of percents between type of program and decision to teach in a high need school: $\chi^2(2, N = 426) = 1.34, p = .510$, Cramer's $V = .056$ and $\chi^2(2, N = 424) = 1.66, p = .436$, Cramer's $V = .063$ respectively.

Background Experiences and Beliefs/Perceptions about Teaching

The factor scores obtained from the factor analyses of the survey instrument described above were examined to determine similarities and differences between scholars enrolled in alternative and traditional programs regarding their background experiences, beliefs and perceptions of how their programs prepared them for teaching in high need schools. (Comparisons here are presented for factors c through h only, because the results for factors a and b are analogous to what was presented in Figures 3 and 4 above). Independent *t*-tests revealed that scholars enrolled in alternative programs were not significantly different from those in traditional programs in how prepared they felt about teaching in a high need school (factor c, $t(397) = 1.81, p = .072, d = .212$) nor their perceptions about their school teaching environments (factor 7, $t(288) = .045, p = .969, d = .005$). In contrast, scholars in alternative programs scored significantly higher on the four remaining factors. These scholars were more likely to have taken higher level courses and consider themselves to be career changers (factor 4, $t(220) = 3.27, p = .001, d = .501$), had a higher tendency to work in districts/schools that were classified as high need (factor 5, $t(272) = 3.02, p = .002, d = .394$), reported more job satisfaction (factor 6, $t(260) = 2.372, p = .018, d = .317$), and reported more mentoring experiences (factor 8, $t(399) = 5.17, p < .001, d = .459$) as compared to scholars in traditional

programs. Hence, overall, scholars enrolled in alternative and traditional programs were significantly different on four of the six factors.

Table 2

Factor Scores

Factor	Factor scores	
	Alternative (M, SD) n =	Traditional (M, SD) n =
3.Preparation for high need school	(.173,.868) n = 95	(-.022,.934) n = 304
4.Path to teaching **	(.274,.917) n = 54	(-.182,.882) n = 168
5.District/school high need environment **	(.230,.752) n = 81	(-.107,.882) n = 193
6. Personal beliefs towards teaching *	(.162,.750) n = 79	(-.096,.830) n = 183
7. School teaching environment	(-.002,.884) n = 90	(-.007,.892) n = 200
8. Mentoring Experience ***	(.423,.816) n = 92	(-.089,.840) n = 309

Note. * indicates $p < .05$, ** $p < .01$, *** $p < .001$ between scholars enrolled in alternative and traditional programs.

Discussion

This study compared Noyce scholars enrolled in alternative and traditional teacher certification programs on their demographics, personal/affective characteristics, commitment to teaching, background experiences, personal beliefs about teaching, and personal perceptions of their programs' effectiveness in preparing them for teaching in high need schools. Results from this study indicated that Noyce scholars from alternative and traditional teacher certification programs were similar in demographics, except for age. This age difference is consistent with common knowledge about teacher candidates enrolled in alternative and traditional certification programs. The finding that both alternative and traditional programs had high representations of ethnic minority groups is in contrast to the literature which purports that alternative programs typically attract more minority teacher candidates (Shen, 1998). Perhaps this is a result of the Noyce program's emphasis on recruiting scholars from underrepresented groups. The Noyce program in general has more participants from ethnic minority groups (32%) compared to the national average of STEM teachers (9-14% depending on subject and

grade range (Weiss, Banilower, & Smith, 2001)). The district representatives that partnered with Noyce alternative programs more often stated that they were getting more minority candidates, which contradicts our demographic comparisons. It therefore appears that incentives such as the Noyce funding may help traditional programs attract a more diverse pool of teaching candidates, which has typically been a strength of alternative programs. Teacher ethnic diversity is important because urban high need schools typically have higher percentages of students of color, and minority teachers are perceived as being better equipped to assist minority students in the transition from school to society, especially if these teachers grew up in urban environments (Salinas, 2002). Furthermore, according to Clewell and Villegas (2001), if selected carefully and given appropriate preparation, teacher candidates from racial/ethnic minority groups who are enrolled in teacher certification programs that work in partnerships with high need school districts are likely to choose high need settings and stay in their positions longer than the average new teacher.

The non-significant results for factor c, preparation for high need schools, suggest that scholars enrolled in alternative and traditional programs were similar in their perceptions of the effectiveness of their programs in preparing them for high need schools. These results corroborate the finding of Finn (2003) who reported that alternative routes often produce teacher candidates who are just as capable inside the classroom as compared to those who went through more “professional” or traditional programs. Thus, these findings regarding scholars’ perceptions of their programs lend support to the advocates of alternative programs who contend that alternative routes of certification might be more cost efficient in supplying the demand of quality STEM teachers into high need schools.

Two significant differences found between scholars in alternative and traditional programs on the factors were due to their background experiences and beliefs about teaching. The finding that scholars from alternative programs had taken more advanced courses in their content area (factor d) is consistent with the literature that reports that most alternative programs require a bachelor’s degree in some content area (Qu & Becker, 2003). Furthermore, the finding that scholars in alternative programs have a higher tendency to perceive themselves as career changers (factor d) is also consistent with Legler (2002). In contrast, the finding that scholars attending alternative programs may have had higher self-efficacy towards teaching (factor 6) is inconsistent with the work of Darling-Hammond and Sykes (2003) and Guyton et al. (1991) who found, instead, that traditional scholars tended to report higher perceptions of preparedness for the classroom.

The finding that scholars enrolled in alternative programs reported more mentoring experiences is consistent with Legler (2002) who reports that most alternative programs tend to have more intensive mentoring support than traditional programs. Mentoring experiences may be an important factor in teacher certification because teacher education literature is replete regarding its benefits. Onchwari (2008) provides a summary of these benefits and highlights the fact that mentoring allows the novice teacher to talk about their practice, observe others’ practice, and work together to plan,

design, research, and evaluate curriculum. Furthermore, mentoring also allows the novice teacher to feel safe making mistakes and practice becoming more reflective. An example of an alternative route that has adopted intensive mentoring is the burgeoning Urban Teacher Residencies (UTR) program of Chicago and Boston (Berry et al., 2008). These researchers found that the implementation of an intensive mentoring program, along with other important program features, resulted in a principal stating that teacher candidates who completed the UTR program took more advantage of mentoring opportunities available at their appointment site. The principal also reported that these candidates were more apt to ask for and receive constructive feedback from their colleagues as compared to other beginning teachers. Furthermore, this study showed that the UTR teachers had a higher retention rate inside high need schools as compared to teachers trained by other routes. Zeintek (2006) also found that positive mentoring experiences influenced novice teachers' perceptions and sense of preparedness for the classroom.

Research supports the notion that teacher intrapersonal characteristics play an important role in their resiliency in high need settings. Erskine-Cullen and Sinclair (1996), Haberman (1995), and McKinney et al. (2007) have all identified affective characteristics of teachers best suited for high need settings. There were no significant differences between the two groups of scholars in their level of commitment to becoming teachers or their level of commitment to teaching in a high need school, which are important characteristics of successful teachers in high need schools (Haberman, 1995). Noyce scholars enrolled in alternative programs, nevertheless, were more likely to report working in high need schools (factor e) compared to those enrolled in traditional programs. This is consistent with Shen (1997a) who compared alternative and traditionally prepared teachers. However, our survey findings did not allow us to suggest demographic or personal/affective differences that may contribute to them working in high need settings because there were no significant differences between the scholars regarding demographic or personal/affective characteristics on the survey. Still, district representatives who partnered with alternative programs more frequently cited that they perceived their scholars as having a higher sense of purpose/mission/calling compared to other teacher candidates. This contradicts our survey findings of no differences in affective characteristics between scholars in alternative and traditional programs and suggests that a limitation of this study was that the survey instrument was not sensitive enough to more specific intrapersonal characteristics. It should be noted though that the district interviews represented only 12 programs, therefore strengths or weaknesses of individual programs may mask or exaggerate any larger trends regarding alternative or traditional programs structure. The notion that scholars from alternative programs may have a higher sense of purpose/mission/calling may be due to the fact that alternative programs often attract career changers. Career changers generally have made more of a sacrifice to become a teacher and that may be interpreted as an increased sense of purpose/mission/calling.

The results for factor 5 suggest that alternative programs may either attract candidates who are better equipped for teaching in high need schools, or that alternative programs might provide better preparatory courses for working in high need schools.

The results of our study, however, do not bring clarification to this speculation. Hence, it is important to determine why these scholars enrolled in alternative programs were more likely to teach in high need schools. If it is due to intrapersonal characteristics (as might have been suggested by the district interview data), then recruiting efforts ought to be tailored towards individuals of a particular disposition. This might help ensure that funding incentives designed to support teacher candidates and potentially lure them into high need settings will not be a wasted investment due to these teachers leaving high need settings. Teacher attrition is of particular concern to high need schools since it tends to occur at a higher rate in these settings (Hanushek, Kain, & Rivkin, 2001; Kirby, Berends, & Naftel, 1999; Plecki, Elfers, Loeb, Zahir, & Knapp, 2005; Shen, 1997b). However, if the difference in the number of scholars teaching in high need schools is due to program characteristics, traditional programs might be well served to incorporate some of the characteristics of alternative programs, such as intensive mentoring. In addition, our findings from district interviews suggest that traditional programs that incorporate a strong urban emphasis are highly valued by school districts.

In summary, our findings demonstrate that Noyce scholars from alternative and traditional programs were similar in most demographics, in their affective characteristics, in their levels of commitment to teaching, and in their perceptions regarding their programs. In contrast, they differed in background experiences, beliefs about teaching, mentoring experiences, and teaching location. Moreover, the data suggest that alternative routes might attract more candidates who are more likely to teach in high need schools. Finally, mentoring opportunities and coursework and fieldwork that have a strong urban emphasis appear valuable for teacher candidates who intend to teach in high need settings; therefore, all teacher preparatory programs might want to consider incorporating both intensive mentoring and a strong urban emphasis to better prepare teacher candidates for working in high need schools.

Limitations

One limitation of this study is in the way traditional and alternative programs were defined. For this study, traditional programs were defined as those that completed at least half of their certification requirements before becoming the teacher of record. This was because the survey item asking “When did you become teacher of record?” had options limited to “at the beginning of the program”, “after a brief introduction (e.g. a summer session)”, “during the program first half”, “during the program second half”, and “upon completion of the program”. The fact that “upon completion of the program” may or may not include student teaching, and “during the program second half” can possibly include the completion of certification requirements with the exception of student teaching, leaves room for speculation. Since institutions like Missouri State University allows students in any teaching program to become the teacher of record before completing student teaching if they have completed all other certification requirements (see <http://www.missouristate.edu/certification/teachofrecord.htm>) lends credence to our classification scheme; however, this might not be the norm for most institutions.

A second limitation of the study is the fact that alternative programs allow their students to enter the field earlier than traditional programs; therefore, the presence of more alternatively prepared scholars in high need schools might be an artifact of this process. To test whether or not alternatively prepared scholars are actually in high need schools in higher percentages, it would be necessary to sample the two groups of scholars and record their presence in high need schools for a fixed amount of time after certification. A third limitation to the study is responder bias to the survey and interviews. It is possible that those who responded to the survey or interview request were not representative of the intended populations; therefore, inferences made are limited.

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