

A Perceptual Assessment of Non-Traditional STEM Teacher Candidates: A University Partnership for Transition to Teaching

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Recent science education reform has made significant commitments to improving K-20 Science, Technology, Engineering, and Mathematics (STEM) education. A series of reports have echoed a resonating call to increase America's talent pool by vastly improving K-12 mathematics and science education, and increasing the number of teacher candidates entering the STEM fields (President's Council of Advisors on Science and Technology, 2010). Specifically, the National Science Board (NSB, 2010) identified key recommendations to develop the next generation of STEM innovators which included providing support for research-based STEM preparation for general education teachers who have the most contact with children (NSB, 2010). Within this policy context, university-based STEM initiatives have expanded and are responding to a clarion call to increase access to and vastly improve K-20 STEM education. This paper focuses on a federally-funded university-based transitional teacher preparation program, Partnership for Transition to Teaching (P3T), aimed to respond to the call. Specifically, researchers in this study examined P3T teacher candidates' perceptions and concerns with respect to teaching and their plans to continue teaching after participating one year in a university-based transitional teacher education program.

Partnership for Transition to Teaching (P3T)

The P3T initiative is housed in a mid-size university centrally located in a southeastern state. The P3T recruits recent college or university graduates, career changers, paraprofessionals, and STEM majors to become mathematics and science teachers. For program eligibility, applicants must hold a bachelor's degree with at least 30 credit hours of either mathematics or science. P3T participants are enrolled in the Master of Arts in Teaching (MAT) program and are encouraged to finish their program and to earn full licensure within two years of obtaining their provisional credentials. Participants in the P3T grant initiative receive additional training, support opportunities, and \$5,000 in financial assistance in a contracted scholarship. In exchange for funding, teacher candidates agree to teach in selected highly diverse, urban districts for three years. The purpose of the partnership is to provide highly qualified STEM teachers in districts with demonstrated need. Characteristics of these districts include pervasive poverty, cultural diversity, and high teacher turnover.

Perspectives and Theoretical Framework

It has been widely advocated that experienced teachers are better teachers. However, experience comes in different forms such as years of teaching or practice in the discipline. To meet the demands and challenges to recruit and hire mathematics and science teachers, content experts – individuals with backgrounds in STEM disciplines – appear to be one avenue that potentially addresses the STEM subject- area shortages (Hanushek, Kain, & Rivkin, 2004). The

literature indicates that nontraditional prepared teachers often select certification in the subject shortage areas, such as mathematics or science, and in urban city school districts that are likely to serve minority students (Shen, 1997).

Teachers who are career-changers are often more mature and better able to manage time, work cooperatively with co-workers, and handle classroom management due to prior work, life, and/or parenting experience than those entering teaching at an early age (Mosenson & Mosenson, 2012). They can bring valuable skills and competencies and knowledge to the classroom as a result of their life experiences, and they enter the profession seeking to make a difference in the lives of students they teach (Haggard, Slostad, & Winterton, 2006; Salyer, 2003). To quote Stehlik (2011), nontraditional learners “are more philanthropic than pragmatic, more inspirational than aspirational, and more holistic than strategic” (p. 167).

Nontraditional teacher candidates have better coping skills and bring more empathy to the classroom than their traditionally prepared peers. Their prior experiences support their ability to plan and implement effective instructional practices (Kaldi, 2009). Chambers (2002) and Klauswitz (2005) found that nontraditional candidates draw from their previous job experiences, parenting or coaching and their knowledge gained through travel. In addition, they work in the community that supports them when approaching their coursework, field assignments, and classroom settings. In addition, nontraditional candidates are better at networking, managing their time, collaborating, and communicating. The academic work of nontraditional teacher education candidates is often of high quality despite the challenges they face, such as parenting or work commitments, which may limit their ability to fully commit to their coursework (Kaldi, 2009).

Researchers estimate that 20% to 50% of all teachers leave the profession within the first five years (Ingersoll & Smith, 2003; Latham & Vogt, 2007; Perrachione, Rosser, & Petersen, 2008) and the overall attrition rate for all teachers is 13% to 15% per year (Ingersoll, 2001). One characteristic that relates to retention is age (Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001). Younger teachers leave the profession either from dissatisfaction with teaching or for family reasons such as childcare. Older teachers leave teaching for retirement, and the erosion of both groups results in a U-shaped plot of age and teacher attrition (Guarino, Santibanez, & Daley, 2006; Hanushek & Rivkin, 2007). Grissmer and Kirby (1997) noted that the theory of human capital also offers insights into the U-shaped distribution of age and teacher retention. Attrition is higher among teachers in the early years of their careers because they have accumulated less specific capital, or knowledge specific to teaching, and attrition attenuates later when teachers have increased their teaching specific capital. Further, in a study of new teachers, Watson, Harper, Ratliff, and Singleton (2010) found that stress was a significant contributor to decreased job satisfaction among new teachers. The higher levels of stress, with the decreased job satisfaction, could be another reason that new teachers leave the field at higher rates. However, many younger teachers do not leave the profession indefinitely; instead they leave and return with the reentrants comprising a significant portion of annual teacher hires (Grissmer & Kirby, 1997).

A primary obstacle to researching the many aspects of nontraditional teacher characteristics and effectiveness is the lack of systematic data collection, at both the national and state levels. The National Research Council (2010) identified basic questions in the field: (a) How do characteristics of teacher candidates vary by program or pathway?, (b) Where do

entrants and graduates of preparation programs ultimately teach?, and (c) How long do teachers with different types of preparation continue to teach and are differences in preparation associated with differences in teachers' career trajectories? The P3T strives to contribute to the quality of data regarding teacher preparation and to help answer these important questions. Answers to these questions may provide a more comprehensive approach to data collection in baseline monitoring of teacher preparation, and improved opportunities to link data with other aspects of the public education system – creating a common foundation on which to build research efforts.

Purpose of the Study

The purpose of the study was to examine P3T (a) teacher candidates' perceptions about science/mathematics teaching and learning, and (b) teacher concerns about participating in the Partnership for Transition to Teaching program. Specifically, the research questions were:

1. What are the patterns of teacher candidates' perceptions about teaching after participating one year in a university-based transitional teacher education program?
2. What is the nature of teacher concerns about participating in a university-based transitional teacher education program?

Method

Participants

The P3T recruits, prepares, and places highly-qualified new STEM teachers with a goal of 30 per year for four years. In the current study, researchers report data from Years 1 to 3 of the 4 Year project. The recruitment efforts target individuals from groups traditionally underrepresented in STEM, including minorities, individuals with disabilities, and women. As part of the grant evaluation plan, participants are surveyed each semester in regard to their satisfaction with the P3T program, required coursework, and expectations of fulfilling their teaching obligations. To date, data were available from 108 completed surveys spanning five semesters. To investigate experiences as a classroom teacher, researchers solicited a subset of all Year 3 P3T teaching and four agreed to participate in the focus group. Participants were: (a) in their final year of the teacher education program, (b) granted a state-approved provisional teaching license prior to their final year of the teacher education program, and (c) teaching mathematics and/or science at high schools in highly diverse urban school districts located in the capital city of a southeastern state.

Instrumentation

Program evaluation surveys. Each semester, all P3T candidates enrolled in coursework are asked to complete a program evaluation survey comprised of eight sections pertaining to various aspects of the grant. The relevant sections for this study were the sections on course satisfaction and fulfillment of teaching obligation. Candidates responded to eight items pertaining to their courses and two items about obligation fulfillment. The response options for the course items were either 6-point levels of satisfaction or levels of agreement. The obligation items were a 5-point level of confidence scale and an open-response item about fulfilling their commitment.

Focus groups. Researchers conducted a focus group with participating Partnership for Transition to Teaching (P3T) teacher candidates with the intent of obtaining insight into the patterns of P3T teacher candidates' perceptions about their participation in the program and the nature of their concerns. Focus groups as a data collection method allow social science researchers to collect data from multiple individuals simultaneously. Often deemed as less threatening to many participants, the approach is an avenue for participants to share their perceptions, express consensus among participants, and dissent toward differing views (Krueger & Casey, 2000; Onwuegbuzie, Dickinson, Leech, & Zoran (2009). Focus group participants should represent a range of diverse individuals and create an environment where participants feel comfortable sharing their thoughts, opinions, beliefs, and experiences. When specialized knowledge exists, Krueger (1994) endorses the use of very small focus groups, or "minifocus groups" which include 3 or 4 participants. The P3T Internal Evaluator facilitated the group online utilizing Skype voice over-IP software and recorded the interview using Pamela for Skype.

Project personnel were particularly interested in improving program supports to P3T teacher candidates. A plethora of findings from a review of related literature noted that classroom management and teacher misunderstandings about cultural diversity were among the top cited reasons for teacher attrition. To capture the perceptions and concerns regarding participation in the P3T program and the issues P3T candidates were facing in regard to classroom management and cultural diversity, focus group questions were developed. The abbreviated focus group questions were (a) What are your thoughts and perceptions regarding the P3T program?, (b) What do you see as the strengths?, and (c) What are some areas of improvement?, (d) On a scale of "1" being low to "10" being high, how satisfied are you with the: level of support you have from the P3T program as a TOR; rate your preparation in classroom management; and rate your preparation for working with diverse populations. Why did you give it this rating? Give examples.

Focus Group Process

The facilitator directed participants to listen to the questions (presented one at a time) and recorded their responses on a note card to be shared aloud with the group. After the facilitator presented each question, the group was asked to read their responses. This process allowed participants to share their initial reactions to the question rather than be influenced by other group members. After each member shared their initial responses, a group discussion took place. Participants often shared similar sentiment and reactions to the questions, and often elaborated upon their responses or confirmed others' perceptions. The entire process took 72 minutes.

Data Analysis

Descriptive statistics were computed for the survey items using SPSS version 22. For the focus group data, researchers utilized a constant comparative analysis and NVivo software. By comparing, the researcher is able to do what is necessary to develop a theory inductively, including categorizing, coding, delineating categories, and connecting them. Leech and Onwuegbuzie (2008) noted that constant comparative analysis is used to analyze many types of data and is appropriate for the analysis of focus group data. The three major stages that characterize the constant comparative analysis are (a) open coding, (b) grouping into categories,

and (c) selective coding formalized our data analysis approach utilized in this study (Onwuegbuzie et al., 2009).

Results

Program Evaluation Surveys

Survey data indicated that participants were satisfied with their course experiences ($M = 4.36$, $SD = 0.87$) and 88% of participants were confident they would fulfill their obligation to teach for three years in a Partnership-School district. Concerns cited with respect to fulfilling their obligation included remaining in the teaching profession for three years, securing a better paying job that would allow for repayment of the scholarship award, and obtaining a position with a Partnership-School District.

When asked to provide an overall rating of all courses taken during the current semester, candidates' responses indicated a high degree of satisfaction with the course work components of the P3T program. Candidate ratings of satisfaction with learning experiences, course materials, relation of knowledge to real life, and course organization averaged from 4.05 to 4.36 out of 5. Ratings of course workload (*very high* '5' to *very low* '1') averaged 3.87 and difficulty ratings (*very difficult* '5' to *very easy* '1') of course content and assignment averaged 3.87 and 3.64, respectively. The descriptive statistics and 95% confidence intervals for the means are displayed in Table 1.

Table 1
Descriptive Statistics for Course Items

Item	<i>M</i>	<i>SD</i>	95% <i>CI</i> <i>LL</i>	95% <i>CI</i> <i>UP</i>
How satisfied are you with your learning experiences?	4.36	0.87	4.20	4.53
Agreement with, "The course materials were worthwhile."	4.22	0.87	4.06	4.39
Agreement with, "The courses inspire my interest in the subject."	4.33	0.89	4.16	4.50
Agreement with, "The courses help me relate the knowledge to life."	4.24	0.82	4.08	4.40
How would you rate the amount of work for the courses?	3.87	0.81	3.72	4.02
How would you rate the difficulty level of the course contents?	3.64	0.54	3.54	3.74
How would you rate the difficulty level of the course assignments?	3.68	0.61	3.56	3.79
How would you rate the organization of the courses?	4.05	0.95	3.86	4.23

Patterns of Teacher Candidates' Perceptions

The coded data from the focus group responses and discussions provided researchers with insights into the patterns of P3T teacher candidates' perceptions about their participation in a STEM-focused nontraditional teacher preparation program, and the nature of their concerns regarding their induction into the education profession via enrollment in a nontraditional program of study. The themes to emerge from the data included: (a) perceptions of benefits and concerns about teaching and learning resulting from their work in their university-based transitional teacher education program and in their partnership classrooms - focusing primarily on the mismatch between the program of study and participant experiences in their schools and (b) perceived logistical benefits and drawbacks of the P3T program as a support for the nontraditional teacher education program (Table 2).

Table 2
Themes Yielded from Coding Focus Group Comments

Themes	Sources	References	Percentage by Category	Percentage Within Category
Benefits	8	21	55.26	
Program and School Support	5	10		47.62
Financial Support	3	6		28.57
Praxis Support	3	3		14.29
Networking Support	1	2		9.52
Program Detriments	2	4	10.53	
Time Commitment	2	3		75
Logistical Concerns	1	1		25
Pedagogical Concerns	5	13	34.21	
Urban Schools	4	6		46.15
Classroom Management	2	5		38.46
Diversity	1	2		15.39

Participants clearly felt that the P3T program enhanced their transition to the education profession. Comments in this category included 21 references, or 55.26% of all comments yielded in the focus group discussions. *Within* this category, candidate comments focused on the

support provided by the P3T and local school personnel (i.e., help with enrollment, providing information and resources, support in the classroom, etc.) (47.62% of all comments within this category), the financial support provided by the P3T (28.57%), the additional support given to participants to prepare for the mandated Praxis exams (14.29%), and the ability to network and share resources and experiences with peers involved in the program (9.52%).

Participant concerns about pedagogical issues focused primarily on the mismatch between their coursework in their program of study and their experiences teaching in the Partnership Schools generating 34.21% of all comments within this category. The content of these comments included the need of the nontraditional program to provide more support in the areas of classroom management (38.46% of all comments *within* this category), in teaching diverse student populations (15.39%), and specifically in teaching in urban settings (46.15%).

In addition to counts, the researchers used NVivo to generate query correlations of assigned codes. Comments coded for the term *mismatch* was highly correlated with the code for the host program of study as well as for the terms *classroom management*, *diversity*, and *urban schools* (Figure 1). This indicates a convergence in participant comments around these codes.

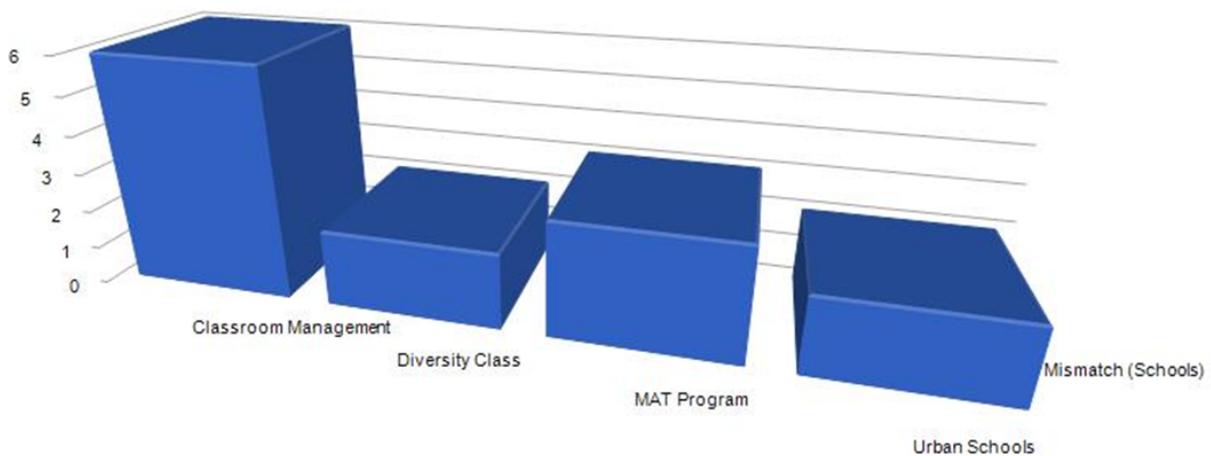


Figure 1. Pedagogical comments in data coding displaying the convergence of comments between *mismatch* and *classroom management*, *diversity class*, *MAT program*, and *urban schools*.

Nature of Teacher Concerns

All participant statements were also cross-coded for attitudinal perspective yielding additional insight into candidates' perceptions. In all, 10 sources were coded for attitude position yielding 40 total references. Of these references, 20 were deemed negative in nature (50%) with another 16 coded as positive (40%) and 4 coded as mixed or neutral (10%). A correlation cross-referencing the codes in the study provided data on what topics participants were discussing in positive or negative context.

Positive participant comments were correlated with the topics of P3T program support, support from the host program, Praxis support, financial support, and networking support (Figure

2). Negative comments focused primarily on the category describing the mismatch between the host program curriculum and the participants' lived experiences in their classroom teaching to include the codes for classroom management and urban schools. Participants also assigned negative comments to the time and logistical commitments required by the P3T program and the level of support they received *within* their schools (Figure 3).

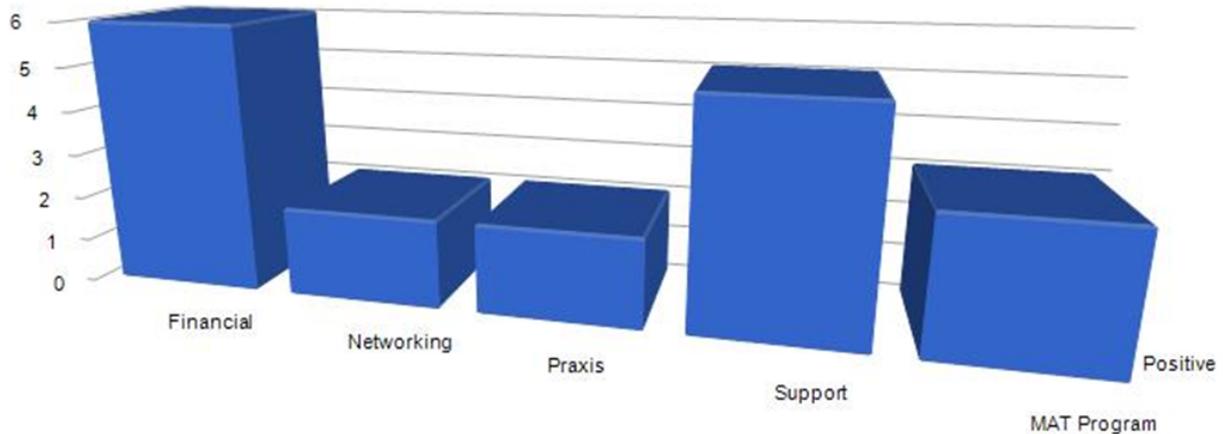


Figure 2. Positive foci in data coding across the categories of *financial, networking, Praxis, support, and MAT program.*

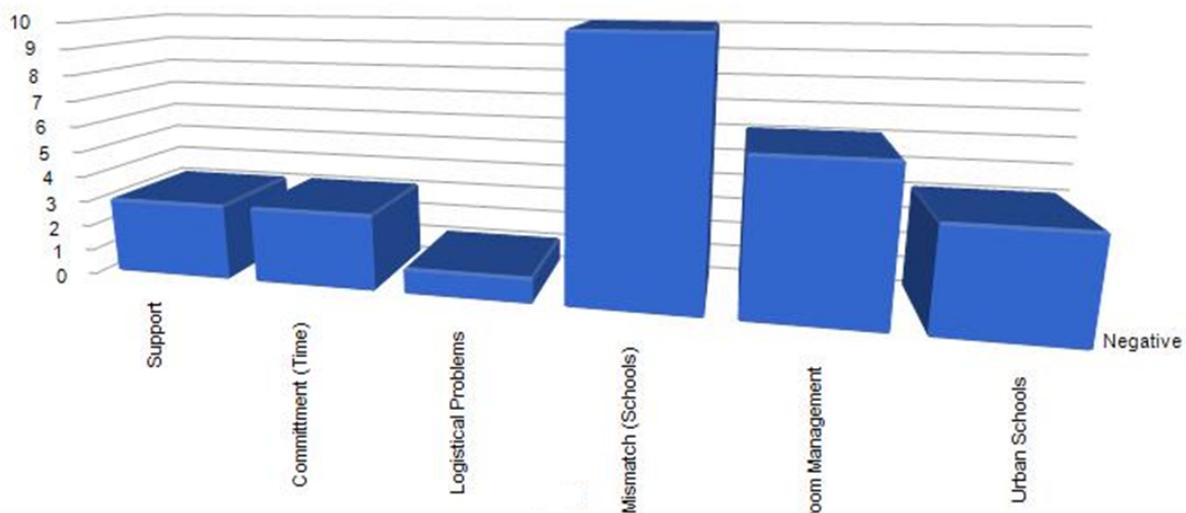


Figure 3. Negative foci in data coding across the categories of *support, commitment (time), logistical problems, mismatch (schools), classroom management, and urban schools.*

Discussion

While enrolled in courses, P3T students expressed a high degree of satisfaction with their courses, and 88% were confident that they would fulfill their teaching obligation with the Partnership Schools. One concern expressed was remaining in teaching for three years.

If 88% of P3T students were to meet their obligation, then that percentage would exceed expectations based on the current literature of 20% to 50% of teachers leaving the profession

within the first five years (Ingersoll & Smith, 2003; Latham & Vogt, 2007; Perrachione et al., 2008). Other P3T candidates may choose to remain in teaching, but may obtain a higher-paying job with a non-Partnership School district and repay the scholarship award. Such a choice is disconcerting, given that candidates were informed of the commitment they were making when they accepted the award. Nevertheless, the higher than expected number expecting to fulfill their obligation supports the use of contracted scholarships as a recruitment incentive for teachers.

In regard to the focus group question on classroom management, Respondent 1 stated, “Urban settings are a total shock; very different than anything else.” Additionally, Respondent 2 reported, “It makes me angry that 30% of my teacher evaluation is tied to classroom management, yet there is very little support and preparation to address classroom management.” Respondent 3 stated, “The teacher education program prepared me for the academic side of teaching, but not the behavior problems.”

In the follow-up question, “Do you think there should be additional Partnership School sites made available to P3T participants?” Respondent 1 stated, “Absolutely not! We knew what we were signing up for when we took the money!” Respondent 2 chimed in, stating “We are filling a great need; if you opened up the opportunity to rural schools or less diverse schools, the need would not be met. Partnerships schools are not for everyone – the P3T and MAT program need to learn how to prepare Teachers of Record better.” Respondent 3 noted, “I agree. We took the money, we will do it! We just need to be better prepared.” Respondent 4 stated, “I have learned great skills that I can use anywhere by being placed in this setting.”

The qualitative data indicate that although P3T participants felt overwhelmed, underprepared, and somewhat shocked about their initial teaching experience; yet, they felt strong convictions toward teaching in highly-diverse urban school districts. They experienced the great need of the districts and were willing to meet the need. The group expressed strong consensus views about not opening up the P3T program to non-urban, less diverse schools, and all focus group participants expressed a commitment to stay in the teaching profession, and in highly-diverse urban schools.

Significance of the Study

The P3T has responded to a clarion call to increase the number of teacher candidates entering the STEM fields, and more specifically, in highly diverse, urban schools. The P3T approach to recruiting existing mathematics and science content experts coupled with the intervention of a university-based transitional teacher education program can inform the field of teacher preparation and improve teacher attrition rates. Given the importance placed on the STEM disciplines and the calls from policy makers to build a pipeline for science and mathematics talent, P3T is a timely catalyst for developing such opportunities for teacher education and the STEM community at large.

About the Authors

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