Alternative Certification Programs & Pre-Service Teacher Preparedness

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Abstract

This explanatory sequential mixed methods research study investigated motives and purpose exhibited by professionals transitioning from careers in science, technology, engineering and math (STEM) to secondary education. The study also analyzed personal perceptions of teaching preparedness, and explored barriers to successful teaching. STEM career changers were surveyed and interviewed. Study participants without industry experience and graduate degrees perceived themselves as being more prepared than study participants with industry experience and graduate degrees when developing lesson plans. Additionally, study participants without graduate degrees felt more prepared than those with graduate degrees in the area of classroom management. Overall, participants perceived themselves as most prepared in assessment and their content area and least prepared in classroom management and handling the psychological needs of their students. Specific recommendations for STEM alternative teacher education programs, instructors within these programs, and STEM career changers are included.

P-12 education has a large number of stakeholders and is often a topic for discussion and debate covered regularly in local, state and national news media. With students, parents, teachers and legislators all concerned about the educational system, K-12 education reform will always be a topic worthy of deliberation. Like industry, education has experienced many transformations over the years leaving stakeholders constantly adapting and implementing new strategies to accommodate constant change (Cuban, 2001). Recently, because of the lack of qualified individuals with appropriate teaching certification, many school corporations increasingly deal with recruiting and hiring issues (Cohen-Vogel & Smith, 2007; Gimbert, Cristol, Wallace, & Sene, 2005; Jacob, 2007).

Although teaching shortages exist in many subject areas in schools throughout the nation, high-needs urban school administrators have special difficulty in staffing positions in Science, Technology, Engineering and Mathematics (STEM) areas (Jacob, 2007; MetLife Foundation, 2007; Ng & Thomas, 2007). Recently, many national, state and local government education initiatives have been STEM-focused (Cavanagh 2008, 2009; Garrett, 2008). As a result, states have continued to increase the number of STEM requirements that students must complete before graduating high school, and many universities have increased STEM entrance requirements (Garrett, 2008). As the number of STEM graduation and entrance requirements continues to increase, demand for P-12 educators certified to teach STEM subjects has also increased (Cavanagh, 2008).

Many actions directed at addressing teacher shortages and increasing government support of STEM educational initiatives have been implemented. For example, in collaboration with state legislators, many universities offer transition-to-teaching programs that allow individuals with baccalaureate degrees to become certified teachers after completing minimal coursework (Cohen-Vogel & Smith, 2007). Additionally, many organizations offer incentives (e.g., loan forgiveness and tuition waivers) to individuals willing to teach STEM subjects in high-needs rural and urban schools (Cavanagh, 2007; Ng & Thomas, 2007). These alternative certification programs take many different forms and offer various incentives for participation.

Although many programs effectively recruit experienced individuals into secondary education, recruitment is only half the battle. Retention of new teachers can be a daunting task. Therefore, retaining and rewarding employees is also a growing concern for secondary school corporations (Hundley, Jacobs, & Drizin, 2009).

Significance and Purpose of the Study

Secondary school administrators continue to face increased staffing pressures as state legislators increase the number of STEM graduation requirements and as many new teachers leave education careers. As more and more incentive opportunities encouraging individuals to transition into secondary education careers are available, and as the outlook for the U.S. economy continues to be dismal, there is an increase in the number of individuals who elect to leave business and industry to complete certification requirements and become secondary teachers. However, because of various barriers, many new educators leave after only a few years in the profession. This research project investigated motives and purposes in transitioning into secondary education, analyzed personal perceptions of teaching preparedness, and explored barriers to successful teaching.

Identification of new teacher barriers to successful teaching has far reaching insight. With new teacher attrition increasing, this is a major area of concern for all stakeholders (Boe, Cook, & Sunderland, 2008, Gimbert et al., 2005, Darling-Hammond, 2000). Addressing difficulties that career changers encounter can help mentor teachers, coaches and university teacher educators to determine the best methods for developing top quality STEM P-12 educators. Additionally, university professors and program coordinators should analyze data to design curriculum that affords individuals more opportunities to practice necessary teaching skills that have been identified as common problem areas.

In response to significant STEM teacher shortages in secondary schools, state and local governments and schools are developing multiple methods for dealing with the problem (Cavanagh, 2007). Transition-to-teaching programs continue to increase in popularity, especially programs offering financial incentives to individuals with STEM backgrounds who are willing to teach in high-needs urban schools (Cohen-Vogel & Smith, 2007; Jacob, 2007). This trend paired with the current uncertain secondary education climate has many interesting implications for the future of secondary education and the training of secondary educators.

The intent of this explanatory sequential mixed method study was to examine transitioning STEM professionals' backgrounds and how these affect their preparedness to teach in high-need STEM areas, while also focusing on barriers to successful teaching experienced by the participants as they entered the classroom for the first time. In the initial phase, quantitative questions focused on the relationship of educational and professional background with

perceived level of preparedness to teach were investigated. Information from the first phase was explored further in a second qualitative phase. In the second phase, interviews were used to determine the significance of quantitative results by exploring aspects of teacher training and experiences thus far in the classroom.

Literature Review

In 2006, there were an estimated 3.2 million American public school educators teaching in elementary and secondary schools. Since the employment size of the public education field is so large, even "low rates of job turnover will result in many vacancies annually" (MetLife Foundation, 2007, p. 2). Analyzing teaching shortages can be somewhat misleading when using the normal framing mechanisms applied to other industries. Typically, shortages are defined as vacant positions that never are filled. However, Jacob (2007) raised a valid point when discussing education shortages: "But exactly what kind of shortage is it when virtually all classes eventually end up with some sort of teacher?" (p. 134). In the case of educators, the demand for effective teachers exceeds supply. In response to this lack of supply, school corporations hire substitute teachers with no certification or out-of-subject-area certification to fill openings (Darling-Hammond, 2000, p. 10).

In 2008, Sawchuk reported that "Demand for new teachers is expected to exceed 1.5 million over the next decade" (Sawchuk, 2008, p. 10). Teacher turnover can result from many factors. Retirement of veteran teachers accounts for approximately a third of vacancies (Cavanagh, 2007; MetLife Foundation, 2007). Also, new teacher retention is a major concern for public school stakeholders. Different studies reflect varying new teacher attrition rates, but multiple studies indicate that approximately 30 to 50 percent of all beginning teachers leave the field within five years (Boe, Cook, & Sunderland, 2008; Gimbert et al., 2005; Darling-Hammond, 2000).

Although all schools feel the pain of recruiting and hiring effective teachers, high-need schools located in urban areas suffer the most. Special conditions and factors exist in urban areas that make teaching positions appear less attractive to highly qualified teachers (Jacob, 2007; Truscott & Truscott, 2005). High-need schools commonly have teachers that are often "found to be less experienced, less likely to be fully certified, and less likely to have graduated from competitive colleges than teachers in suburban schools" (MetLife Foundation, 2007, p. 4).

Specifically, in mathematics and biology, urban schools have more difficulty filling vacancies than their suburban counterparts (MetLife Foundation, 2007). Urban schools have a distinct difficulty in attracting effective teachers for a number of reasons: increased diversity, high dropout rates, extreme childhood poverty, low standardized test scores, high crime rates, and limited resources (Jacob, 2007; Truscott & Truscott, 2005). Although urban schools experience difficulties in staffing all subject matters, they face significant hardship in recruiting and hiring qualified STEM educators and many urban schools have an immediate need for STEM educators (Cavanagh, 2007, Ng & Thomas, 2007, p. 3).

Over the last several years, many economic trends and global factors have led national, state, and local government to increase STEM education programs (Garrett, 2008). STEM initiatives also continue to be a top priority for government officials because of "job losses, weak test scores, and competition from an increasingly skilled foreign workforce" (Cavanagh, 2008, p. 10). In the past, approximately, 25 percent of SAT takers expressed interest in majoring in a STEM field in college (Brett, 2007; College Board, 2011). Since many government officials want to boost this interest, they have been increasing the number of math and science requirements necessary to graduate high school (Garrett, 2008).

Alternative certification programs continue to be one of the most popular trends for luring individuals into the classroom. "The term *alternative certification* (AC) has historically been used to refer to every licensure avenue outside of traditional college-based programs" (Cohen-Vogel & Smith, 2007, p. 733). The Cohen-Vogel and Smith definition accurately illustrates the extremely large parameters as to what qualifies as an alternative certification program. Since there is no national standard for these types of programs, the result is "differences in the quality of coursework, supervision and mentoring, and school context" (Carter & Keiler, 2009, p. 440).

Although there are many types of alternative certification programs, "two kinds of alternative certification programs are proliferating: those delivered by agencies not affiliated with an institution of higher education (sometimes called NUCPs for Non-University Certification Programs) and pared-down degrees delivered over the Internet by universities and corporations specializing in 'for-profit' educational endeavors" (Baines, 2006, p. 326). While many of the first alternative certification programs were created to address teacher shortages, today these programs are thought of as a way to improve education (Cohen-Vogel & Smith, 2007).

More and more states are handling teaching struggles through the deregulation approach. Just a few years ago, "Florida Gov. Jeb Bush signed into law a mandate that every school be given the authority to certify teachers" (Baines, 2006, p. 326). Similarly, in Indiana, the previous State Superintendent of Public Instruction, mandated that future Indiana teachers must major in their content area and not in education (Indiana Dept. of Education, 2009). Additionally, school boards are increasingly being granted permission to hire administrators with limited educational experience (McFeely, 2009). The reasoning behind such moves is the idea that a highly-qualified teacher is synonymous with being a subject matter expert.

After reviewing the literature, Gimbert, Cristol, and Sene (2006) found that alternative certification programs are beneficial in contributing highly qualified teachers and relieving teacher shortages in high-need urban areas. Additionally, some research indicates that students taught by alternatively trained teachers do as well as or better than students taught by traditionally trained teachers (Gimbert et al., 2006; Jacob, 2007). However, a study conducted by Cohen-Vogel and Smith (2007) found that alternative certification programs did not recruit more qualified individuals, and other studies found that students taught by alternatively certified teachers learn less than students taught by traditionally trained teachers (Wenglinsky as cited in Baines, 2006; Darling-Hammond, 2000).

Potentially, alternative certification programs have promise in alleviating teaching shortages and educator quality issues. However, recruiting individuals into the teaching profession is only half of the battle. Results of several alternative certification programs have many educators concerned about alternative certification programs' ability to address the problems they are intended to fix. In many cases, graduates of these programs do not stick with the teaching profession after completing an alternative certification program (Cavanagh, 2007; Darling-Hammond, 2000).

Clearly, many possibilities exist for using alternative certification programs to address STEM teaching shortages in high-need schools located in urban and rural areas. However, these programs cannot be viewed as a single solution, and research must be completed to determine quality and participant perceptions of these new initiatives. There is a gap in the literature regarding the quality, participant perceptions and effectiveness of certain aspects of alternative certification programs. There is a need for additional research to identify and better understand motives, purpose, perceived program weaknesses, and/or barriers to success so that all stakeholders involved can create solutions to overcome those barriers.

Method

Considering the nature of the alternative certification program being studied, the number of study participants and the theoretical lens currently dominating alternative certification programs for STEM career changers, using an explanatory sequential design seemed most appropriate for the current study. Cresswell and Plano Clark (2007) assert that the explanatory sequential mixed methods research design consists of quantitative data collection and analysis, followed by qualitative data collection and analysis followed by interpretation (see Figure 1).

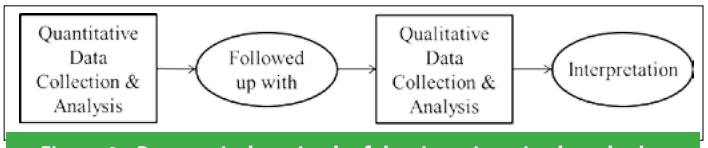

Figure 1. Prototypical version b of the six major mixed methods research designs (Cresswell and Plano Clark, 2007).

This two-phase design, also referred to as a sequential model, sequential triangulation, and iteration design begins quantitatively and uses qualitative methods as a means to follow up on results from the quantitative phase (Tashakkori & Teddlie, 1998; Morse, 1991; Greene, 2007). The overall purpose of the explanatory design is to use a qualitative strand to explain initial quantitative results. According to Cresswell and Plano Clark (2007) the two-phase, sequential explanatory design is most useful when the researcher "wants to assess trends and relationships with quantitative data but also wants to be able to explain the mechanism or reasons behind the resultant trends" (p. 82). Finally, the strengths and advantages of the explanatory design make it the most straightforward of the mixed methods designs.

In the initial phase of this study, a survey was used to gather information about study participants for quantitative analysis. In the second phase, interviews were used to determine the significance of quantitative results.

Participants

In this study, the sample consisted of 18 graduate students participating in an alternative certification program at a large, urban, public university. The program provided a total of $30,000 to STEM career changers and focused on preparing individuals to teach STEM subjects in high-need urban secondary schools. A total of 13 people enrolled in the program chose to participate in this study. At the time the survey was administered, all participants had taken coursework in, been exposed to, and completed approximately one year of clinical experience as student teachers in urban schools. Courses and experience in the following areas had been completed by all 13 study participants:

- Multicultural/Diversity in Education
- Educational Psychology
- STEM Methods
- Curriculum & Instruction
- Clinical Experience

Study participants in the program had three degree options: Master of Science in Mathematics, Master of Science in Technology or Master of Science in Secondary Education. A large number of certification options were also available to study participants based on the MS degree program in which they were enrolled. These areas included teaching licenses in science (biology, chemistry, earth science, etc.), math (algebra, calculus, etc.), and engineering technology and computer education (engineering technology, computer applications, computer programming, etc.)

Procedure and Instrumentation

For this study, an online survey was developed and delivered followed by a face-to-face interview. The 15 questions on the survey focused on participants' professional and educational background, reasons for transitioning into teaching, personal perceptions of teaching preparedness, and barriers experienced as they entered the classroom for the first time. Additionally, demographic data and general information about each participant were collected.

The first five questions of the survey focused on the participants' professional and academic background. Question six explored the participants' reasons for participating in the transition-to-teaching program. The next six questions focused on the participants' personal perceptions of preparedness on entering their first full-time teaching position. The topic of preparedness for each of these questions was selected based on the coursework and field experiences each of the participants had experienced at this point in their program. For example, a course that participants were required to take was *Multiculturalism and Diversity in Education*. Therefore, one of the questions asked participants to rate their preparedness to teach a diverse group of learners. Finally, the remaining three questions were used to collect demographic data and general information about participants. The complete survey is included in Appendix A.

Multiple validity measures were considered when constructing the survey instrument. First, the face validity of the survey was checked through pilot testing (Gall, Borg and Gall, 2006). Individuals in the pilot group (10 participants) included current secondary educators and current graduate students at a large, public, urban university in the Midwest. According to Gall, Borg, and Gall, (2006) a thorough pre-test or pilot test should be carried out before using a survey of any kind to gather data. They recommend that those who take the pre-test be provided the opportunity to both write and verbalize feedback to the researcher in an effort to improve the instrument. Educators and graduate students who took the survey as a pre-test were provided space after each question to provide comments, criticisms or suggested revisions. Also, each person who took the pre-test was asked to verbalize what the questions meant. Feedback from this process was used to clarify any confusing aspects of the survey. Additionally, to address content validity, during survey development, experts in STEM education were consulted (Jackson, 2009).

After revising the survey, it was administered online using Zoomerang. One month following the pre-test, a link to the survey was sent via e-mail to all 18 graduate students participating in the transition-to-teaching program by the researcher, along with a brief description of the study. Additionally, in this email, all study participants were invited to participate in a follow-up interview. After two weeks, another e-mail was sent out to all study participants as a reminder. The survey was left open for an additional week and then closed. At the time the survey was closed, there were 13 respondents. With 13 of 18 respondents, the response rate was 72 percent. Four of the 13 who completed the survey agreed to participate in the interview portion of the study. While the use of e-mail to send study details to participants may be an efficient, cost-effective method, e-mail messages can be easily deleted or overlooked (Thach, 1995). Thus, using this approach may have resulted in lower participation than another method.

The second part of the study consisted of interviewing four participants in an effort to clarify results from the survey. A list of interview questions was developed based on the findings from the analysis of survey results. The purpose of the interviews was to look deeper at perceived barriers to successful teaching, how study participants overcome those barriers, perceived levels of preparation, and perceived likes/dislikes regarding the transition-to-teaching program they participated in. Core interview questions included:

1. What barriers to successful teaching are you experiencing?
2. How did you overcome these barriers?
3. As you prepare for your first fulltime teaching position, what aspects of teaching do you feel best prepared for? Why?
4. As you prepare for your first full-time teaching position, what aspects of teaching do you feel least prepared for? Why?

5. What do you like best about the transition-to-teaching program?
6. What do you like least about the transition-to-teaching program?

The interviews took place during a 30-day period following the survey. Three of the interviews were face-to-face, and one interview was conducted via phone. A total of seven hours of interviews were recorded and transcribed. Information on the interviewed study participants is included in Table 1. Each interviewee was given a pseudonym to protect confidentiality.

Pseudonym	Gender	Age	Certification Area
Nancy	Female	45	Chemistry
Fran	Female	44	Chemistry
Vance	Male	25	Technology
Martin	Male	70	Physics

Table 1. Interviewed Participant Information

Results

The quantitative research questions of the study focused on comparing the participants' perceived preparedness in lesson planning, classroom management, content area, assessment, educational psychology, and diversity to the following independent variables: industry experience, graduate degrees, gender and age. When investigating these areas, each independent variable was compared against the six pedagogical areas. Additionally, total preparedness was considered when compared against the four independent variables.
All comparisons were conducted using parametric t-tests. According to Norman (2010), parametric statistics can be used with Likert data with small sample sizes. Additionally, de Winter and Dodou (2010) found that the t-test and the Mann-Whitney-Wilcoxon non-parametric tests generally have equivalent power. Small sample sizes do raise the question of external validity. However, there is no claim that the sample used for this study is representative of the population or that results are generalizable.

Respondents

Table 2 provides demographic attributes of the respondents, including gender, age, certification area, industry experience, field of experience, high school attended, and graduate degrees earned. Additionally, respondents worked in many roles including engineers, scientists, sales and marketing representatives, managers, and researchers.

Variable	Response
Gender	
Male	54%
Female	46%
Age	
22-30	38%
31-40	8%
Over 40	54%
Certification area	
Chemistry	23%
Life science	62%
Math	8%
Physics	15%
Technology	8%
Industry experience	
0 Years	23%
1-10 Years	62%
11-20 Years	8%
Over 20 Years	8%
Field experience	Ministry, Chemical Engineering, Biomedicine, Information Technology, Science, Chemical Sales, Project Management, Sales, Pharmaceutical Research, Biomedical Research
High school attended	
Rural	46%
Suburban	46%
Urban	8%
Graduate degrees	
STEM	23%
Non-STEM	23%
No degree	54%

Table 2. Summary of Survey Responses

Industry Experience

To test the hypothesis that study participants' perceived preparedness varies based on years of experience, six independent-samples *t* tests were calculated comparing the level of preparedness in each of the six pedagogical areas and years of industry experience. The responses of those participants with no industry experience were compared with the responses of those with any amount of industry experience. A summary of descriptive statistics from these *t* tests is shown in Table 3.

Variable	n	M	SD	DF	t	*p*
Lesson planning						
0 years	3	4.00	.00	8	2.53	**.035***
>0 years	9	3.56	.53			
Classroom management						
0 years	3	3.00	1.00	11	.00	1
>0 years	10	3.00	.47			
Content						
0 years	3	4.67	.58	11	.82	.43
>0 years	10	4.20	.92			
Assessment						
0 years	3	3.67	.58	11	-1.03	.33
>0 years	10	4.00	.47			
Educational Psychology						
0 years	3	3.00	1.00	11	-.99	.34
>0 years	10	3.50	.71			
Diversity						
0 years	3	3.33	.58	11	-1.21	.25
>0 years	10	3.90	.74			

*Indicates significant results, p < .05

Table 3. Mean Responses of Respondents Based on Industry Experience

The *t* test comparing the mean scores of study participants with industry experience to those without industry experience found a significant difference between the means of the two groups when dealing with lesson planning. The mean response of respondents with no industry experience was significantly higher than the mean response of those study participants with industry experience. The *t* tests comparing the mean scores of respondents with industry experience to those without industry experience when dealing with classroom management, content, assessment, educational psychology, and diversity were not significantly different.

Graduate Degrees Earned

To test the hypothesis that study participants' perceived preparedness varies based on graduate degrees earned, six independent-samples *t* tests were calculated comparing the level of preparedness in each of the six pedagogical areas and graduate degrees earned. Forty-six percent of the survey respondents already had graduate degrees before starting the alternative certification program. The responses of those with graduate degrees were compared with the responses of those with no graduate degree. A summary of descriptive statistics from these *t* tests is shown in Table 4.

Variable	n	M	SD	DF	t	*p*
Lesson planning						
Grad degree	6	3.33	.52	5	-3.16	**.025***
No grad degree	6	4.00	.000			
Classroom management						
Grad degree	6	2.67	.52	11	-2.22	**.048***
No grad degree	7	3.29	.49			
Content						
Grad degree	6	4.33	.82	11	.10	.93
No grad degree	7	4.29	.95			
Assessment						
Grad degree	6	4.00	.000	11	.50	.60
No grad degree	7	3.86	.69			
Educational Psychology						
Grad degree	6	3.33	.52	11	-.21	.84
No grad degree	7	3.43	.98			
Diversity						
Grad degree	6	3.50	.55	11	-1.27	.23
No grad degree	7	4.00	.82			

*Indicates significant results, p < .05

Table 4. Mean Responses of Respondents Based on Graduate Degrees Earned

The *t* test comparing the mean scores of study participants with graduate degrees to those without graduate degrees found a significant difference between the means of the two groups when dealing with lesson planning and classroom management. In both cases, the mean response of the respondents with no graduate degrees was significantly higher than the mean response of those with graduate degrees. The *t* tests comparing the mean scores of participants with graduate degrees to those without graduate degrees when dealing with content, assessment, educational psychology, and diversity were not significantly different.

Gender, Age and Overall Preparedness

To test the hypothesis that study participants' perceived preparedness varies based on gender, six independent-samples *t* tests were calculated comparing the level of preparedness in each of the six pedagogical areas and graduate degrees earned. The responses of male participants were compared with the responses of female participants. All six of the *t* tests comparing the mean scores of male and female participants found no significant difference between means.

To test the hypothesis that study participants' perceived preparedness varies based on age, six independent-samples *t* tests were calculated comparing the level of preparedness in each of the six pedagogical areas and age. The responses of those less than 40 years old were compared with the responses of those more than 40 years old. All six of the *t* tests comparing the mean scores of study participants less than 40 years old to those more than 40 years old found no significant difference between means.

To test the hypothesis that participants' total perceived preparedness varies based on industry experience, graduate degrees earned, gender or age, four independent-samples *t* tests were calculated comparing the total level of preparedness with the independent variables. To determine total preparedness, responses for each of the preparedness questions were added. Individuals could have a maximum of 30 or a minimum of six. All four of the *t* tests found no significant difference between means.

Summary of Perceived Preparedness Questions

To determine overall perceived strengths and weaknesses in the pedagogical areas, agree and strongly agree answers were grouped and counted, and neutral, disagree and strongly disagree responses were grouped and counted. Neutral responses were included with disagree and strongly disagree because respondents choosing neutral seemed uncertain as to whether they are prepared for their first full-time teaching position in that area. Overall, assessment and content were areas where participants' perceived themselves as most prepared when entering a first fulltime teaching position. When dealing with assessment, 11 study participants agreed or strongly agreed that they felt prepared in this area, and when dealing with their content area, ten felt confident in their subject matter. Figure 2 shows a complete spread of positive responses.

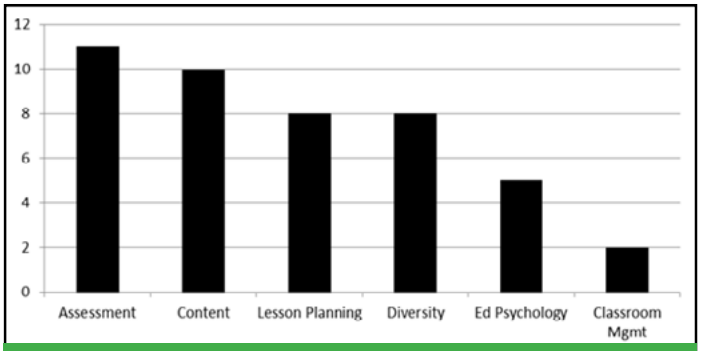

Figure 2. Summary of *Agree* and *Strongly Agree* responses on preparedness.

Classroom management and educational psychology were the areas that study participants felt least prepared to handle upon entering their first full-time teaching position. Eleven of the 13 respondents disagreed that they were prepared to deal with classroom management, while eight felt uncertain in educational psychology. Figure 3 shows a complete spread of negative responses.

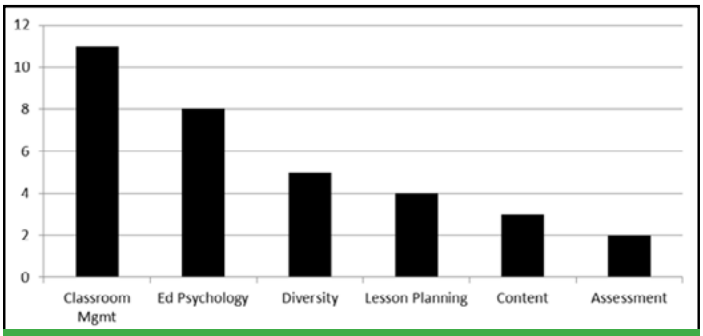

Figure 3. Summary of *Neutral, Disagree*, and *Strongly Disagree* responses on preparedness.

Barriers to Successful Teaching and Overcoming Barriers

During the interviews, four study participants were asked what barriers to successful teaching they were experiencing and how they overcame these barriers. One of the main concerns the participants had was handling classroom management and developing their own teaching style. Additionally, motivating students also seemed to be a barrier to some of the participants.

For example, Nancy and Martin discussed difficulties they experienced with classroom management and motivation. Nancy (age 45) expressed that dealing with students as individuals was difficult, "When you walk into the classroom, you must teach 30-odd kids that each have their own unique pieces of baggage." She also admitted that as a teacher you must always be ready for the unexpected, "A lesson never goes as planned—there are always minor changes that occur." In the chemistry classes Nancy taught, the students needed to have math skills to complete course content. She expressed this was sometimes a problem. Finally, Nancy added that motivating her students was sometimes difficult. She questioned, "Why do they care and want to do well in my class?" Nancy also mentioned some of the methods she used to overcome these barriers. To address the weak math skills, she used "bell work" activities (e.g., giving students a problem to work at the beginning of the class session), and when dealing with student motivation, she said, "I continually tried more activities to add variety, including drawing pictures to help visual learners if necessary."

Similarly, Martin (age 70) expressed the biggest barrier he experienced was with classroom management. He elaborated by saying, "I was placed in a classroom with highly motivated students, and knowing how best to manage them was difficult." He also added that grasping all the concepts in his content area to be difficult when "dealing with the high level physics concepts." In their field experience placement, study participants were paired with another individual in their certification area. Martin felt his partner was his saving grace, "I wouldn't have been able to make it through student teaching without him. He really helped me with the content."

Vance and Fran struggled more with finding their personal professional teaching style. When asked about the barriers he experienced, Vance (age 25) reported that dealing with the "cool factor" was difficult. Vance felt that he was not that much older than his students, and "there is a fine line between professional and casual." During his student teaching, he felt challenged to get his students accustomed to his style. "The time span for transitioning kids from my host teacher's style to mine was hard." He added that balancing teaching with graduate school was difficult stating, "There is so much going

on with university requirements, you have to let something slide." Also, during his middle school placement, Vance admitted that "developing lessons that are appealing to the female students can be hard." He also added, "I am a quiet guy, and finding my own teaching style, while getting used to talking in front of groups of students has been an adjustment." Vance felt that most of his barriers could be overcome with experience and through trial and error by trying a variety of lesson ideas.

Similar to what Vance expressed, Fran (age 44) felt that fitting into the host teacher's structure was difficult. "I did my best to fit and to make mental notes about how my host teacher went about things." She also was concerned about handling the discipline issues in her classroom. "Dealing with discipline problems would have been easier if the school had a specific plan in place to follow." She also felt uncertain about classroom management. "Keeping track of all of my responsibilities and transitioning students into my class was hard at times." When asked how she handled her barriers, she shared, "I would have discussions with my host teacher for advice and reflect on issues."

Perceived Personal Strengths and Weaknesses

Interviewees were asked what they felt most prepared for as they entered the classroom for the first time. Nancy's first response was lesson planning, especially using the "5E Method." However, she added, "Unit planning is hard—it's easy to know where you want to end up, but getting there is difficult and developing essential questions is sometimes hard." To help with this, she shared that she used the Internet and the pacing guides provided by the schools. Nancy also added that she felt ready for diversity because of the field placements, "I was exposed to a diverse population and was required to work with these students. I learned a lot through trial and error." She also shared that she was always willing to try ideas that worked for other teachers and found the English language learning coach at her host school helpful.

Vance felt the same as Nancy in his perceived strengths. He felt most prepared in lesson planning. "I feel confident in coming up with creative material for my lessons." He also added that he felt comfortable with scaffolding learning.

Martin reported one of his strengths was being well-grounded in concepts. "I have a very wide insight into practical application." He also thought that being a parent helped him prepare for his first teaching assignment. "Parenting gives me a better appreciation for the students and teaching."

Content area was one aspect Fran felt most prepared. "I feel strong in content because of my undergraduate education and seven years of work experience." Fran also felt that her personality allowed her to easily connect with her students, and she felt comfortable with planning instruction. Overall, she felt "having the support system with the other participants is helpful."

Just as the study participants were asked what they felt most prepared for, they were asked what they felt least prepared to handle in their first full-time teaching assignment. Nancy's first reaction to the question was classroom management. "In our coursework, we've had zero discussions on classroom management. Classroom management is different than discipline." She also added that with high school being so content heavy, "finding different ways to make a connection when the first way doesn't work adds additional days and throws the unit off." She questioned, "How do you go through the material in a way that works for you and your students?" Finally, she added that grading assigned work and returning this work in a timely manner was a struggle.

Vance echoed Nancy's apprehension. "I am concerned about classroom management, especially with the urban factor. Dealing with the special needs and cases that come with teaching in urban schools concerns me." He also added that he felt somewhat unprepared for assessing his students and handling discipline in his classroom.

Just as the participants interviewed before them, Martin and Fran shared that they too felt unprepared for classroom management. Martin explained that he worried about keeping "control" over his students. He added, "I find grading and paperwork to be overwhelming. I lose papers and spend so much time searching for them." Fran shared, "Classroom management is where I feel least prepared." She added that managing assignments and grading was difficult.

Perceived Program Strengths and Weaknesses

Participants were asked what they liked best about the transition-to-teaching program. Nancy said, "At first, I would say inquiry-based learning. I had never heard about it and wanted to learn more about what it was and how to use it." She went on to say that she liked the rubric evaluation system they were taught. "It is very good to show you where you are and what you need to do to improve, while being fun to implement in the classroom." She also felt positive about meeting all of the other members of the transition-to-teaching program, stating, "We really gelled as a group." Having the networking capabilities and support from the group was very comforting for her. "Everyone is unique and brings something to the table. So, we can all learn from each other." Nancy expressed that she wished everyone could get a job teaching together. Knowing the impossibility of this dream, she added, "Everyone is still just a phone call away." Additionally, she was pleased that the program required 30 weeks of field experience.

Vance also liked the connection the program afforded and the positive aspects of the student network stating that, "It's nice to have a support group in my fellow students and faculty." He admitted that the scholarship was also a positive attribute of the program. Additionally, Martin liked three main aspects of the transition-to-teaching program: cohort experience, university environment, and student teaching. Because of the cohort setup of the program, he felt that "as much learning was going on from each other as was in the classroom." He thought that the university setting was a positive and stated that, "This university is a good place and provides a lot of opportunities and the chance to work with good people." Finally, he shared that he had great placements and host teachers. He also liked the partnering aspect and found working with fellow pre-service teachers to be "magnetic."

Just as all the other participants reported, Fran enjoyed the cohort experience. Like Martin, she added, that being paired with another intern and having a coach were very helpful. "The teaching partner (intern) gave me a chance to collaborate closely with someone who had the same background and objectives. The coach was very valuable because she had real teaching experience and could give me useful feedback on what I did that worked and how to improve what didn't." Also, Fran added that she enjoyed the focus on inquiry-based teaching and noted the importance of having a good mentor. "I had a mixed experience with mentors—one excellent and one so-so. I'm sure it's really challenging to identify and secure mentor teachers, but having an excellent mentor made a big difference for my high school experience."

The final interview question asked what participants liked least about the transition-to-teaching program. Nancy's first thought was that she had difficulty in "connecting theory with reality." She found that bridging this gap was difficult, partly because she "was going through learning the theory and completing student teaching at the same time." Also, she found the program schedule to be frustrating. "On Tuesdays, we have student teaching all day and then night class that night. It was pretty intense. My focus was constantly diverted, and I had a hard time with balancing everything. Every spare moment I had was given to planning or working on my classes." She felt that she was not able to give as much to the student teaching experience because she was so busy with homework and her own assignments. "Many of us have families and kids. It seems like there could be a better structure for the program." She also felt discouraged by the extreme amount of grading and planning required during the field experience and that she did not always receive timely feedback from professors on submitted assignments.

Vance also felt a disconnect existed between theory and reality: "It was hard to understand how the different philosophies were supposed to be applied because we had never experienced them. I would have been able to discuss the topics more effectively if I could have experienced them first and then used the philosophy to apply to a specific situation and think about it differently." He also added, "I feel that we could have benefitted more from having more instruction from individuals with hands-on secondary teaching experience."

Martin found the curriculum in the program to be troubling. "There is too much overlap in the curriculum and redundant work." Also, he desired more modeling on the part of his instructors. "Many of the instructors told us to teach in a specific manner, but they would not teach using those methods themselves." Martin also expressed that he would like to have more educational technology direction: "I would have liked more instruction on using technology in the classroom to help me with lessons and the whole process."

Fran also expressed concern about some of her instructors' teaching habits and the curriculum. "What we were required to do during student teaching and for our class assignments did not seem to align. Early in the semester, we turned in a unit plan. The unit plan did not coincide with what I was teaching in my high school placement, which created extra work. I did not receive timely feedback, and so, I didn't know what I had done wrong in my unit plan until after I could have been making the same mistakes during student teaching without knowing." She also added that the structure of the program was "exhausting."

Discussion

Results from the quantitative portion of this mixed methods study were revealing. The survey results indicated that individuals without industry experience and individuals who did not have a graduate degree perceived themselves as being more prepared when creating lesson plans than those individuals with industry experience and individuals with graduate degrees respectively. Additionally, participants without graduate degrees felt more prepared than those with graduate degrees in the area of classroom management. Interestingly, lesson planning and classroom management were the only pedagogical areas that a significant difference between groups existed; the study participants who were interviewed for the qualitative portion of the study all mentioned that classroom management was a perceived weakness. Overall, the respondents perceived classroom management as a weakness. Therefore, the questions of why the participants of transition-to-teaching programs, in general, and this program in particular, feel underprepared in the area of classroom management of urban children must be examined. Likely, the participants' lack of perceived preparedness relates to the unique realities of urban schools (Jacob, 2007; Truscott & Truscott, 2005) paired with the surprising realities of transitioning into the teaching profession (McCann & Johannessen, 2004).

Considering the qualitative aspect of the study, participants revealed during interviews that they perceived managing the classroom and fitting into their host teacher structure as challenging. They overcame barriers using a variety of methods, including looking to mentors and relying on members of their cohort groups. Participants perceived their strengths as lesson planning and content and their weaknesses as handling classroom management. Program strengths were identified as inquiry-based learning, cohort/participant-networking experience, two semesters of student teaching, and working with another peer during field placement. Finally, program weaknesses included disconnect between theory and reality, hectic structure of program schedule, untimely feedback and modeling by professors, and overlaps in the curriculum.

Recommendations

Based on results from both quantitative and qualitative data gathering and mixed-methods analyses,future research must consider how similar transition-to-teaching programs can be improved (Cresswell & Plano-Clark, 2007). Common themes that should be addressed and recommendations for leaders of existing and future transition-to-teaching programs include the following:

- Leverage Peer Support through Maximizing the Diverse STEM Backgrounds of Participants
- Build Participant Competencies Using Mentors, Professional Development, and Assignment Design
- Restructure Program Format to Promote User-Friendly Experiences

Leverage Peer Support through Maximizing the Diverse STEM Backgrounds of Participants

Individuals applying for the transition-to-teaching program examined in this research come from a variety of professional backgrounds. Often transition-to-teaching programs recruit STEM career changers from a variety of STEM backgrounds and those recruits have individual strengths that should be exploited to ensure program participants understand how different subject matter can be integrated with their own expertise. During the interviews, all of the participants shared that they enjoyed the cohort experience and expressed that they felt very connected to everyone in the group. Additionally, from survey results, most participants (77%) felt very confident in their content area of certification, and many had industry experience (77%). Program administrators and participants should consider maximizing the cohort experience and building on the content area confidence of program participants. For example, participants in this transition-to-teaching program were paired with another participant in the same certification area during their field experience. All parties reported this was a positive aspect of their field experience since they were able to collaborate closely with someone.

To expand upon this, program participants could be paired with individuals from a different certification area. Assisting with STEM subject integration will help ensure that participants understand STEM as a discipline and understand their part in the broader picture. For instance, based on a study by the National Academy of Engineering and the National Research Council, Cavanagh (2009) summarized that "engineering studies, or lessons on how products are designed and built, have the potential to bolster student engagement and understanding in math and science" (p. 7). If STEM teachers have the ability to share with their students how STEM subject matter is connected across the curriculum, students will likely be more engaged and experience more learning, in turn better preparing them for post-secondary opportunities (Berry, Reed, & Ritz, 2004; DeArcos, 2009; Herschbach, 2011). Recent research by Stober (2009) indicated that successful interdisciplinary conversations between post-secondary faculty require strong leadership as it is often difficult to manage disciplinary bias and power dynamics among those who have been successful in a specific discipline. In order to build trust, these power conflicts must be resolved. When these issues can be solved and interdisciplinary faculty can be encouraged to explore synthesis of different views, creative partnerships and initiatives can arise (Stober, 2009). This process and outcome should be considered in all transition-to-teaching programs that include STEM career changers.

Build Participant Competencies Using Mentors, Professional Development, and Assignment Design

Participants in this transition-to-teaching program had taken coursework in multicultural/diversity, educational psychology, teaching methodology, curriculum and instruction, and assessment during their first year in the program. However, based on survey results and comments from interview respondents,

participants indicate that they desire more guidance to clarify some of these areas in education. With a very small percentage of study participants perceiving themselves as prepared for classroom management, this is clearly a concern. Additionally, all of the interviewed participants reported that they had major concerns with handling classroom management during their first full-time teaching position. This reality is not surprising because in numerous studies, new teachers report having difficulty with classroom management as well (Rotherham & Willingham, 2009; Yohon, 2005; Conway, Hansen, Schulz, Stimson, & Wozniak-Reese, 2004).

Leaders and participants in transition-to-teaching programs should consider seeking out more connections and mentors during the field experience. To enrich the field experience, students should create as many connections as possible. Although participants in this study seemed connected well with each other, they should go beyond the university-mandated relationships to self-explore. Observing teachers in their own and other disciplines, collecting assessment and classroom management resources from veteran teachers, and seeking advice on classroom management approaches will help to reinforce the training the beginning teachers have received and allow them to further develop their own methodology and pedagogy.

Additionally, after program participants have some clinical teaching experience from their field placement, university instructors should provide access to experts on classroom management and student motivation so they provide advice to address concerns that student teachers are experiencing. Professional development opportunities that focus on classroom management and leadership should be provided via guest speakers, professional conferences, or clinical experiences. According to Kohn and Nance (2009) providing comprehensive and well-designed professional development experiences is an excellent way for new career changers enrolled in transition-to-teaching programs to stay abreast of current best practice.

In addition to concerns about classroom management, all of the study participants that were interviewed expressed that they had difficulty applying the theory and philosophy discussed in their courses to real-life situations in the classroom. Program administrators and instructors of transition-to-teaching programs should consider creating activities and assignments to better connect theory and practice. One example of how to accomplish this is for the university instructors to model methodological approaches they wish student teachers to adopt. Through active modeling of theory application, students can see firsthand how ideas are used and attain a better grasp of the concepts. Also, instructors must consider aligning course assignments with clinical experiences.

If university faculty approach assignment design in this manner, participants will not feel as if they are completing redundant or meaningless work. University coursework assignments will be valued if they can directly relate theory and philosophy with application in the clinical experience. Additionally, university faculty must prepare assignments with mentor teachers to make sure that all work for students is contextualized and meaningful in the classroom. Finally, offering individuals continued support in their first years of teaching may be helpful. Since retention of urban teachers is problematic, offering individuals opportunities for "in-depth professional development" (p. 143) focused on the unique conditions of urban schools may be helpful for retaining teachers (Jacob, 2007).

Restructure Program Format to Promote User-Friendly Experiences

Alarmingly, study participants reported that numerous elements of the program design of this transition-to-teaching initiative were not "user friendly." Program structure and the workload experienced by study participants appeared to be a major concern. Based on qualitative results, study participants reported that managing the demands of the program was very exhausting. Completing student teaching is like having a fulltime job, and teaching for the first time can be very stressful. Pair this reality with taking nine to 12 graduate credit hours, having a family, taking care of self and others, and one can see that being "user friendly" is important.

To help alleviate some of the stress felt from the intense training, program administrators should consider restructuring certain programmatic aspects of transition-to-teaching programs. For example, instead of offering required evening courses, required courses could be offered on select Saturdays, or a hybrid method could be employed where students would receive some instruction online and some face-to-face. Also, courses could be offered at the school where students are teaching and not at the university. Additionally, instructors and program administration should consider giving pre-service teachers guidance and professional development on time, academic and life management. Providing participants with resources and tips on ways of being more efficient could go a long way in promoting their success as teachers.

Program administration should consider that although pre-service teachers in transition-to-teaching programs may be experts in their subject matter, this does not automatically and instantly make them expert teachers. Teaching is much more than content knowledge (Rotheram & Willingham, 2009). Instead, individuals transitioning into education need appropriate instruction on many of the "soft skills" needed for teaching, including classroom management. Classroom management can be infused in many areas already discussed including giving participants opportunities for discussion and reflection of experiences among peers, seeking guidance from mentors, and observing instructors modeling appropriate techniques. It is also important that transition-to-teaching programs be as "user friendly" as possible. STEM career changers are often many years removed from their first and only university experience. It is advantageous to develop a user friendly structure of course offerings, bursar payment schedules, course schedules, and locations in order to reduce stressors.

Conclusion

The findings from this research study have multiple implications on future research and policy. Although the survey and interview results provided much valuable information, additional research can afford even more opportunities to improve alternative certification initiatives commonly known as transition-to-teaching programs.

One of the major limitations of this research is the small sample size. With such a small sample size, the results of the study cannot be generalized to other similar alternative certification programs. Additional research is needed to expand upon these findings. However, the mixed-methods approach used in this study was selected in part because of the small sample size. Through this methodology, the researchers felt that the qualitative investigation could further inform the quantitative findings. Certainly, those who design and create alternative teacher preparation programs can learn from this research.

To expand this study, participants should be tracked during their first full-time teaching experiences to explore what barriers they face and how their perceptions have changed. Additionally, this research should be expanded to include similar programs across the nation. Another area that may be examined includes comparing the participants' perceptions of performance with host teacher and mentor evaluations. Comparing these results would be helpful in determining gaps and identifying additional barriers transition-to-teaching participants are experiencing. Finally, comparing these results with the perceptions of traditionally trained educators could be enlightening.

Potentially, STEM career changers have something to offer to students taking STEM subjects in high-need schools, and programs like the one examined in this study may be a step in the right direction. However, as in all new initiatives, revisions and improvements should be made to ensure participants are reaching maximum potential as they enter full-time teaching positions. It

is important for policy makers and practitioners to understand and embrace that STEM industry expertise does not automatically guarantee STEM teaching expertise. Many of the barriers participants identify in this study may result in frustration that could lead to new teacher attrition. To minimize barriers and to ensure a successful teaching experience, STEM career changers, university faculty and administrators participating in transition-to-teaching programs should be mindful of challenges. They should not be afraid to experiment, make changes and test results in an effort to serve both program participants, and most importantly, high need schools and students that stand to benefit from high quality STEM teachers.

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Appendix A

1. Before starting the program, how many years did you work in an industry position related to your field? (Circle one.)

| 0 years | 1-10 years | 11-20 years | Over 20 years |

2. If you have industry experience, in what field have you worked? _____

3. Prior to starting the program, did you have any graduate degrees? Please check all that apply.
   _____ STEM Field
   _____ Non-STEM Field
   _____ No Graduate Degrees

4. If you have industry experience, what was your job title?

5. What type of high school did you attend?
_____ Rural
_____ Suburban
_____ Urban

6. List the main reason for applying to the program?

For questions 7-12, circle the number that indicates how much you agree or disagree with the following statements. Each statement is referring to starting your first fulltime teaching position.

7. I feel prepared to develop effective lesson plans.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

8. I feel prepared to handle classroom management issues.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

9. I feel knowledgeable in the content area I will teach.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

10. I feel prepared to assess student learning.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

11. I feel prepared to support the psychological needs of secondary students.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

12. I feel prepared to teach a diverse group of students.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

13. Gender 14. Major 15. Age 22-30 | 31-40 | 40 and over