Summer 2010 Special Issue

Transforming Teacher Education: Taking Stock of Our Evidence Base, Making Recommendations for Promising Directions

NEW YORK ASSOCIATION OF
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Summer 2010 Special Issue

Introduction

Reviewers of this special issue were the members of the

Political Action Initiative Subcommittee of the NYACTE Executive Board.

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This special issue is also available in full online at www.nyacte.org.

Readers are invited to continue the conversation at the NYSATE/NYACTE/NY Higher Education Support Center Task Force on Quality Inclusive Schooling Fall conference in Saratoga Springs, New York. Go to www.nyacte.org for more information on the conference.

New York State Association of Teacher Educators,
New York Association of Colleges for Teacher Education
and
New York Higher Education Support Center Task Force on Quality Inclusive Schooling

invite you to participate in this year's annual conference

Our Theme is

An Inclusive Vision for Teacher Education: Exploring Issues of Engagement

October 21-22, 2010

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October 20, 2010

Gideon Putnam Resort and Spa
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INTRODUCTION

The fall 2009 conference of NYACTE/NYSATE was a successful meeting of those most passionate about teacher education. While the sessions were both informative and inspirational, members were talking in the hallways about their frustrations with our national and state leaders. In his address to the faculty at Teachers College, Columbia University, Secretary of Education Arne Duncan reminded the audience that "the single biggest influence on student academic growth is the quality of the teacher standing in front of the classroom," and he also said the majority of teacher education programs were "doing a mediocre job of preparing teachers for the …classroom" (http://www.tc.edu/news/article.htm?id=7195). This kind of general statement was most demoralizing for the many strong teacher education program faculty in attendance.

The members of the New York Association of Colleges for Teacher Education (NYACTE) Executive Board met during the fall 2009 meeting and addressed many of the concerns voiced at the annual conference. Specifically, the Board recognized that the voices of professionals in the field of teacher education were not included in the discussion and subsequent public criticism of teacher education. We were also concerned that even if we were included, we did not have current and comprehensive answers to some of the criticisms. We thought that if we had recent literature reviews to guide our discussions, they would provide us with the opportunity to enter discussions proactively rather than defensively.

The NYACTE Board was concerned that decisions were being made that were not based on the research literature in our discipline, or on the best practices that we teacher educators employ. Secretary Duncan also made a judgment that "we lack empirical evidence of what works in preparing teachers for an outcome-based education system" (http://www.tc.edu/news/article.htm?id=7195). But there exists some empirical evidence, and that is a missing piece in the public discussions on teacher education.

The Board decided to approach its membership and offer mini-grants to people who would conduct a review of the extant literature and write a summary of their findings. The purpose of the project was to assist the membership in having a clear understanding of the current research in order to respond quickly and appropriately to those political initiatives that detract from or do not contribute to furthering effective teacher education practices in their efforts to improve public education. The Board described four critical questions to be addressed:

1. What are the critical characteristics and performances of preservice candidates that are related to improving P-12 student achievement?
2. What does the research indicate about the impact of different fieldwork models on teacher effectiveness (e.g., teacher residency, developmental fieldwork connected to teacher education course work)?

3. How have P-16 management systems been used to inform effectiveness in teacher education?
4. What does the research indicate about the effectiveness of varied pathways of teacher education (e.g., alternative and traditional routes and providers)?

The call for proposals asked for a 500-word description of the topic, general issues associated with the topic, and guiding questions for the review.

Four writers were selected to address two of the critical questions. The three journal articles in this Summer 2010 Special Issue address the characteristics and performances of preservice candidates that are associated with P-12 student achievement and the effectiveness of varied pathways of teacher education. Jones and Jones address the knowledge, skills, and dispositions that have demonstrated increases in student achievement. They found strong support for the notion that a teacher's level of content knowledge and value-added education courses has positive influences on student achievement. Jones and Jones also found that a teacher's self-awareness, academic optimism, social awareness, belief that students can succeed, and ability to create caring relationships with students all contributed to increased achievement.

Plumer and Lassonde each describe the research addressing the varied pathways of teacher education from two different points of reference. Plumer focuses specifically on four large-scale alternative programs—Teach for America, New York City Teaching Fellows, New Jersey New Pathways to Teaching, and Urban Teacher Residency programs—and the research completed on them. Lassonde takes a more comprehensive look at the multitude of alternative programs. Between the two reviews, we see both the broad picture and an in-depth look at alternative pathways. The conclusions of both these reviews are that alternative pathways are going to continue, we need to look at the elements of these programs that appear to be effective, and there is no way to compare and/or evaluate general differences between traditional and alternative pathways. That said, the research does not condemn either type of pathway, but hopes to identify some essential elements for strong teacher education programs. As is always the case with educational research, we don't know more than we do know. The variation within and among programs makes drawing legitimate conclusions almost impossible.

All of the writers here make thoughtful assessments about what can be demonstrated and provide excellent talking points for all of us as we seek to continuously improve our programs. We continue to need more and better research on many aspects of teacher education, particularly those practices that best prepare candidates to be effective in all classrooms.

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What Are the Critical Characteristics and Performances of Preservice Candidates Related to Improving P-12 Student Achievement?: A Review of Current Research in Teacher Education

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Executive Summary

In this review of research, we focused our attention on one of the most fundamental questions in teacher education: What are the critical characteristics and performances of preservice candidates that are related to improving P-12 student achievement? Since there are more than 1,300 public and private colleges and 122 alternative programs educating teachers in the United States (NCEI, 2009), a research-supported summary of the essential knowledge, skills, and dispositions teachers need for success in the K-12 classroom is critical.

To create this review, we considered over 100 recently published research studies, 41 of which have been included in this report. We established criteria for study inclusion (described in detail in the body of our work) designed to ensure pieces were current, relevant, and academically rigorous. Though we did find substantial gaps in the teacher education literature, the studies we found provide substantial insight for the teacher education community.

Our piece is organized around the two foundational questions and six sub-questions that guided the direction of our work. The basic outline of our piece follows:

Part I. What knowledge and skills do preservice teachers need to have to improve K-12 student achievement?

Sub-questions

1. How does a teacher's level of specific content knowledge affect student achievement?
2. How does a teacher's level of pedagogical content knowledge affect student achievement?
   a. The effect of teacher certification on student performance
   b. The effect of value-added education courses on student achievement

Part II. What dispositions and competencies do preservice teachers need to possess and display to improve K-12 student achievement?

Sub-questions

3. How do a teacher's self-awareness, self-management, social awareness, and relationship management dispositions affect student achievement?
4. How do a teacher's self-management dispositions affect student achievement?
5. How do a teacher's social awareness dispositions affect student achievement?
6. How do a teacher's relationship management dispositions affect student achievement?
   a. The effect of developing students' self-efficacy on student achievement
   b. The effect of developing teacher-student relationships on student achievement

Summary of Findings for Part I: Knowledge and Skills

A review of 24 research studies on student achievement at the elementary, middle, and secondary consistently found that extensive, flexible, and meaningful knowledge of content *and* pedagogical knowledge is essential to K-12 student achievement. Future teachers must not only be competent in the subject matter they will teach, but also in the knowledge and skills needed to create meaningful learning experiences for all students. We found that while more is not better in terms of content knowledge (student achievement was actually negatively correlated to discipline specific advanced degrees or doctorates), value-added education courses were consistently correlated with increased student achievement. While we found inconsistent research showing the linkage between teacher certification (as a measure of pedagogical knowledge) and student achievement, research on supplemental education courses unanimously suggested a benefit to students.

The last type of knowledge we explored in this piece was technological pedagogical content knowledge. Though it has been recently suggested as a modern requisite for preservice teacher preparation, we found no studies that linked teacher technological pedagogical content knowledge and student achievement. Therefore, while upcoming research may suggest a correlation, no such studies exist at this time.

Summary of Findings for Part II: Dispositions and Competencies

In addition to empowering preservice teachers with cognitive skills and knowledge, contemporary teacher education programs also must prepare future teachers with the personal and social competencies they need for success in the classroom. Since neither the National Council for Accreditation of Teacher Education (NCATE), the Teacher Education Accreditation Council (TEAC), nor the Regents Accreditation of Teacher Education (RATE) programs provides a structure for classifying teacher dispositions, we chose Goleman, Boyatzis, and McKee's (2002) framework for emotional intelligence given its contemporary nature, analogous implications from the business world, and the plethora of research support.

We then viewed the intrapersonal and interpersonal dispositions they propose in light of current student achievement research. Our analysis found that student achievement is strongly linked to teacher self-awareness in the area of teacher self-efficacy as well as self-management in the area of academic optimism. In the realm of teacher interpersonal dispositions, research suggests that student achievement is linked to social awareness in the areas of teacher organizational and professional commitment, and to relationship

management in terms of developing student self-efficacy and building relationships. Our findings conclude that student achievement is correlated to both teachers' interpersonal and intrapersonal dispositions at all grade levels.

Introduction

Facing a classroom full of challenges unique to a 21st-century generation of students (Dilworth, 1992; Ladson-Billings, 2000; Martin, 1995), preservice teachers must leave their teacher education programs with a certain body of skills, knowledge, and dispositions that are linked to student success (Levine, 2006; Shulman, 1987; Wilson, Floden, & Ferrini-Mundy, 2003). In an effort to better prepare educators for the realities of the classroom (and thus create qualified teachers), the purpose of this paper is to review existing research on essential preservice teacher characteristics, with special attention paid to the knowledge, skills, and dispositions that research has shown increases student achievement. Though the task of improving and reforming teacher education is tremendous, a highly skilled and competent workforce of teachers is worthy of the careful time and attention of teacher educators.

Methods Used for this Review

Though research on teacher education is relatively new, the studies selected for consideration for this review were the result of database searches using the Education Resources Information Center (ERIC), EBSCOhost, ProQuest, JSTOR, ScienceDirect, and the National Center for Education Statistics. We referenced and utilized appropriate websites with a clear focus on teacher education, as well as the latest scholarly publications of educational research, educational psychology, teacher leadership, and higher education studies. For the purposes of this piece, books and dissertations on teacher preparation have been excluded due to the lack of uniformly reviewed material. Additionally, works that are not directly related to one of the guiding questions of this piece, which will be considered later, were excluded to ensure a focused and targeted scope. Scholars in the field of teacher preparation for gaps have reviewed drafts of this manuscript and editorial changes have been incorporated.

Research Selection Criteria

Research to be included in this manuscript has been selected based on the following criteria. Though this piece is not an all-inclusive look at the research that exists, this criterion was meant to ensure works were relevant, empirically sound, and met acceptable research standards.

1. All research utilized in this piece is directly related to one of this paper's guiding questions. As previously described, this limitation was meant to narrow our focus to only the most appropriate research studies.

2. All studies were published in peer-reviewed journals. This was meant to ensure only high-quality, rigorous works were included, not opinions, commentary, or self-published pieces.

3. All research used in this manuscript has been published since 1989. To ensure the research included is the latest in educational theory and practice, no works more than 20 years old have been included.

Framework Utilized in this Review

Though there are many avenues by which the subject of teacher preparation can be addressed, we have chosen a targeted two-part framework for considering the teacher characteristics and performances that influence student achievement. Written in the form of guiding questions, the following questions serve as the two main parts of our work with sub-questions addressed within each part.

Part I: What **knowledge and skills** do preservice teachers need to possess and display to improve K-12 student achievement?

Part II: What **dispositions and competencies** do preservice teachers need to possess and display to improve K-12 student achievement?

For each question, research studies that met the requirements previously stated were reviewed and synthesized, with the generalizations and tendencies noted and expanded. The consistent trends we discovered are explored in the following sections.

Existing Research on Teacher Preparation

Part I: Knowledge and Skills

For decades, teacher education programs have looked to pinpoint the specific types of knowledge preservice teachers must know and be able to apply to be effective in the K-12 classroom. Though historically addressed in an unbalanced, bifurcated way, it has only been since Shulman's (1987) conception of pedagogical content knowledge (PCK) that teacher educators have looked to place equal emphasis on the development of preservice teachers' knowledge of subject matter as well as their knowledge of pedagogy. At the heart of PCK is the notion that extensive knowledge of content alone is not enough for success as an educator, nor is extensive knowledge of pedagogy. Shulman's emphasis on the role of content- pedagogical knowledge for teaching is foundational to our current understanding of effective teacher preparation and the role of skill development within that structure.

It is with this in mind, that we will delineate our first guiding question "What knowledge and skills do preservice teachers need to have to improve K-12 student achievement?" into the exploration of two types of knowledge: (1) specific content knowledge and (2) pedagogical content knowledge. Though other models for preservice teacher knowledge exist, we state that preservice teachers need specific content knowledge and pedagogical content knowledge as to conform with the standards and principles of NCATE (Standard #1), TEAC (Quality Principles 1.1 and 1.2), and RATE. RATE states that effective teachers "use their knowledge of human developmental processes and variations and their skill in applying that knowledge to form a caring and nurturing environment for all their students" (RATE Programs, 2010, p. 1).

For the purposes of this piece, we define *specific content knowledge* as a preservice teachers' deep and flexible understanding of the critical concepts of a subject or discipline he or she will teach. *Pedagogical content knowledge* refers to teachers' knowledge about teaching and learning. This includes knowledge about how people learn and how to create effective learning experiences for all learners. Teachers who have pedagogical content knowledge have a meaningful understanding of how to make the content of their discipline able to be understood by all students. In the following sections, specific content knowledge and pedagogical content knowledge will be considered in light of recent research in education about how they impact K-12 student achievement.

Sub-question 1: How does a teacher's level of specific content knowledge affect student achievement?

In exploring this sub-question, we found eleven educational research studies that directly related to our first sub-question and fit the criteria previously listed. Of the research studies considered, five were specifically focused on achievement levels at the secondary level grades 9 through 12 (Darling-Hammond, Berry, & Thoreson, 2001; Goldhaber & Brewer, 1997, 2000; Monk, 1994; Rowan, Chiang, & Miller, 1997), and six were studies of primary students in grades K through 8 (Buddin & Zamarro, 2009; Easton-Brooks & Davis, 2009; Hill, 2007; Hill & Lubinski, 2007; Hill, Rowan, & Ball, 2005; Kukla-Acevado, 2009). Of the studies focused at the primary level, one targeted reading achievement only (Easton-Brooks & Davis, 2009), four math achievement only (Hill, 2007; Hill & Lubinski, 2007; Hill et al., 2005; Kukla-Acevado, 2009), and one considered both mathematics and reading achievement (Buddin & Zamarro, 2009). Five of the six elementary studies considered data from independent samples (Buddin & Zamarro, 2009; Hill, 2007; Hill & Lubinski, 2007; Hill et al., 2005; Kukla-Acevado, 2009) while Easton-Brooks and Davis (2009) interpreted data from the Early Childhood Longitudinal Study K-5 (ECLS K-5). The elementary studies ranged in sample size from 2,963 students (Hill et al., 2005) to 22,000 students (Easton-Brooks & Davis, 2009).

Five of the data samples collected from studies of secondary grades 9 through 12 student achievement used a more unified set of data than the elementary research. Four of the five secondary achievement studies interpreted data from follow-ups to the National Education Longitudinal Study of 1988 (NELS:88) (Darling-Hammond et al., 2001; Goldhaber & Brewer, 1997, 2000; Rowan et al., 1997). Monk (1994) utilized data from the Longitudinal Study of American Youth, and Kukla-Acevado (2009) used data compiled by the Kentucky Education Profession Standards Board. Sample sizes ranged from 6,196 students (Goldhaber & Brewer, 1997) to 2,524 students (Goldhaber & Brewer, 2000). Studies at the secondary level were markedly discipline-specific with two studies simply investigating mathematics achievement (Monk, 1994; Rowan et al., 1997), two studies focusing on only math and science (Darling-Hammond et al., 2001; Goldhaber & Brewer, 2000), and one study looking at achievement in mathematics, science, English, and history (Goldhaber & Brewer, 1997).

Findings. Ten of the eleven studies reviewed suggested at least a minimally significant correlation between teacher specific content knowledge and student scholastic achievement. Especially in the areas of mathematics, research suggests both elementary

and secondary teachers who had a high level of specific content knowledge were shown to have increased levels of student achievement (Buddin & Zamarro, 2009; Darling-Hammond et al., 2001; Goldhaber & Brewer, 1997, 2002; Hill, 2007; Hill & Lubinski, 2007; Hill et al., 2005; Kukla-Acevado, 2009; Monk, 1994; Rowan et al., 1997). Goldhaber and Brewer (2002) found that for each additional math course a teacher of secondary mathematics took, student achievement in his/her class increased by three-quarters of one percent of a standard deviation—a similar finding to that which they suggested five years earlier (Goldhaber & Brewer, 1997). Similarly, in considering 12 characteristics of teacher preparation and experience, Kukla-Acevedo (2009) found that only overall grade point average consistently positively affected student achievement across all subgroups. The only study we reviewed that did not find a relationship between a teacher's knowledge of basic skills and student achievement was Buddin and Zamarro (2009); however, this was also the only study that measured content knowledge by score on a content-based teacher certification examination.

Despite the noted relationship between specific content knowledge and student achievement, Monk (1994) suggests that there is in fact a curvilinear relationship between the number of math courses a teacher takes in undergraduate preparation and his or her students' academic performance. His study suggests that up to four math courses increases student achievement but has diminishing returns after that point. Beyond four courses, there was little to no effect on student achievement. Neither an advanced degree nor doctoral degree in mathematics was shown to have an impact on student mathematics achievement at either the secondary (Goldhaber & Brewer, 1997; 2002) or elementary levels (Buddin & Zamarro, 2009).

In areas outside of mathematics education, the research relating specific content knowledge to student achievement is slightly less conclusive. In one study of 22,000 fifth-grade students, reading teachers with more content knowledge were shown to have students with higher reading abilities than those with less content knowledge (Easton-Brooks & Davis, 2009). This was not the case in higher-level reading classes, however, where research indicates that subject specific variables had a statistically insignificant effect on student test scores (Goldhaber & Brewer, 1997). In secondary history classes, no correlation between student achievement and advanced courses completion was found (Goldhaber & Brewer, 1997).

Though slightly beyond the scope of our inquiry, an interesting side note regarding content knowledge and student performance in elementary mathematics is indicated by Hill (2007), Hill and Lubinski (2007), and Easton-Brooks and Davis (2009). Each research study independently noted the relationship observed between a teacher's increased level of content knowledge and its effect on minority student achievement. Easton-Brooks and Davis (2009), for example, found that while teachers with higher levels of content knowledge had higher collective student test scores, increased levels of knowledge were marginally more important for African-American students than their Caucasian classmates. Similarly, Hill (2007) and Hill and Lubinski (2007) suggest that while there is an uneven distribution of teachers with increased content knowledge, in those districts of low socio-economic status and high minority populations, teachers with more content knowledge had greater student achievement.

Sub-question 2: How does a teacher's level of pedagogical content knowledge affect student achievement?

Unlike sub-question 1, which considered only content specific knowledge, the research considered for this sub-question specifically focused on a teacher's level of knowledge about learning, teaching, and instruction of content. Historically, teachers' pedagogical content knowledge has been difficult to measure due to its ambiguous nature. In educational research the effect of pedagogical knowledge is determined either by (a) exploration into the effect of teacher certification on student performance or (b) exploration into the effect of additional education courses on student performance.

Compounding this problem is the reality that teacher certification standards and teacher education courses themselves vary tremendously among states and institutions. With no nationwide course requirement or formative nationwide assessment, courses are not required to be completed in a certain order or to accomplish the same objectives. Due to this variability, this portion of this review will examine both teacher certification and value-added education courses separately, in hopes of determining the overall effect of increased pedagogical knowledge on student achievement.

(a) The effect of teacher certification on student performance.

In comparing the effect that certification has on student achievement, we reviewed seven articles that fit our criteria and were pertinent to this sub-question. Of the studies selected, four studies considered student achievement at the elementary level (Buddin & Zamarro, 2009; Clotfelter, Ladd, & Vigdor, 2007; Croninger, Rice, Rathburn, & Nishro, 2007; Early, Bryant, Pianta, Clifford, Burchinal, Ritchie, Howes, & Barbarin, 2006) one at the middle-school level (Curran Neild, Nash Farley-Ripple, & Byrnes, 2009) and two at the high-school level (Darling-Hammond et al., 2001; Goldhaber & Brewer, 2000). Sample sizes of these studies ranged from 730,000 students (Buddin & Zamarro, 2009) to 800 students (Early et al., 2006).

Of the elementary studies considered, two were independent samples (Buddin & Zamarro, 2009; Clotfelter et al., 2007), one used data from the Early Childhood Longitudinal Study (Croninger et al., 2007), and one used data from the National Center for Early Development and Learning (Early et al., 2006). The middle-school study utilized an independent sample of 22,853 urban students. Of the secondary education studies, both utilized data from the National Education Longitudinal follow-up study (Darling-Hammond et al., 2001; Goldhaber & Brewer, 2000).

Findings. In considering whether teacher certification positively affects student achievement, our research results were inconclusive. Four out of seven studies we used found little indication that certified teachers were more effective at raising student achievement than their non-certified colleagues (Buddin & Zamarro, 2009; Croninger et al., 2009; Early et al., 2009; Goldhaber & Brewer, 2000), despite the fact that two of those five found positive correlations with value-added education courses (Buddin & Zamarro, 2009; Croninger et al., 2009). No elementary studies, except Clotfelter and colleagues (2007) found teacher certification linked to student achievement, even when all disciplines were considered. In fact, Buddin and Zamarro (2009) did not find a correlation between teachers' Reading Instruction Competence Assessment (RICA)

scores and student achievement, despite the fact that it is the only certification test in the State of California that specifically addressed the skills taught in teacher education. Similarly, one of two high-school level studies also pointed to the negligible effect of teacher certification on student achievement in both math and science achievement (Goldhaber & Brewer, 2000).

Of the research studies, which did suggest a link between teacher certification and student achievement, one was at the middle level (Curran Neild et al., 2009), one at the elementary level (Clotfelter et al., 2007), and one at the secondary level (Darling-Hammond et al., 2001). Interestingly, when comparing math and science achievements, Curran Neild and colleagues found that teacher certification had a more significant impact on science scores than math scores. However, when comparing math and reading, Clotfelter and colleagues found that teacher certification had a more significant impact on math scores than reading. Clotfelter and colleagues also reported teacher certification to be more significantly correlated to student achievement than class size or student socio-economic status.

(b) The effect of value-added education courses on student achievement

The second way current research in teacher education describes pedagogical knowledge is in terms of value-added education courses. Simply put, when considering pedagogical knowledge with this model, researchers look to determine whether the number of supplemental education courses affects students' performance. We found six research studies that looked for correlation between education course work and student achievement, three at the elementary level (Carpenter, Fennema, Peterson, Chiang, & Loef, 1989; Croninger et al., 2007; Kukla-Acevedo, 2009), two at the secondary level (Guyton & Farokhi, 1987; Monk, 1994), and one considered K-12 students (Boe, Shin, & Cook, 2007). Sample sizes ranged from 23,000 students (Croninger et al., 2007) to 41 students (Carpenter et al., 1989).

Findings. Despite their different demographics, all six studies reviewed found a strong positive correlation between education courses and student achievement. Whether researchers correlated grades in education courses (Guyton & Farakhi, 1987), number of education courses taken (Boe et al., 2007; Carpenter et al., 1987; Monk, 1994), or number of credit hours accrued from education classes (Kukla-Acevedo, 2009), each was shown to have a significant impact on student growth. In fact, course work in pedagogy was found to be a stronger predictor of teacher effectiveness than the general knowledge (Guyton & Farakhi, 1987) or additional content knowledge (Monk, 1994), though each was found to contribute to student achievement.

Surprisingly, even those studies previously mentioned that found a statistically insignificant correlation between teacher certification and student achievement, found a strong, positive correlation between additional education courses and student achievement (Croninger et al., 2007). Croninger and colleagues considered 23,000 first-grade students and found no correlation between student achievement and teacher certification. However, the study did conclude that increased levels of achievement in reading and math were the result of quality education courses that placed emphasis on these subject areas.

Although not included in this discussion of student achievement, the only research study we found that did not report a correlation between increased completion of

education courses and teacher quality was Denton and Lacina (1984). Though well designed, this study was not included in our discussion due to its age (26 years old) and lack of congruency with our sub-question regarding student achievement. In this study, a sample of 82 secondary-level student teachers—55 who were education majors, and 27 who had majors in other fields—completed fieldwork and were ranked by their field supervisor in terms of instructional competencies, personal and professional competencies, and their ability to plan two units. Denton and Lacina (1984) found that field supervisors reported little to no differences between the groups of students, but these findings were not linked to student achievement data or their effectiveness as actual teachers of grades 7 through 12.

Note

As a side note, there has been a recent flurry of discussion in the teacher education literature to suggest that effective teachers also need to have a meaningful and flexible understanding of technology. Though dozens of studies have suggested a link between the use of educational technology and student achievement (Hancock, Knezek, & Christensen, 2007; Kozlowski, 2000; O'Dwyer, Russell, Bebell, & Tucker-Seeley,2005) and numerous theoretical pieces have been published on the notion of technological pedagogical content knowledge (Ferdig, 2006; Hofer & Swan, 2008; Mishra & Koehler, 2006; Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009), there are no available studies that link a teacher's technological pedagogical content knowledge to student achievement. Our focus was specifically on teachers' knowledge and its impact on student achievement. No discussion of technological pedagogical content knowledge has been included in this piece.

Part II: Dispositions and Competencies

It has long been suggested that dispositions should play an integral role in the teacher education curriculum (Dottin, 2008; INTASC, 1992). Although the specifics of teacher dispositions are historically vague, the recent cry for more clarity on this subject (Damon, 2007; Murray, 2007) and the political confusion it has created (Shiveley & Misco, 2009), has led to some headway in defining this concept in recent years. According to Burant, Chubbuck, and Whipp (2007) there is a three-part definition of the term *dispositions* as it relates to teacher education: (1) Dispositions are beliefs and attitudes (Kagan, 1992; Pajares, 1992); (2) Dispositions are personality traits (Mullin, 2003); (3) Dispositions are those things that can be inferred from observable behaviors (Diez, 2006; Mullin, 2003; Rinaldo, Denig, Sheeran, Cramer-Benjamin, Vermette, Foote, & Smith, 2009). This will serve as our working definition of these terms throughout this review.

In our quest to find a structure through which we could frame our discussion on teacher dispositions, we turn to the Goleman and colleagues' (2002) emotional intelligence domains as the basis for this review. This framework was chosen for several reasons:

1. The four emotional intelligence domains outlined in their book *Primal leadership: Learning to lead with emotional intelligence* frame 18 leadership competencies have

been proven to increase business productivity (Goleman et al., 2002). While we recognize that teaching P-12 students differs from business management in many ways, we assert that the dispositions needed to be an effective leader in the class room are analogous to those needed to be an effective leader in the business world. Given that both are service-oriented, motivation-driven professions, the disposi tions we highlight for teaching success also underscore business success.

2. Daniel Goleman, co-author of this framework, has been a leader and pioneer in the field of emotional intelligence since the mid 1990s. His theories regarding social and emotional intelligence are widely known, widely established, and well researched (Goleman, 1995, 1998). His 2002 conception of emotional intelligence as it relates to leadership is current and well respected in today's literature base.

3. Although the assessment of teacher dispositions is required by NCATE, TEAC, and RATE, there is no concise list of research-supported teacher dispositions for which to base this review. While individual teacher education programs have developed their own criteria and assessment measures to meet this end (Rinaldo et al., 2009), very few of these suggested lists have proven to increase student achievement in their graduates' classrooms. Needing a research base to back up our claims, we propose a set of dispositions that have documented evidence in promoting academic achievement.

4. The assertion made in this review is that increased productivity of students ultimately relates to the degree of emotional intelligence of the students and their teacher. While Social and Emotional Learning programs such as those designed by the Collaborative for Academic, Social, and Emotional Learning (CASEL, 2009; Elias & Arnold, 2006), are designed to help children develop these skills, we sought an approach that was aimed at making strides with adults. Ironically CASEL's five core groups of social and emotional competencies exactly mirror Goleman and colleagues' (2002) dispositional domains—self-awareness, self-management, social awareness, and relationship skills—with the added responsible decision-making category. The ambiguous and introspective nature of responsible decision making, however, makes it virtually impossible to link to student achieve ment and, therefore, will not be used in this review.

Goleman and colleagues' (2002) emotional intelligence framework focuses on four dispositional domains:

Personal Competencies: These are indicators of one's intrapersonal skills, as one determines how one becomes aware of and manages one's thoughts and actions.

1. **Self-awareness** includes the competencies of emotional self-awareness, accurate self-assessment, and self-confidence.

2. **Self-management** includes the competencies of emotional self-control, transparency, adaptability, achievement, initiative, and optimism.

Social Competencies: These are indicators of one's interpersonal skills, as one determine how one builds and sustains relationships with others.

3. **Social awareness** includes the competencies of empathy, organizational awareness, and service.

4. **Relationship management** includes the competencies of inspirational leadership, influence, developing others, being a catalyst for change, conflict management, and teamwork/collaboration.

It is with these ideas in mind that the second guiding question "What dispositions and competencies do preservice teachers need to possess and display to improve K-12 student achievement?" will be explored. The four domains of Goleman and colleagues' (2002) emotional intelligence framework will serve as the framework through which we delineate the teacher dispositions that are predicative of student achievement. While the dispositions selected for this review were selected based on the current research that is directly related to student achievement, it should be noted that they are by no means inclusive nor are they solely predictive of future teaching success.

Sub-question 3: How do a teacher's self-awareness dispositions affect student achievement?

Investigating the effect of teacher personal competencies on student achievement first involves defining what the manifestation of these internal states looks like in this context. In an effort to address the first dispositional domain of self-awareness (knowing one's internal states, preferences, resources, and intuitions), a review of five current research studies suggests that the manifestation of these competencies can best be described as teacher self-efficacy. A strong sense of self-efficacy increases teacher self-confidence, improves one's willingness to adapt to change and try innovative practices, and strengthens one commitment and optimism towards teaching (Brouwers & Tomic**,** 2000***;*** Caprara, Barbaranelli, Steca, & Malone, 2006). A brief investigation of how teacher self-efficacy impacts student achievement will be discussed in the following sections.

Our conception of teacher self-efficacy is well researched and grounded in Bandura's social cognition theory (Bandura, 1997). According to this theory, self-efficacy affects behavior by affecting goals, outcome expectations, affective states, and perceptions of reality. As is consistent with our findings on teacher self-efficacy and student achievement, individuals who feel they will be successful on a given task are far more likely to be so. Many of the current studies we found about teacher disposition echoed Bandura's original conceptions of self-efficacy.

For investigation of this competency, we examined five studies that looked for a direct connection between teacher self-efficacy perceptions and student achievement. These studies sought to explain student outcomes at both the primary (Goddard, Hoy, & Hoy, 2000; Ross, Hogaboam-Gray, & Hannay, 2001; Shidler, 2009) and junior-high levels (Caprara et al., 2006; Ross, 1992). The students in these studies were general education students with sample sizes as large as 2,000 teachers in 75 schools in both Italian (Caprara et al., 2006), Canadian (Ross et al., 2001), and U.S. schools (Goddard et al., 2001; Ross, 1992; Shidler, 2009). Two of these research studies involved schools whose teachers underwent self-efficacy training, with pre- and post-data examining the effect of this intervention on student achievement (Ross, 1992; Shidler, 2009).

Findings. As was to be expected, the research studies included in this review all found significantly positive correlations in teacher self-efficacy and students' academic achievement. Positive gains were found in the subject areas of mathematics (Goddard, Hoy, & Hoy, 2001), reading (Goddard et al., 2001; Shidler, 2009), history (Ross, 1992), and computer literacy (Ross et al., 2001). Ross and colleagues found an increase in teacher self-efficacy could be attributed to 7 to 9% of student outcome variance in improved computer skills. Goddard and colleagues reported that collective teacher efficacy explained between 53.27% and 69.64% of the between-school variance in mathematics and reading, respectively in a large Midwestern urban district. As is consistent with Bandura's (1993) findings, this report suggests the effect of collective teacher efficacy is greater in magnitude than that of any other demographic control, even socioeconomic status (SES). In other words, the negative association between SES and achievement is more than offset by the positive association between collective teacher efficacy and student achievement.

Interestingly, Caprara and colleagues (2006) found a reciprocal nature between teacher self-efficacy and student achievement. Noting Ingersoll's (2001) analysis of the National Schools and Staffing Survey and Teacher Follow-Up Survey, which found that more than one-third of beginning teachers leave the profession during the first three years and almost one-half leave after five years, there are benefits into looking at teacher efficacy as a means of proving the retention rates of new teachers. This finding is also in accordance with Bandura's (1993) social-cognitive theory in that the most important sources of self-efficacy beliefs are experiences of success.

In addition to the documented academic benefits, studies also conclude that high teacher self-efficacy increases students' motivation (Midgely, Feldlaufer, & Eccles, 1989; Woolfolk, Rosoff, & Hoy, 1990), improves classroom management (Brouwers & Tomic, 2000; Friedman & Farber, 1992), increases job satisfaction, and has a positive impact on collective school efficacy (Caprara et al., 2006 Goddard et al., 2000; Ross, 1992). While these are secondary factors in this review, they undoubtedly influence student performance and can be attributed to teachers' self-awareness and the disposition of self-efficacy.

Sub-question 4: How do a teacher's self-management dispositions affect student achievement?

According to Goleman and colleagues (2002), self-management is the personal competency that describes one's emotional tendencies towards managing one's internal states, impulses, and resources. He states that dispositions such as optimism and initiative are characteristic of people who have a great deal of self-control and notes those who innately possess these dispositions tend to have an intrinsic drive to achieve their goals. Research since 2006 has coined the phrase "academic optimism" to describe this competency as it specifically relates to a teacher's self-management and self-motivation in the classroom. Although the newness of this concept limits its validity in regards to the amount of available research, we found two studies on this topic.

Academic optimism is a term originally coined by Hoy, Tarter, and Hoy (2006) to describe teachers who steadfastly possess positive beliefs about themselves, their students, students' parents and curricular instruction. They state that the properties of academic emphasis, collective efficacy, and faculty trust in students and parents work together in a unifying fashion to create this academically optimistic synergy. While this

concept is commonly applied to schools collectively, this disposition is also reflected in the individual behaviors that contribute to the overall school community.

Smith and Hoy (2006) and Hoy, Tarter, and Woolfolk Hoy (2006) were the first to establish the link between academic optimism and student achievement. Their studies looked to pinpoint the effects of academic optimism at both the elementary (Smith & Hoy, 2007) and high-school levels (Hoy et al., 2007) from both urban (Smith & Hoy, 2007), suburban and rural schools (Hoy et al., 2007). The number of schools involved in these studies ranged from 96 to 99 schools and ranged in size from 289 to 1,251 students.

Findings. Using teacher survey data to measure the levels of academic optimism in Midwestern U.S. schools, both Smith and Hoy (2007) and Hoy and colleagues (2006) reported gains in student achievement in schools that exhibited a high level of collective efficacy, trust, and academic emphasis or academic optimism. Even when controlling for socioeconomic factors and school size, Smith and Hoy found a significant correlation with academic achievement and academic optimism ($r = 0.60$, $p < 0.01$) at the fourth-grade level. In comparing twelfth-grade math, science, reading, social studies, and writing test scores to ninth-grade assessments from two years before the study, Hoy and colleagues (2006) discovered a correlation coefficient of 0.23 for collective efficacy, 0.21 for trust in parents and students, and 0.24 in academic emphasis. Therefore, they concluded that academic optimism could be conceived as a property that attributes to school success. In then looking at these characteristics collectively, they found an increase in academic optimism directly related to 21% of the variation in math and science achievement and 27% of the variance in the reading, writing, and social studies data. They propose that improving teachers' academic optimism should be of interest to all schools seeking to increase students' academic achievement, as this predictor of student achievement is within a faculty's control.

Sub-question 5: How do a teacher's social awareness dispositions affect student achievement?

In categorizing and examining the social competencies of empathy, organizational awareness and service, Goleman and colleagues (2002) state that social awareness can be defined as one's sense of purpose, dedication and commitment to a cause. The current research on teacher commitment broadly defines this term in two ways. The first type of commitment (organizational commitment) is defined by allegiance to established organizational goals and mission of a school community (Mowday, Steers, & Porter, 1979). As a global sense of belonging, this type of commitment is demonstrated through dedication to one's occupation or school community (Mowday et al., 1979). The second type of commitment (commitment to the profession) is a more individualized sense of dedication to student learning characterized by a teacher's sense of responsibility for student growth and well-being (Dannetta, 2002; Elliott & Crosswell, 2002; Nias, 1981). Though research on the topic of commitment is mostly focused on the outcomes of organizational commitment on variables other than student achievement (such as motivation, sense of self-efficacy, job attrition and job satisfaction), below we will consider the available research on how both types of commitment relate to student achievement.

In considering the available research on teacher social awareness, we found three studies that fit our established criteria and were focused on student achievement. One considered both organizational commitment and professional commitment (Kushman, 1992), one only professional commitment (Park, 2005) and the last on only the effects of organizational commitment (Ross & Gray, 2006) on student achievement. Park (2005) used data from the National Educational Longitudinal Survey of 1988 to consider the mathematics achievement of 2,738 twelfth-grade students in 281 schools nationwide. Both Ross and Gray (2006) and Kushman (1992) used independent samples. Kushman considered students at 63 urban elementary and middle schools, and Ross and Gray considered 3,041 teachers in 205 schools in Ontario.

Findings. Conclusions from these pieces were mixed, as only one out of the two studies relating to professional commitment indicated a positive correlation between professional commitment and student achievement (Park, 2005). Interestingly, Kushman (1992), who found that professional commitment was not associated with student achievement, was later critiqued by Park for using school-wide commitment mean scores and ignoring variation among teachers and their individual students in his study. Park thereby attributed these methodology inaccuracies with their conflicting results. However, Kushman did find there was a very strong positive correlation between professional commitment and job satisfaction, which has since been supported by other researchers (Fresko, Kfir, & Nasser, 1997; Razak, Darmawan, & Keeves, 2009).

The results linking organization commitment to student achievement were more conclusive. Both studies dealing with organizational commitment found a positive correlation between organizational commitment and student achievement (Kushman, 1992; Ross & Gray, 2006). Despite the fact this research was done in different countries and with different sample sizes (Kushman considered only 63 schools, while Ross and Gray considered 205), they both independently attributed this correlation to a combination of strong teacher-parent, teacher-student, teacher- administration, and school-community relationships.

Sub-question 6: How do a teacher's relationship management dispositions affect student achievement?

Goleman and colleagues (2002) define relationship management as one's demonstration of inspirational leadership, influence, development of others, encouragement of others, conflict management, and teamwork/collaboration. Due to the complexity of interpersonal competencies and their immense implications on educators, this category will be considered from two seemingly different but related aspects. For this section, we will consider the effects of a teacher's relationship management competencies on student achievement through (a) exploration of the effects of developing students' self-efficacy on student achievement and (b) exploration of the effects of developing teacher-student relationships on student achievement. Though similar, each addresses unique aspects of this dispositional domain that are worthy of careful consideration by teacher educators.

(a) The effects of developing students' self-efficacy on student achievement

While the competencies of inspirational leadership, influence, and development of others all fall under the category of relationship management, we assert that their manifestation

in the classroom looks different than it would in the business world or when dealing with adults. For exploration of this competency as it specifically relates to educators, we will consider how these traits specifically manifest themselves through high and clear expectations for all students. In relating this disposition to Goleman and colleagues' (2002) framework of relationship management, a belief in student efficacy reflects a powerful influence in student learning, commitment to development of others, and the inspirational leadership necessary to reach all learners. It is from this viewpoint that we will consider the role relationship management plays in student achievement.

Studies indicating a relationship between teacher expectations and student academic achievement can be traced back to Rosenthal and Jacobson's self-fulfilling prophecy research of the late 1960s (Rosenthal & Jacobson, 1968). Since then, research has consistently and empirically shown that positive and motivating teacher expectations are associated with student performance gains. Research describing the relationship between teacher expectations and student academic performance generally falls into two types.

First, there are a number of studies that highlight the accuracy of teachers' expectations in relation to their students' future achievement, thereby noting a correlative relationship between teacher beliefs and student achievement (i.e., Alvidrez & Weinstein, 1999). There are also studies that explore the presence of a causal relationship between teacher judgments and student performance, suggesting teacher beliefs in students' abilities attribute to student performance (i.e., Benner & Mistry, 2007; Kuklinski & Weinstein, 2001; McKown & Weinstein, 2008; Trouilloud, Sarrazin, Martinek, & Guillet, 2002). In an effort to stay true to the scope of our guiding question, we will primarily focus on the latter relationship between teacher expectations and student achievement. Due to its longitudinal merit and important findings, however, the Alvidrez and Weinstein piece will briefly be considered, after which the remaining four studies will explore aspects of the causal relationship between these variables.

The five research studies reviewed in this section took place over a ten-year span from years 1999 to 2008. They studied the effects of teacher expectations on students ranging from elementary school (Kuklinski & Weinstein, 2001; McKown & Weinstein, 2007) to the middle- and high-school levels (Trouilloud et al., 2002) with two studies describing both elementary and high school age achievement (Alvidrez & Weinstein, 1999; Benner & Mistry, 2007). The number of participants in these studies ranged from 1,872 students (McKown & Weinstein, 2008) to 110 students (Alvidrez & Weinstein, 1999). Studies used to assess students' academic achievement as it related to teacher expectations included grade point average (GPA) and Scholastic Aptitude Test (SAT) scores (Alvidrez & Weinstein, 1999), the Woodcock Johnson achievement test (Benner & Mistry, 2007), and other local testing measures (Kuklinski & Weinstein, 2001; McKown & Weinstein, 2007; Trouilloud et al., 2002).

Findings. The only longitudinal study in this review, Alvidrez and Weinsein (1999), is worthy of special consideration in this review because it tracked the academic performance of 110 students from 4-year-old kindergarteners to 18-year-old high-school seniors. In an effort to examine the relationship between naturally occurring teacher perceptions and long-term achievement patterns, students were evaluated by their teachers in regards to social, personality, and cognition traits at ages 4 and 11. The results of these surveys were then compared to students' high school GPA and SAT

scores, and the correlation was noted. Alvidrez and Weinstein found a curvilinear relationship between teacher ratings at age 4 and students' future high school GPA. They concluded that teachers' ratings were significant predictors of SAT results twelve years later. In other words, the degree to which teachers overestimated intelligence relative to intelligence quotient (IQ) at age 4 predicted success in GPA and SAT test results in high school. They found that the more teachers overestimated students' abilities in kindergarten, the higher their overall high-school performance would be and were able to attribute teacher beliefs and expectations to such performance results.

The remaining four studies in this review (Benner & Mistry, 2007; Kuklinski & Weinstein, 2001; McKown & Weinstein, 2007; Trouilloud et al., 2002) were conclusive in their findings that a teacher's belief in his or her students' abilities had a significant causal relationship on students' academic achievement. Both Kuklinski and Weinstein and McKown and Weinstein, who sought to discover which students were most affected by their teacher expectations, found older students in high-bias classrooms are most influenced by their teacher's beliefs. Kuklinski and Weinstein found teacher expectancy accounted for 2 to 3% of the variance in ending achievement with students in grade 5 being most affected. McKown and Weinstein found in high-bias classrooms, teacher expectancy accounted for an average 0.29 to 0.38 standard deviations of the year-end ethnic achievement gap. However, in low-bias classrooms, teacher expectations had a negative effect ranging from -0.06 to 0.08 standard deviations. Trouilloud and colleagues add to this research with their finding that teacher expectations early in the year have a direct and lasting effect in predicting student perceived ability later in in the year have a direct and lasting effect in predicting student perceived ability later in the school year, noting the importance of developing and maintaining high expectations for students.

(b) The effects of developing teacher-student relationships on student achievement

Next we will consider Goleman and colleagues' (2002) notion of relationship management through consideration of the extensive body of research about the effect of teacher-student relationships. According to Mendes (2003), teacher-student relationships are evidence of teacher exhibition of dozens of dispositions including inspiring, encouraging, and developing others.

In our exploration of the effects of relationship building (as accomplished by the exhibition of social skills) on student achievement, we found eight studies that met our established criteria. Of those, four were focused at the elementary level (Hughes & Kwok, 2007; Liew, Chin, & Hughes, 2010; O'Connor & McCarthy, 2007; Painta & Stuhlman, 2004), one described K-8 student achievement (Hamre & Pianta, 2001), two described middle-level academic gains (Goodenow, 1993; Voelkl, 1995), and one examined grades 9 through 12 student achievement (Murray & Malingren, 2005). Sample sizes ranged from 13,121 students (Voelkl, 1995) to 48 students (Murray & Malingren, 2005).

Data was primarily gathered from independent samples. Only O'Connor and McCarthy (2007) used a national database—the NICHD study of early child care and youth development. All of the studies considered measured academic achievement according to grades in all subject areas.

Findings. Overwhelmingly, all of the studies we considered indicated a significant positive correlation between the quality of a student positive relationship with a teacher

and his or her overall academic achievement. Especially with children at risk—those living in poverty, students with emotional and/or behavioral problems, and those with a history of failure—introducing a strong, high-quality teacher-student relationship consistently improved academic achievement. Despite differences in geographic location and age of student, both Liew and colleagues (2010) (a sample of 761 at-risk first-graders in Texas) and Murray and Malingren (2005) (a sample of 48 at-risk ninth- through twelfth-graders in the Midwest) found a strong relationship with a teacher as a significant indicator of student success.

An interesting component of several of the research studies we considered was the fact that two studies tracked effects on student achievement over a multiple year span. Hamre and Pianta (2001), for example, tracked teacher-student relationships starting in kindergarten and then considered the students' academic grades, standardized test scores, work habits, and discipline records 9 years later. Hamre and Pianta found that even when controlling for gender, ethnicity, cognitive ability, and behavior ratings, negative ratings in kindergarten were related to poor academic outcomes in eighth grade. The other multi-year study, Hughes and Kwok (2007), only considered the effects of teacher relationship from kindergarten to first-grade but found similar results.

It is important to note that many of the studies we reviewed considered the effect strong teacher-student relationships had on achievement as well as other factors such as student motivation, social and personal skill development, classroom engagement, and self-control (Goodenow, 1993; Hughes & Kwok, 2007; Liew et al., 2010; Pianta & Stuhlman, 2004). Though indicators of success for obvious reasons, for our purposes we described academic achievement in terms of GPA and standardized test scores, though increases in these other areas are worth noting.

Recommendations for Future Research

Though we found 41 studies that directly tied into our guiding questions relating skills, knowledge, and dispositions to student achievement (and met our standards of empirical rigor), there is still much work to be done in the field of teacher education research. Because the question of how to best prepare preservice teachers is vital to the future of the American education system, in the following sections we will make a series of recommendations based on our work. While our review was by no means an exhaustive look at all research available, we hope that our reflections on this experience will be of value to the teacher education community.

Recommendations for Teacher Skills and Knowledge Acquisition

- Being that the development of skills and knowledge are fundamental components of new teacher preparation, research on required bodies of knowledge and skills is essential. While our review clearly indicated that increased teacher skill and knowledge increased K-12 student achievement, where those specific bodies of knowledge and skills were obtained is unknown. Even within the same state, required pedagogy course work varies, as does the curriculum of those courses. We believe a program-wide (perhaps even state- or nationwide) curriculum map of teacher preparation courses would be extremely helpful in determining where essential pedagogical skills and knowledge are taught. This would also provide

opportunities for conceptual spiraling and the linkage of field experiences to support knowledge and skill acquisition.

- The same logic holds true with content knowledge and teacher acquisition of pedagogical content knowledge. Based on our review of the research, we recom mend the institutions of higher education align their discipline-specific courses with required pedagogical content knowledge by comparing the requirements of education majors with non-education majors. To be successful in the K-12 class room, preservice teachers need a deep, flexible conceptual understanding of the discipline they will teach. Therefore, we believe more needs to be known about the specific content of subject-specific courses beyond their course titles.

- Finally, the upcoming domain of technological pedagogical content knowledge is a very intriguing but under-researched area of teacher preparation. While we searched extensively, we found no studies linking a teacher's technological pedagogical content knowledge to student academic gains, and therefore question its relevance. We suggest more research be done in the area of technology, pedagogy, and content knowledge (TPACK), specifically its correlation to student achievement.

Recommendations for Teacher Disposition Acquisition

- In recent years, teacher education programs have struggled with the task of infusing, teaching, and assessing affective dispositions in their teacher education programs. Without guidance from accrediting bodies as to which teacher dispositions have the greatest impact on student achievement, institutions have very limited support with which to make crucial program decisions. The indecisiveness and ambiguity of accrediting bodies in regards to the dispositions that should be taught and assessed causes an inconsistency even among those programs accredited by the same mandating body. Teacher education programs cannot do everything, so a clear and straightforward guide as to what (research supported) dispositions need special attention will ensure that they are addressed with the same careful attention as other aspects of teacher education programs. If accrediting bodies believe in teacher dispositions as much as they do knowledge and skills, they need to show it by providing a list of the research-supported dispositions teacher education programs should focus on in their course work.

- Faced with the task of presenting evidence to accrediting bodies as to preservice teachers' dispositions, institutions are doing the best they can to decide on those dispositions they deem most important and then find ways to infuse them into course work. The problem, however, is that most programs have no idea if the dispositions on which they are basing their programs even have an effect on their graduates' behaviors in the field. Therefore, institutions need to devise systems with which they can track their graduates and measure the effect of emphasized teacher dispositions on student achievement. While this would be nearly impossible to do with all students, possible long-term tracking cohorts could serve as valuable resources in advancing the research on teacher dispositions.

- Lastly, development of preservice teacher dispositions should not solely be the job of the teacher education faculty but viewed as the communal responsibility of all educators of teacher candidates (including those in the field). Current research on social-emotional learning suggests that students need various opportunities to display dispositions that cannot be exhibited in the classroom (CASEL, 2009; Elias & Arnold, 2006). By viewing dispositional development as a more holistic obligation, we recommend educators of subject specific content, field supervisors, cooperating teachers, and community members take part in the development of teacher candidates' dispositions. This would provide a plethora of new research to support the relationship between teacher dispositions and student achievement.

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Appendix A: Summary of Reviewed Research

Part I: What knowledge and skills do preservice teachers need to have to improve K-12 student achievement?

Sub-question 1: *How does a teacher's level of **specific content knowledge** affect student achievement?*

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Buddin, R., & Zamarro, G. (2009)	730,000 students from Los Angeles Unified School District (LAUSD) in grades 2 through 5 for five consecutiveschool years from 2000 to 2004.	***Journal of Urban Economics***	Teacher licensure tests have little effect on student achievement. Student achievement is unaffected by whether classroom teachers have advanced degrees. Student achievement is not influenced by a teacher's knowledge of basic skills.
Darling-Hammond, L., Berry, B., & Thoreson, A. (2001	National Education Longitudinal Study of 1988 (NELS:88)	***Educational Evaluation and Policy Analysis***	Teachers with more training in the field of education have increased levels of student achievement. Teachers with emergency or temporary certification have credentials similar to those with traditional certification.
Easton-Brooks D., & Davis A. (2009)	Early Childhood Longitudinal Study, Kindergarten through Grade 5 (ECLS-K-5) 22,000 children who entered kindergarten in 1998 and were in fifth grade in 2003.	***Education Policy Analysis Archives***	Primary-level students with a certified teacher score higher in reading than students who do not have a certified teacher. Teacher certification is associated with decreasing the achievement gap between Black and White students in elementary grades.

Goldhaber, D. D., & Brewer, D. J. (1997).	National Education Longitudinal Study of 1988 (NELS:88) 5,113 students in mathematics; 4,357 students in science; 6,196 students in English; and 2,943 students in history	***Journal of Human Resources***	General measures of teacher degree level are not related to high school student achievement in math, science, English, or history. Teachers who have BA and MA degrees in mathematics and hold certification in mathematics are associated with higher student mathematics test scores. Teachers with BA degrees in science are associated with higher student science test scores. Teachers holding advanced degrees were not found to influence student outcomes in English or history.
Goldhaber, D. D., & Brewer, D. J. (2000).	National Educational Longitudinal Survey 1988 3,786 students in mathematics 2,524 students in science 2,098 mathematics teachers 1,371 science teachers	***Educational Evaluation and Policy Analysis***	Mathematics students with teachers who hold standard certification perform better than students with teachers who hold probationary or emergency certification or who are not certified. In both mathematics and science, students with teachers who have a Ph.D. or similar advanced degrees are not found to have higher test scores than students of teachers without an advanced degree.
Hill, H. C. (2007)	Chosen sample of 1,000 teachers selected and contacted from data compiled by the National Center for Education Statistics (NCES) Common Core Database (CCD).	***Educational Evaluation and Policy Analysis***	The amount of mathematical course work, subject-specific certification, and high school teaching experience were all factors positively correlated with an educator's teaching-specific mathematical knowledge and student achievement specifically in low SES, high-risk schools.
Hill, H. C., & Lubienski, S. T. (2007).	438 K-8 California teachers	***Educational Policy***	Teachers at low performing, low-SES schools are less likely to possess the depth of content knowledge as teachers in high performing districts. More mathematically knowledgeable teachers produce more mathematically knowledgeable students.

Hill, H. C., Rowan, B., & Ball, D. L. (2005).	115 elementary schools during the 2000–2001 through 2003–2004 school years.	***American Educational Research Journal***	Teachers' mathematical knowledge is significantly related to student achievement gains in both first and third graders.
Kukla-Acevedo, S. (2009).	Data from 3812 students, 46 schools, and 120 teachers. compiled by the Kentucky Education Profession Standards Board	***Economics of Education Review***	Teacher GPA consistently, positively impacts students' math achievement even when controlling for student group.
Monk, D. H. (1994).	Data from the Longitudinal Study of American Youth of 2,829 students who were enrolled in 10th grade in fall 1987; 608 mathematics teachers and 483 science teachers	***Economics of Education Review***	There exists a correlation between a teacher's level of undergraduate mathematics preparation and students' mathematics performance. However more than four mathematics courses has little effect on student achievement. Having a major in mathematics has no impact on student mathematics achievement. There exists a correlation between a teacher's undergraduate physical science preparation and students' science performance. Advanced teacher training (such as a PhD) is not correlated to student achievement for science and mathematics
Rowan, B., Chiang, F.-S., & Miller, R. J. (1997).	A sample of 5,381 students in 410 schools from the National Education Longitudinal Study of 1988 (NELS:88)	***Sociology of Education***	A teacher's level of content knowledge has a positive significant effect on students' achievement. Students taught by a teacher with a mathematics background have higher academic gains than those without a mathematics background.

Sub question 2: *How does a teacher's level of **pedagogical content knowledge** affect student achievement?*

Boe, E., Shin, S., & Cook, L. (2007).	Data on 10,952 teachers in their first 5 years of teaching employment from the Public School Teacher Questionnaire (PSTQ)—a component of SASS (1999/2000), conducted by the National Center for Education Statistics (NCES).	***The Journal of Special Education***	Teachers with extensive pedagogical preparation (measured by both amount of field experience and number of education courses) are more effective at increasing student achievement than those who have little or no pedagogical preparation.
Buddin, R., & Zamarro, G. (2009)	730,000 students from Los Angeles Unified School District (LAUSD) in grades 2 through 5 for five consecutive school years from 2000 to 2004.	***Journal of Urban Economics***	Teacher licensure tests have little effect on student achievement. Student achievement is unaffected by whether classroom teachers have advanced degrees. Student achievement is not influenced by a teacher's knowledge of basic skills.
Carpenter, T. P., Fennema, E., Peterson, P. L., Chiang, C.-P., & Loef, M. (1989).	41 first-grade teachers from Madison, Wisconsin and the surrounding communities	***American Educational Research Journal***	Students of teachers with greater knowledge of problem-solving and the relationship between skills and problem solving, have increased levels of achievement in mathematics as compared to those whose teachers have less knowledge.
Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007).	Data from North Carolina Education Research Data Center on students grades 3-8.	***Economics of Education Review***	The effect of a Ph.D. on student achievement is statistically insignificant. Teacher certification has a positive impact on elementary students' math scores, even more so than reading. Teacher certification is more significantly correlated to student achievement than class size or student socio-economic status

Croninger, R. G., Rice, J. K., Rathbun, A., & Nishio, M. (2007).	23,000 kindergartners attending nearly 1,300 public and private schools were considered using data collected by the Early Childhood Longitudinal Study (ECLS)	***Economics of Education Review***	There is no correlation between student achievement and teacher certification, but increased academic achievement in reading and math is found when teachers take part in high-quality education courses that places specific emphasis on these subject areas.
Curran Neild, R., Nash Farley- Ripple, E., & Byrnes, V. (2009).	An independently collected sample of 22,853 middle school math students and 539 middle school math teachers as well as 21,980 science students and 495 science teachers.	***Educational Policy***	In mathematics, students with teachers who have math certification outscore those with uncertified teachers or those who are certified in special education. Students with teachers who have certification in secondary science, out perform those with no certification or certification in special education. Teacher possession of advanced degrees is negatively related to student achievement in mathematics.
Darling-Hammond, L., Berry, B., & Thoreson, A. (2001)	National Education Longitudinal Study of 1988 (NELS:88)	***Educational Evaluation and Policy Analysis***	Teachers with more training in the field of education have increased levels of student achievement. Teachers with emergency or temporary certification have credentials similar to those with traditional certification.
Early, D. M., Bryant, D. M., Pianta, R. C., Clifford, R. M., Burchinal, M. R., Ritchie, S., Howes, C. & Barbarin, O. (2006).	Over 800 children in 237 pre-kindergarten classrooms as compiled by the National Center for Early Development and Learning's (NCEDL) Multi-State Study of Pre-Kindergarten	***Early Childhood Research Quarterly***	In classrooms where the teacher has a Bachelor's degree, students gain significantly more math knowledge than in classrooms where the teacher has only an Associate's or no post-secondary degree. When comparing only Bachelors and Associate's degrees, children whose teacher had a Bachelor's or higher gained more mathematical knowledge than children whose teacher had an Associate's degree.

Goldhaber, D. D., & Brewer, D. J. (2000).	National Educational Longitudinal Survey 1988 3,786 students in mathematics 2,524 students in science 2,098 mathematics teachers 1,371 science teachers	***Educational Evaluation and Policy Analysis***	Mathematics students with teachers who hold standard certification perform better than students with teachers who hold probationary or emergency certification or who are not certified. In both mathematics and science, students with teachers who have a Ph.D. or similar advanced degrees are not found to have higher test scores than students of teachers without an advanced degree.
Guyton, E., & Farokhi, E. (1987).	413 Graduates from Georgia State University between 1981 and 1984 with statewide Teacher Certification Test scores	***Journal of Teacher Education***	The quality of teacher education course preparation is a stronger predictor of student success than the quality of general knowledge preparation.
Kukla-Acevedo, S. (2009).	Data from 3,812 students, 46 schools, and 120 teachers. compiled by the Kentucky Education Profession Standards Board	***Economics of Education Review***	Teacher academic GPA consistently, positively impacts students' math achievement even when controlling for student group.
Monk, D. H. (1994).	Data from the Longitudinal Study of American Youth of 2,829 students who were enrolled in 10th grade in fall 1987; 608 mathematics teachers and 483 science teachers	***Economics of Education Review***	There exists a correlation between a teacher's level of undergraduate mathematics preparation and students' mathematics performance. However more than four mathematics courses has little effect on student achievement. Having a major in mathematics has no impact on student mathematics achievement. There exists a correlation between a teacher's undergraduate physical science preparation and students' science performance. Advanced teacher training (such as a Ph.D.) is not correlated to student achievement for science and mathematics

Part II: What dispositions and competencies do preservice teachers need to possess and display to improve K-12 student achievement?

Sub-question 3: *How do a teacher's **self-awareness** dispositions affect student achievement?*

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Caprara, G.V., Barbaranelli, C., Steca, P., & Malone, P.S. (2006).	2,184 teachers from 75 schools in Italy and their students	***Journal of School Psychology***	Teachers' perceived self-efficacy was a significant predictor of students' academic achievement, $t = 3.12$, The percentage of explained variance for students' academic achievement was 48%.
Goddard, R., Hoy, W. K., & Hoy A.W. (2000).	46 elementary school teachers, from 46 different schools and 5 states	***American Educational Research Journal***	Collective teacher efficacy was a significant predictor of student achievement in both mathematics and reading achievement. Collective teacher efficacy explained 53.27% and 69.64% of the between-school variance in mathematics and reading, respectively The effect of collective teacher efficacy is greater than other demographic controls for achievement variables. The negative association between SES and achievement is more than offset by the positive association between collective teacher efficacy and student achievement.
Ross, J.A. (1992).	18 grade 7 and 8 history teachers in 36 classes with the help of 6 coaches in Ontario, Canada	***Canadian Journal of Education***	Significant predictors of student achievement were self reported use of a coach and personal teaching efficacy. There was more student growth in the classes of teachers who reported greater use of their coach and in the classes of teachers who had stronger beliefs in their personal efficacy.

Ross, J. A., Hogaboam-Gray, A. & Hannay, L. (2001).	387 students aged 6-9	***Elementary School Journal***	Teacher efficacy variables explained 7 to 9% of the student outcome variance as students moved to a new grade with varying teacher efficacy levels. Students who moved from a teacher with low computer confidence to a teacher with high confidence benefited more from an infusion of technology than those who moved from a high- to a low-confidence teacher.
Shidler, L. (2009).	12 Elementary Head Start classrooms in central Florida	***Early Childhood Education Journal***	A significant correlation was found between time spent in the classroom working on teacher's instructional efficacy in specific content and students' alphabet recognition scores during the first year of this program. These results could not be duplicated in years 2 and 3 of this study.

Sub-question 4: *How do a teacher's* ***self-management*** *dispositions affect student achievement?*

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Hoy, W.K., Tarter, C. J., Woolfolk Hoy, A. (2006).	A random sample of teachers from 96 high schools (comprising both Grades 9-12 and 10-12) located in a midwestern state	***American Educational Research Journal***	Academic emphasis, faculty trust, and collective efficacy form a general latent construct called academic optimism In mathematics and science, academic optimism was directly related to student academic achievement ($p = 0.21$). In reading, writing and Social Studies, academic optimism was directly related to student academic achievement ($p = 0.27$).
Smith, P.A., & Hoy, W. H. (2007).	99 urban elementary schools in Texas with school size ranging from 289 to 1,251 students with an average size of 682	***Journal of Educational Administration***	Academic emphasis, faculty trust, and collective efficacy form a general construct, called academic optimism that significantly impacts student achievement. Academic optimism had a positive impact on mathematics achievement (beta = 0.34, $p <$ 0.01) even controlling for SES and school size. In this sample of elementary schools, academic optimism had the same beta weight as SES (beta = -0.34, $p <$ 0.01).

Sub-question 5: *How do a teacher's **social awareness** dispositions affect student achievement?*

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Kushman, J. W. (1992).	An independent sample of students in 63 urban elementary and middle schools	***Educational Administration Quarterly***	There is no correlation between professional commitment and student achievement but there is a very strong positive correlation between professional commitment and teacher job satisfaction. At the elementary and middle-school levels there is a strong positive correlation between organizational commitment and student achievement.
Park, I. (2005).	Data from 2,738 12th-grade students in 281 schools nationwide as compiled in National Educational Longitudinal Survey of 1988	***Educational Research and Evaluation***	There is a positive correlation between professional commitment and student achievement as well as organizational commitment and student achievement at 12th-grade level. There is no correlation between student achievement and teacher commitment at the organizational level.
Ross, J. A., & Gray, P. (2006).	An independent sample of 3,041 teachers and their students in 205 schools in Ontario	***Canadian Journal of Education***	There exists a strong positive correlation between organizational commitment and student achievement. When desegregated this relationship is due to strong teacher-parent, teacher-student, teacher-administration and school-community relationships and can be promoted through transformational leadership practices.

Sub-question 6: *How do a teacher's **relationship management** dispositions affect student achievement?*

a.) The effect of developing students' self-efficacy on student achievement

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Alvidrez, J., & Weinstein, R. S. (1999).	110 four year olds (53 boys and 57 girls)	***Journal of Educational Psychology***	Teacher ratings of intelligence were moderately correlated with concurrent IQ scores at ages 4 *(r* = 0.56) and age 11 (*r* = 0.46). The correlation between teacher ratings of intelligence at age 4 and those at age 11 was 0.30. After controlling for initial differences in IQ and socioeconomic background, the, more positive teacher discrepancies in judgment predicted more positive student performance in high school.
Benner, A. D., & Mistry, R.S. (2007).	522 low-income urban youths ages 9-16 from 370 families	***Journal of Educational Psychology***	Higher teacher educational expectations for youth were positively related to higher scores on the Woodcock–Johnson. Higher teacher expectations also predicted higher youth educational expectations and competency beliefs related to reading and mathematics.
Kuklinski, M. R; Weinstein, R.S (2001).	376 first- through fifth-graders in urban elementary schools and their 48 teachers	***Child Development***	Findings provided strong support that classroom environment and grade level differences moderated the strength of direct and indirect teacher expectancy effects. The strongest direct effect on teacher expectation and student achievement was in grade 1, with teacher expectation accounting for 9 to 12% of the variance in student achievement. Links were also found in increased teacher expectations with increases in student self-expectations.

McKown, C. & Weinstein, R.S. (2008).	1,872 elementary-aged children in 83 class-rooms	***Journal of School Psychology***	In high-bias classrooms, teacher expectancy effects accounted for an average of 0.29 and up to 0.38 standard deviations of the year-end ethnic achievement gap. Discrepancies in teacher expectations of children from stereotyped and non-stereotyped ethnic groups reflect differences of 0.93 and 1.00 standard deviations in reading and math, respectively.
Trouilloud, D.O., Sarrazin, P. G., Martinek, T. J.; Guillet, E. (2002).	173 students (93 boys and girls) from 8th to 11th grade in 6 French junior high schools and 7 teachers with experience ranging from 7 to 30 years	***European Journal of Social Psychology***	There is a significant link (in terms of zero-order correlation) between teacher expectations and student achievement. Teacher expectations are significantly correlated with final standardized test score ($r = 0.79$, $p < 0.001$) and with final marks ($r = 0.65$, $p < 0.001$). However, zero-order correlations do not prove causation. It could be that teachers who have accurate assessments of their students' abilities create expectations as such.

b.) The effects of developing teacher-student relationships on student achievement

Author(s)/ Year of Publication	Data Sample	Publication	Summary of Findings
Goodenow, C. (1993).	353 students in grades 6-8 enrolled in an English course	***Journal of Early Adolescence***	Middle-school student achievement in English is related to a student's sense of belonging as determined by the perceived strength of their relationship with the teacher. Teacher relationships are more closely related to female student motivation than male student motivation. Teacher expectations play a significant role in classroom effort and student achievement.

Hamre, B. K., & Pianta, R. C. (2001).	An independent sample of 179 children tracked from kindergarten through eighth grade	***Child Development***	Poor teacher-student relationships (as perceived by the teacher) in early elementary grades are statistically related to poor academic achievement in grades 1 through 8. Correlations remained strong even after controlling for gender, ethnicity, cognitive ability, and behavior ratings.
Hughes, J., & Kwok, O. (2007).	443 first-grade students in Texas	***Journal of Educational Psychology***	There is a positive correlation between a strong teacher-student relationship and a student's academic achievement. Academic achievement was not limited to only a child's current grade but future academic achievement as well. There is a positive correlation between a strong parent-teacher relationship and a student's academic achievement. Like teacher-student relationships, academic achievement was not limited to only a child's current grade but future academic achievement.
Liew J., Chen Q., & Hughes J.N. (2010).	761 academically at-risk first-grade students in Texas	***Early Childhood Research Quarterly***	Positive teacher-student relationships are statistically correlated with student achievement. The influence of positive teacher-student relationships on future achievement is most pronounced on tasks that require fine motor skills, accuracy, and attention-related skills.
Murray, C., & Malmgren, K. (2005).	An independent sample of 48 students in grades 9 through 12 identified by their teachers as having significant behavioral or emotional problems	***Journal of School Psychology***	The introduction of a positive teacher-student relationship increases student overall GPA even for students at who have a history of emotional and behavioral problems.

O'Connor, E., & McCartney, K. (2007).	1,364 children from birth through sixth grade from data compiled by the National Institute of Child Health and Human Development Study of Early Care and Education	***American Educational Research Journal***	There is a positive association between quality of teacher-child relationships and achievement in the elementary and middle grades.
Pianta, R. C., & Stuhlman, M. W. (2004).	An independent sample of 490 first grade students	***School Psychology Review***	The quality of a teacher-child relationship plays a significant role in a child's ability to achieve academic success in first grade. A high quality teacher-child relationship also helps students acquire the skills necessary for future success in school.
Voelkl, K. E. (1995).	An independent sample of 13,121 eighth-graders	***Journal of Experimental Education***	The degree of teacher warmth, caring, and supportiveness (as perceived by the student) are positively correlated with increased levels of student participation in class and academic achievement.

Note: Though there were 41 distinct studies included in this report. This table includes 46 summaries due to the duplication of five studies (Buddin & Zamarro, 2009; Darling-Hammond et al., 2001; Goldhaber & Brewer, 2000; Kukla-Acevedo, 2009; Monk, 1994), which had multiple noteworthy findings.

Appendix B: Inquiry Brief

After reviewing a substantial pool of research on teacher education, this appendix is meant to serve as a summary of the evidence gathered about this paper's guiding questions. While our review was by no means an exhaustive look at all studies available, in this section we attempt to provide an accessible synthesis of our investigation.

Part I: What knowledge and skills do preservice teachers need to have to improve K-12 student achievement?

1.) How does a teacher's level of specific content knowledge affect student achievement?

According to the sample of research we reviewed, teacher knowledge of subject matter does play a role in student achievement. The impact was most significant in mathematics but was also observed in reading and overall academic standing. Results were slightly less conclusive in other subject areas such as history where a teacher's increased level of understanding did not influence student achievement. Interestingly, the studies we found indicate that more is not always better when it comes to content knowledge as advanced content specific degrees (such as a Ph.D.) have little impact on student achievement.

2.) How does a teacher's level of pedagogical content knowledge affect student achievement?

(a) The effect of teacher certification on student performance

Though multiple studies on the effects of teacher certification were reviewed, we found inconclusive evidence that having certification positively influences student academic achievement. We believe this indecisiveness may be due to differences in statewide certification processes, requirements of different teacher education programs, and testing requirements. In our research we found content and pedagogical content knowledge were essential; therefore, we believe our inconclusive findings indicate that certification alone is not a sufficient measure of teacher preparation.

(b) The effect of value-added education courses on student achievement

Our research indicates value-added education courses have a significant impact on student achievement. We found it did not matter whether measured by number of education credits accrued, grades in education courses, or number of education classes taken, each are correlated with student achievement. This finding (paired with the first regarding content knowledge) seems to suggest that additional education courses have a greater impact on student achievement than additional discipline-specific courses.

Part II: What dispositions and competencies do preservice teachers need to possess and display to improve K-12 student achievement?

3.) How do a teacher's self-awareness dispositions affect student achievement?

All of the research reviewed for this study suggests that teachers' self-awareness dispositions, which we pinpointed to be sense of self-efficacy, has a strong positive impact on student achievement. As is consistent with classical Bandura research, we found that when teachers display a high level of self-efficacy, the effect on student achievement can overshadow other potentially negative factors such as SES. High teacher self-efficacy also can be attributed to increased student motivation, classroom management, and teachers' job satisfaction.

4.) How do a teacher's self-management dispositions affect student achievement?

A review of the research on a teacher's self-management skills lead to the discovery of academic optimism—a relatively new concept used to describe teachers who steadfastly possess positive beliefs about themselves, their students, students' parents, and curricular instruction. Although the research on this topic is limited, since it only dates back to 2006, preliminary studies suggest teachers' academic optimism is correlated with student achievement.

5.) How do a teacher's social awareness dispositions affect student achievement?

In considering the relationship between teachers' social awareness dispositions and student achievement, we found a more significant correlation between teachers' organizational commitment and student achievement than teachers' professional commitment and student achievement. It was suggested that increased academic achievement is due in part to the fact that teachers who exhibit organizational and professional commitment have increased levels of job satisfaction, more dedication to their occupation, and stronger relationships with other members of the school community.

6.) How do a teacher's relationship management dispositions affect student achievement?

(a) The effect of developing students' self-efficacy on student achievement

Research into the topic of student self-efficacy brought forth a plethora of research noting both a correlative relationship and a causal relationship between teacher beliefs in students' abilities and student performance. In one interesting longitudinal study, researchers found the more teachers overestimated students' abilities in kindergarten, the higher their overall high school performance would be 12 years later, thereby successfully attributing teacher beliefs and expectations to such performance results. All of the research on this topic pointed to the idea that teacher expectations early in the year have a direct and lasting effect in predicting student-perceived ability, noting the importance of developing and maintaining high expectations for students.

(b) The effect of developing teacher-student relationships on student achievement

All of the research we reviewed in this piece indicates there is a definitive correlation between the quality of a student-positive relationship with a teacher and his or her overall academic achievement. Especially with at-risk populations (i.e., those living in poverty, students with emotional and/or behavioral problems, and those with a history of failure), the presence of a sustained, healthy teacher-student relationship was a consistent factor in academic success. These findings seem to suggest teachers' with strong relationship management dispositions positively impact student achievement.

What Does the Research Indicate About the Effectiveness of Varied Pathways to Teacher Education?

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Introduction

Questions about the effectiveness of alternative routes to teaching and teacher certification go back at least to the development of the New Jersey Provisional Teacher Program in 1985 (Fiestritzer, 2009). The New Jersey program and the many that have followed intend to address teacher shortages—the overall shortage, the shortage of teachers in subjects like math and science, a shortage of minority teachers, and the shortage of teachers in low-income, high-needs schools.

Twenty-five years after the New Jersey program started, alternative routes to teacher certification have spread to all 50 states and include some 600 program providers that, nationwide, prepare roughly 620,000 new teachers yearly. In New Jersey 40% and in California and Texas one-third of the new teachers are prepared in alternative programs (Feistritzer, 2009)[1] .

Since 2001 the growth of alternative programs has been stimulated by the availability of Title II funds from No Child Left Behind (NCLB) "to encourage the development and expansion of alternative routes to certification under State-approved programs…" (PL 107-110, 20 USC 6681). More recently, the Federal program "Race to the Top" appears to have encouraged, for example, the New York State Board of Regents to consider expanding alternative routes to teacher certification to qualify for Federal funds (*New York Times,* 11/16/09; November 10 memorandum to The Joint Committee on Higher Education and EMSC).

There is little uniformity among these many routes and programs. There are large, highly selective programs like Teach for America, small district-specific programs like Battle Creek, Michigan. There are programs in Boston and Chicago that require a year-long residency (Berry, 2008) and programs like Hillsborough County, Florida that "provides little training and relies on performance assessment to identify unacceptable teachers" (Birkeland, 2003, p. 5). Some alternative programs are called early entry; others are referred to as alternative certification; and still others are called alternative route or alternative pathway programs.

Despite the variety of routes and programs, the following broad description applies to most programs. "Typically, alternative certification programs[2] provide abbreviated preservice training, rapid entry to paid teaching positions, and some form of mentoring during the first year of teaching" (Hawley, 1990, in Birkeland, 2003, p. 1).

Alternative routes to teacher certification, like other departures from established practice, have aroused opposition and advocacy. Dating at least to 1994, Linda Darling-Hammond has vigorously advocated for traditional college- and university-based preparation programs requiring extensive course work and practice teaching before becoming the teacher of record (Darling-Hammond, 1994, 1997, 2000, 2008).

On the other hand, supporters of alternative approaches (Thomas B. Fordham Foundation, 1999; Hess, 2001; Kopp, 2001; Nadler & Peterson, 2009) favor strong selectivity and early classroom responsibility. The underlying premise is that mentored teaching is the best way to learn the craft—with the added benefit of getting paid a teacher's salary at the start of the academic program. In addition, the alternative routes to certification are said to attract minority candidates, candidates with a science and math background, and mature candidates who may be less likely to leave the profession (Grossman & Loeb, 2008).

In 2009 one aspect of the differences between the two approaches to teacher preparation ended up in a California court. In Renee *v.* Spellings[3] (2007) the plaintiffs challenged the use of the term "highly qualified" to apply to novice teachers who had the limited course work and practice teaching typical of many alternative programs. Based on a detailed examination of the No Child Left Behind (NCLB) legislation and regulations, the court determined that teachers with non-traditional preparation could be labeled highly qualified.

Alternatively prepared teachers may all be highly qualified for purposes of NCLB, but not all alternative programs are the same. For example, an analysis by Nadler and Peterson (2009) emphasized one type of difference among such programs. The authors identified two distinct types of state-sponsored alternative programs: symbolic and genuine. Alternative programs were deemed by the authors to be merely symbolic when they resembled traditional programs by requiring completion of 30 academic credits before a candidate could be certified to teach. Of the 21 states considered by the authors to have genuine programs, seven required only that a candidate pass a test before beginning teaching. Fourteen other genuine programs "required course work but considerably less than 30 credits" (p. 3).

Finally, Walsh and Jacobs (2007), reflecting the views of the Thomas B. Fordham Institute and the National Council on Teacher Quality, pursued a somewhat similar line of thinking. They surveyed 49 randomly selected AC[4] program directors and concluded there are only a few alternative programs: Teach for America and the New York City Teaching Fellows. They argued that state-approved programs, run for the most part by schools of education, fail to meet their criteria for alternative programs because they have low admissions requirements, they require too much course work during the first year of teaching, and they provide limited mentoring.

Before turning to studies of alternative programs, it may be helpful to compare four frequently referenced programs: Teach For America (TFA), New York City Teaching Fellows (NYCTF), New Jersey Pathways to Teaching, and Urban Teacher Residency—Boston. See Table 1.

Review

This review concentrates on research since 2000 as this period has seen rapid growth in alternate programs and in the research examining program and teacher effectiveness.

Table 1 Four Frequently Referenced Alternative Programs

Program	Selection	Preparation to Teach	Mentors	Placement	Scope	Subjects
Teach for America (TFA)	Selected by TFA	5 Weeks in Summer	Districts Provide	TFA & High-Needs Districts	National 1	Math, Science, English Language Learners (ELL)
NYC Teaching Fellows	Selected by NYCDOE	7 Weeks in Summer Districts Provide	Districts Provide	NYCDOE & High-Needs Districts	NYC High Needs	Math Science ELL
NJ Pathways to Teaching	NJDOE &Districts	24-Hour course & Certificate of Eligibility	Mentored 34 Weeks Districts	Districts	NJ	All Subjects
Urban Teacher Residency-Boston	UTR & Districts	One Year Mentored Residency	Trained & Paid	UTR & Districts	Boston	Math Science

A 2001 review (Wilson, Floden, & Ferrini-Mundy, 2001) highlighted several topics that are part of the ongoing search for critical elements in the preparation of effective teachers. Are there program elements like content courses or pedagogical courses that can be shown by their presence, absence, or type to influence program and teacher effectiveness? The authors reviewed 300 studies, selected 57 that met their specifications, and concluded with a review of 14 studies of alternate pathways.

Wilson and colleagues (2001) examined research on subject-matter preparation, pedagogical preparation, and student teaching and found all three program components had some research showing their importance in the preparation of effective teachers. The authors concluded, however, that none of the evidence was conclusive. Even widely held views about student teaching lacked empirical validation.

These are not groundbreaking conclusions, but they do identify some themes and questions that populate the research on alternate pathways. On the subject of the current review—the effectiveness of varied pathway to teacher certification—Wilson and colleagues' (2001) review reached several conclusions that have been revisited in subsequent studies.

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> Studies of alternatively certified (AC) teachers and traditionally certified (TC) teachers come to conflicting or "no difference" conclusions regarding impact on high school achievement (Goldhaber & Brewer, 2000[5]; Xu, Hannaway, & Taylor, 2007), ratings by supervisors (Lutz & Hutton, 1989), and student achievement and teaching behavior (Miller, McKenna, & McKenna, 1998)[6]
>
> Initial differences in teacher effectiveness and self-confidence among the two groups of teachers appear to wash out by the end of the first school year (Huston, Marshall, & McDavid, 1993; Miller et al., 1998; Sandlin, Young, & Karge, 1992).
>
> AC programs tend to have a larger percentage of minority candidates than do TC programs (Gyton, Fox, & Sisk, 1991; Huston, Marshall, & McDavid, 1993; Lutz & Hutton, 1989; Shen, 1998).
>
> One study previews subsequent research on teacher placement practices in a number of AC programs: teachers from a small New Hampshire AC program began teaching with little or no academic or pedagogical training. In principal ratings and 26 other measures, the TC teachers were rated higher than their AC counterparts.

Rather than studying a broad array of AC and TC programs, Raymond and colleagues (2001) focused on a single AC program—the 117 Teach for America teachers teaching in grades 3 through 8 in the Houston, Texas, Independent School District from 1996 to 2000. As this was a retrospective study, there was no opportunity to achieve random assignment of students or teachers. Indeed the study demonstrated that the TFA teachers were non-randomly assigned to more difficult, harder-to-staff classrooms than their non-TFA counterparts.

Lacking the opportunity to randomly assign either teachers or students, Raymond and colleagues (2001) used ten alternative statistical models that included students' prior test scores, demographic background, and TFA or non-TFA teacher status. The authors concluded

> In all the models we tested, even those with diluted TFA involvement due to students having several teachers in a subject, the average impact of having a TFA teacher was always positive.... The results look strongest in Mathematics where strong compara tive results were obtained in both elementary and middle school. Results in Reading were also positive, but the magnitudes of impact were smaller (p. 33).

In comparisons between TFA teachers and non-TFA newly hired teachers and between TFA teachers and all Houston teachers, students of TFA teachers were found to perform as well as or better than students of non-TFA teachers. Raymond also compared the best and worst TFA teachers to the best and worst non-TFA teachers. The comparison showed a greater spread among non-TFA teachers' results. Raymond interpreted this outcome to mean that TFA teachers were, on the whole, more likely to produce positive student outcomes. The analysis of most and least effective teachers recurred in Kane and colleagues' work (2006) with different implications.

Two things are important to note concerning Raymond and colleagues' conclusions. First, the number of TFA teachers was small (slightly more than 4%) compared to all

novice teachers or to the entire teacher population of the Houston district. Second, the study acknowledged that the comparison groups (non-TFA) contained a large number of non-certified teachers and teachers without a bachelor's degree. Thus, the TFA teachers were compared to a nonequivalent group. This problem of equivalent comparison groups figures in a number of other evaluations of TFA. (See, for example, Boyd, Grossman, Lankford, Loeb, & Wykoff, 2006; Kane et al., 2006; and Wilson et al., 2001.)

The modestly positive results of this, the first large-scale study of TFA, came on the ten-year anniversary of TFA, and might have been cause for celebration in the TFA camp. However, the Preface by Wendy Kopp, TFA founder and chief executive office, and the Forward by Chester Finn of the Fordham Foundation adopted a celebratory, almost combative, tone that—in the view of this reviewer—compromises the findings (2010).

Darling-Hammond, Holtzman, Gatlin, and Heilig (2005) used the same data and found mixed effects of TFA teachers on student test score gains, with students of TFA teachers performing relatively better in tests of mathematics than English language arts.

A similar conclusion resulted from a study by Decker, Mayer, and Glazerman (2004). The authors were able to compare teachers within the same grade and school in an experimental format that randomly assigned teachers to students. Using a sample of 17 schools from Baltimore, Chicago, Los Angeles, Houston, New Orleans, and the Mississippi Delta, the authors found TFA teachers were more effective at improving student math scores than were other teachers, though there were no statistically significant differences in reading scores. See Table 2.

Several observations emerge from the studies noted in Table 2. With the exception of Xu and colleagues (2007), they concentrated on grades 3 through 8, in Houston, New York City, Arizona, and North Carolina. Several used random assignment of students; others used regression techniques to compare groups of students. The number of teachers studied varied from 44 (Decker et al., 2004) to 445 (Kane et al., 2006) to a much larger (though unspecified) number of New York City teachers (Boyd et al., 2009). Studies that included middle-school grades used a variety of statistical techniques to match students and teachers since middle-school students typically had different teachers for different subjects. All studies except Darling-Hammond and colleagues (2005)[7] and Laczko-Kerr and Berliner (2002) found traditional certification was not a predictor of level of student learning achievement. Kane and colleagues in particular considered alternative variables and concluded "neither certification status nor easily observable academic traits such as college selectivity and undergraduate GPA seem to be associated with teacher effectiveness" (p. 24). This conclusion echoed that of the Mathematica study (ABCTE, 2009).

Kane and colleagues (2006) also noted the importance of experience in years two and three of a beginning teacher' career—especially among alternatively certified teachers. Finding a large difference in effectiveness within all groups of AC and TC teachers prompted him to observe: "The large observable differences in teacher effectiveness *ex post* suggests that districts should use performance on the job, rather than initial certification to improve average teacher effectiveness" (p. 42). Clearly, implementation of this practice would have significant implications for collective bargaining, tenure decisions, and teacher recruitment.

Considering Teach for America in particular, the studies in Table 2—with the exception of Laczko-Kerr and Berliner (2002) and Darling-Hammond and colleagues (2005)—found TFA teachers achieved student results in math that were slightly better

Table 2 Comparison of Studies of Alternate Routes and Student Achievement

Study	Authors	Date	Subjects	Conclusion
Teach for America: An Evaluation of Teacher	Raymond, Fletcher, & Luque	2001	117 TFA teachers in grades 3-8 in relation to their non-TFA Houston colleagues	TFA teachers slightly more effective than non-TFA new hires and other Houston teachers
The Effectiveness of Teach for America...	Laczko-Kerr & Berliner	2002	109 pairs of 3-8 teachers in 5 Arizona districts	The TFA program appears to be a failure.
The Effects of TFA on Students—National Evaluation	Decker, Mayer, & Glazerman (See Hibpersham [2004] for a critique of Decker)	2004	17 schools; 100 teachers (44 TFA teachers); 2,000 students. Random assignment of students. *Iowa Test of Basic Skills*.	TFA teachers more effective in math; equal in reading; same across gender, race, and school.
Does Teacher Preparation Matter?	Darling-Hammond, Holtzman, Gatlin, & Heilig	2005	Houston grades 3-5; three tests. Students not random.	TFA teachers not as effective as certified teachers.
Teacher Preparation and Student Achievement	Boyd, Grossman, Lankford, Loeb, & Wykoff	2009	NYC—effectiveness of teachers from different programs.	Program variables relate to teacher effectiveness.
What Does Certification Tell Us?	Kane, Rokoff, & Staiger	2006	NYC—445 TFA, NYCTFP, etc. 1999-2004.	Experience, not certification, GPA or college selectivity are key variables.
Making a Difference	Xu, Hannaway, & Taylor	2007	Carolina high school students; 23 LEA's; Not randomized.	TFA more effective in math and science, more than experienced teachers.

than those achieved by certified or other novice teachers. In reading, TFA teachers were on a par with other teachers.

The studies in Table 2 and others (Darling-Hammond, 2001) also documented the consistent assignment of TFA (and NYC Teaching Fellows) to the lowest achieving classes in hard-to-staff schools. Thus, studies that pair a TFA teacher with a teacher from the same school and grade will compare high-performing graduates of selective colleges with teachers having generally more modest credentials (Xu et al., 2007).

Linda Darling-Hammond (2001) also noted this situation in her detailed and vigorous rebuttal of a 2001 paper by Kate Walsh (2001), which challenged the value of traditional teacher certification. Significantly, Darling-Hammond also called attention to the variations among teachers classified as AC. In some instances these teachers may have been temporary or teaching out of license. In addition, some AC teachers may have come from programs that closely resemble a traditional program in length of prior classroom experience and academic course work; while others may have come from programs that require minimal preparation for teaching.

Darling-Hammond (2001) made an important summary observation that applied to all research involving teachers from several alternative programs: *"To understand the outcomes of different approaches, studies of alternatives need to acknowledge the differences in program models"* (p.14). Emphasis added.

One study of alternate routes to teacher certification did point to differences between programs, questioning generalizations about alternate routes. Grossman and Loeb (2008) analyzed seven alternative programs, including Teach for America, the New York City Teaching Fellows Program, and the New Jersey Provisional Teacher Program. The authors underlined the variations among the programs, concluding, "The one characteristic common to all programs is that they are considered to be alternative, rather than traditional teacher preparation programs" (p. 69). The authors' point about program differences was illustrated by the different lengths of preservice preparation. Teacher candidates in New Jersey can begin full-time teaching with as little as two weeks of preservice work. On the other hand, the Teacher Education Institute of Elk Grove, Illinois requires a year of course work and field experience before participants assume full responsibility for a classroom.

The same observation about program-to-program variation applies to other program elements: preservice course work and clinical preparation, on-the-job training, and mentoring, In particular, mentoring varies in quality, content, and amount. Some programs rely on volunteers; whereas others train their mentors and still others supply a curriculum and pay the mentors.[8]

Besides acknowledging program differences, studies that compare academic achievement for groups of high school students taught by TC and AC teachers need to account for the possible effects of student attrition. Decker and colleagues (2004), for example, reported a 9% attrition rate over the year studied. However, the study did not address the possibility that the students who left could have affected the post test results.

The first TFA study of high-school teachers and students (Xu et al., 2007) compared the student learning outcomes for two groups of students, one taught by TFA teachers and the other taught by traditionally certified teachers. The study, involving 23 LEA's in North Carolina, covered the 2000-01 to 2006-07 school years. Since random assignment of teachers or students was not possible, the study useed a fixed-effects model to approximate random assignment and minimize the possibility of bias based on the

assignment of more- or less-capable students to TFA or non-TFA classes. Different from earlier studies (Decker et al., 2004; Kane et al., 2006; Raymond et al., 2001), Xu and colleagues' study incorporated end-of-course examination results over time as a substitute for pre-post examination data. The analysis of these data came to three conclusions:

1. TFA teachers came from more-competitive colleges, had slightly higher Praxis scores, were more likely to be licensed in the subject they were teaching than their non-TFA colleagues, and were teaching more academically challenged classes. These were descriptive data, not part of the analysis of end-of-class scores.

2. Students taught by TFA teachers generally outperformed the students of novice and experienced non-TFA teachers. This result held across all levels of prior performance, though the TFA effect was stronger at the higher levels of student prior performance and stronger in the sciences.

3. The study concluded, "In short, the TFA effect remains mostly consistent no matter what our comparison group is. TFA teachers have a particularly strong positive effect on student science test scores. In all cases, the TFA effect is several times larger than the effect of teacher experience" (p. 23). This finding contrasted sharply with Kane's (2006) conclusion regarding the primacy of experience as a predictor of teacher effectiveness.

Continuing to explore the topics reviewed in the studies noted, a large-scale study by Mathematica Policy Research for the U.S. Department of Education (2009) addressed the issue of program effectiveness by again testing the effect of teachers from AC and TC programs on student achievement. The study began by noting, "Despite the expansion of...new routes into teaching, there exists little research to provide guidance as to the effectiveness of different teacher training strategies" (Executive Summary).

The research sought answers to two questions. First, what are the effects on student learning of teachers trained by AC and TC programs, and how do their teaching practices vary? Second, what aspects of preparation programs are associated with teacher effectiveness?[9]

Concentrating on 20 school districts and 63 schools in 11 states, the study randomly selected 87 traditionally prepared teachers (TC) and 87 alternatively prepared teachers (AC). These two groups were divided into teachers from programs with large amounts of course work and those from programs with much less course work, creating four groups: teachers from traditional programs with high and low course work and teachers from alternative programs with high and low course work requirements. The purpose of this division into high and low course work groups was to examine the influence of several types of teacher preparation course work on student achievement.

Relative to earlier work, these four groups provided a detailed picture of the variations among AC programs and between AC and TC programs. Differences included

1. Candidates in high course work programs (both AC and TC) had significantly higher SAT scores than their low course work counterparts.

2. Low course work AC candidates were much more likely to report having children, holding a Master's degree, and taking courses while teaching.

3. All AC candidates from California were from high course work programs. Students taught by teachers from these programs scored lower in math than students from TC programs.

4. Nine teachers in the study (seven from New Jersey) were not required to complete any course work before starting full-time teaching.

The study included only programs with less selective (below 3.0) admissions criteria—no selective programs like TFA, NYC Teaching Fellows, or the Boston Urban Residency Program. The 87 AC and 87 TC teachers were paired by grade (K through 5) in the same school. These pairs formed 87 mini-experiments. Students were randomly assigned to either a TC or an AC class, thus eliminating potential bias from clustering capable and not-so-capable students. Using the results of the *California Achievement Test, 5th edition*, the study compared student achievement for each of the pairs. From this comparison, the study concluded

> The study found no benefit, on average, to student achievement from placing an AC teacher in the classroom when the alternative was a TC teacher, but there was no evidence of harm, either. (p. xxii)

Additional findings included

1. Significant overlap in the course work hours required by the two types of programs. AC hours ranged from zero to 795; TC hours ranged from 240 to 1,380. (See also, for example, Rokoff, 2004.)

2. No significant differences between the two groups of teachers in SAT/ACT scores, selectivity of colleges attended, or GPA (cf., Xu et al., 2007). However, SAT scores for high course work teachers were significantly higher than those for low course work teachers in both groups.

3. AC teachers were more likely to identify themselves as Black.

4. Average differences in math and reading achievement were not statistically different for students taught by AC and TC teachers.

5. No evidence supported that greater amounts of course work correlated with higher student achievement.

6. No statistically significant relationship existed between student achievement and required hours of course work in math or language pedagogy or fieldwork.

The only statistically significant difference between the two types of programs was in measures of teacher classroom practice (measured by the *Vermont Classroom Observation Tool*). AC teachers' "classroom culture" was scored lower in the teaching literacy dimension. This finding is consistent with other studies that find equal or greater effectiveness for

alternative program teachers in math but less success in literacy (Boyd et al., 2006; Raymond et al., 2001; Xu et al., 2007).

Concerning the study's second question about aspects of teacher preparation programs that might be related to teacher effectiveness, the study concluded first that AC teachers with masters degrees were less effective in improving students in reading than TC counterparts without a masters degree. Second, it concluded that students of AC teachers taking course work scored lower than students of TC teachers not taking course work. The authors stated that

> although individual teachers appear to have an effect on student achievement, we could not identify what it is about a teacher that affects student achievement. Variation in student achievement was not strongly linked to teachers' chosen preparation route or to other measured teacher characteristics. (p.xxii)

Interestingly, the study omitted the theoretical or prior research rationale for the belief that the amount of course work would be an important variable in achieving student learning outcomes, assuming perhaps that this is a "known truth."

This study went some way to answering Darling-Hammond's concern for the need to attend to individual program differences but left the question of critical program elements open.

Three Alternate Pathways Programs

Three other programs are included in this review. They have not been the subject of rigorous research. They are included here because they loom large in the landscape of alternate certification and because they provide insight into some of the outcomes of alternate certification outside of student achievement. They also represent three different approaches to alternate certification.

The New York City Schools are served by four AC programs: Teaching Fellows, Teach for America (TFA), Peace Corps Teaching Fellows, and the Teaching Opportunity Program. TFA research has been reviewed previously, and the Peace Corps (based at Teachers College, Columbia), and Teaching Opportunity (sponsored by the City University of New York system) are both small.

The New York City Teaching Fellows is the largest local alternative certification program in the country. Launched in 2000 and modeled on TFA, the program was designed to address a serious teacher shortage in New York City. Like TFA the Fellows is highly selective (1 in 20 applicants selected) and is designed to prepare teachers for high-needs schools and high-needs subjects. In 2009, 26% of all city math teachers and 18% of all science teachers were from the Fellows program.

Also similar to TFA, the Fellows take an intensive summer program before starting to teach full time. They must have a bachelor's degree but do not have to have taken any education courses. Two studies—in 2002 and 2007—used a variety of qualitative methods to assess the quality of preparation and support for Fellows as well as their teaching practice and future plans.

Stein (2002) analyzed 31 survey responses from the first cohort of Fellows at Lehman College. They reported diverse paths to the Fellows program—some right from college, some taking a pay cut to join. Most reported classroom management problems

and limited support from school administrators, college faculty, or colleagues. Over half of the respondents say they would stay in teaching but left their SURR[10] school as soon as possible.

Maegher, Brentlinger, and Cooley (2007) studied middle-school and high-school math Fellows. Starting with a demographic survey of 300 Fellows and narrowing to eight intensely studied Fellows, the authors concluded classroom management was not a problem. However, "The evidence suggests that there is a connection between the large social distance between Fellows and their students and control-oriented mathematics instruction" (p. 55). In other words, the author found the Fellows had not been taught (or had not been able) to teach "conceptually challenging mathematics" to underachieving minority students. The author did not comment on teacher retention related issues.

New Jersey's Provisional Teacher Program (PTP) was started in 1984 also to address a teacher shortage. It has not been the subject of rigorous research. State officials assert it is achieving its goal of increasing the number of New Jersey certified teachers: half of the teachers recommended for certification by school principals have come through the PTP.

PTP candidates must take a 24-hour course and pass the Praxis II in their subject to obtain a Certificate of Eligibility (CE). Once hired, candidates are closely mentored and supervised for 34 weeks. Different from TFA and the Teaching Fellows Program, much of the recruitment and preparation for the CE occurs through New Jersey colleges and community colleges.

The practice of having principals rather than college teacher education faculty recommend candidates for state certification is in line with the growing emphasis on teaching effectiveness—often gauged by student achievement. (See Kane et al., 2006, and the 2010 Federal education budget proposal in *Education Week,* 2.10.10.) "The result [of the budget shaping education policy] has been a new Federal emphasis on teachers' on-the-job performance as a basis of gauging their capacity rather than the strength of 'inputs' such as credentials, subject matter knowledge and the route into the profession" (p. S11). (See also "Components of a Bold Application," 2009, the U.S. Department of Education's guidance for preparing Race to the Top proposals.)

A third alternative path program—Urban Residency—represents an unevaluated but much-admired option for schools and teachers. In 2008 the Boston program (BTR) was a finalist for an Innovations in American Government award sponsored by the Kennedy School at Harvard.

The June 2008 issue of *Phi Delta Kappan* represents a milestone of sorts. In it Linda Darling-Hammond and Wendy Kopp wrote constructively (after more than a decade of criticism and advocacy) about the possibility/desirability of incorporating a residency component in TFA—as suggested by a TFA alumna. Linda Darling-Hammond observed, "The teaching residency model holds particular promise for addressing the problems of teacher preparation, recruitment and retention in high-need districts—and may constitute one of the most important reforms of teacher education generally" (p. 732).

The Urban Residency Programs in Boston, Chicago, and Denver[11] are models for this kind of "third way" between what might be called "pure" TFA and the more traditional college/university-based preparation programs long favored by Darling-Hammond. The specifics of each of the three residency programs are different, but the basic concept is the same in each.

The residency begins with active recruitment and selection of able, recent graduates and career changers—similar to TFA and the Teaching Fellows. Unlike these two programs, teacher candidates in the residency programs begin preparation in a teaching residency under the guidance of proven (and paid) public school teachers. The residency combines academic subjects and practice teaching in well-run schools—charter schools in Chicago and public schools in Boston and Denver.

Supervision and mentoring continue into the teacher's second year of teaching. This program of continuing guidance and support has two purposes. The first purpose is strong preparation for teaching in high-needs schools. The second purpose is to keep the teacher in teaching and in education as long as possible—in short, retention. Retention is a big part of the attraction of the residency programs. Nationwide, roughly 50% of new teachers leave teaching by their fifth year. Residency retention rates for the first cohorts in Boston report 90% are still teaching after three years; in Chicago, 95% are still teaching (Berry, 2008).

The programs have prepared only a small number of cohorts (five classes of teachers between 2003 and 2008), and the teaching effectiveness of these graduates has not been formally assessed. However, in Boston surveys of teachers and principals rate 88% of residency graduates equal to or more effective than other first-year teachers. Sixty-four percent were rated more effective than all other teachers (Ash Institute, 2008).

One outcome sought by a number of alternate pathways programs is to recruit minority candidates and candidates with math and science backgrounds. A report by Public Agenda (Berry, 2008) suggested this aim was being achieved in two programs. In Boston 53% of Residents were minority candidates; in Chicago, 57% were minority candidates.

Retention

Though residency programs lack research validation, they have attracted significant financial support, starting with $40M from the Carnegie Foundation in 2002 and continuing with $43M in the current Federal education budget. In addition, residency and other alternative programs play a prominent role in the U.S. Education Department's Race to the Top (R2T). The Department of Education publication "Components of a Bold Application (for R2T funds)" (2009) promotes alternate paths in the guidelines for improving teaching effectiveness. Secretary Duncan focuses on Louisiana as an example of the push to "open the teacher education market to a range of providers, set high standards for all and hold providers accountable for results..." (p. 34).

Retention has been the focus of criticism of TFA since the first cohort fulfilled its two-year commitment. Darling-Hammond (2008) and others have pointed to the high cost of frequent turn over. Estimates run from $8,000 to $48,000 for each replacement. And in 2004-05 the Boston Public Schools spent an estimated $3.3M to replace 194 teachers (Donaldson, 2008). Without addressing the cost of turnover, the Schools and Staffing Survey concludes

> The SASS analysis shows that once school characteristics are included in a multi variate analysis of turnover decisions, teachers with alternate certification are no more likely than teachers with regular certification to leave the profession. (Grossman & Loeb, 2008, p. 131)

This is hardly the last word on this subject. There is a growing literature on this topic, much of it based on the opportunity wage theory of teacher labor markets—individuals remain in teaching as long as teaching remains the most attractive occupation available to them (Grossman & Loeb, 2008). For purposes of this review, the central question is whether teachers who enter teaching through alternate routes turn over at higher rates than traditionally certified teachers.

Summarizing a number of studies of this question, Grossman and Loeb (2008) concluded

> Teachers who enter the field through alternative certification programs on average *are* less likely to stay in their positions from year to year, but that this lower likeli hood appears to be due largely to characteristics of the schools in which these teachers work and not to attributes of the alternate certification programs that helped them get there (p. 153).

The Boston Teacher Residency Program includes extensive mentoring and induction, and programs like the Teaching Fellows and the New Jersey Provisional Teacher Program include an induction component (although reports of program alumni do not always confirm the availability of this program component). However, a study of induction by the National Center for Educational Evaluation (NCEE, 2009) suggested that induction may not be sufficient to offset the other factors associated with teacher attrition.

Because of TFA's two-year obligation the program is often criticized for high turn over. TFA answers this charge in two ways. First, TFA statistics show some 90% persistence from year one to year two (*Annual Report*, 2009). To the same point, Donaldson (2008) reports, on the basis of her thesis research, "Overall, I find 44% of TFA teachers remained in their initial, low-income placement school and 61% remained in the teaching profession longer than 2 years" (p. 2). Second, TFA makes a case for measuring persistence more broadly, citing large numbers of TFA alumni/ae who have continued a commitment to the TFA goal of social justice through careers in law, government, politics, and education. Give Well (n.d.), a philanthropy advisory service, reports results from a TFA survey: "the report indicates that 66% of TFA's alumni are currently in education-related jobs, though not teaching jobs specifically" (p. 2). One frequently cited example of TFA alumni/ae commitment to education is the KIPP charter schools, founded by two TFA corps people.

Finally, the research on teacher turnover will become increasingly important as the number and type of alternate route programs proliferates. While each program must have persistence as a criterion for effectiveness, researchers and policy analysts must also keep firmly in mind the role specific school settings as well as the larger labor market play in determining teacher turnover.

Conclusions and Unanswered Questions

Several conclusions emerge from this review of alternate routes to teacher certification.

1. There is no longer any question whether alternate pathways programs have a valid role to play in teacher education. TFA and the Urban Residencies have found a place

in the Federal education budget, and both have ambitious growth plans. The Secretary of Education is actively supporting the growth of alternative routes programs.

2. There is no clear demarcation between most alternative and traditional programs. They share many of the same features, and each prepares teachers who are effective and teachers who are not especially effective.

3. There is great variation among the academic programs that make up the alternative and traditional approaches.

4. On average, alternatively prepared teachers appear to be slightly more successful with mathematics and science than with reading.

5. Studies of the impact of program components come to conflicting conclusions.

6. Studies comparing the relative effectiveness of the two types of teacher preparation provide ambiguous policy guidance because of the many differences within the two types of programs.

7. There is some evidence to support the claim that alternative programs are able to enroll more minority candidates and prepare more teachers with math or science backgrounds, but this observation hardly applies to all alternate preparation programs.

8. There is very limited assessment of the effectiveness of alternatively prepared teachers with special education students, or in teaching sciences or languages.

9. Though the Urban Teacher Residency and TFA programs do report some cost figures, there is no systematic analysis of the costs associated with either type of preparation and thus no cost-benefit assessment of the two approaches or compari son to the costs of traditional programs.

10. Research on the impact of induction programs on retention has come to mixed conclusions.

11. As background for this analysis, there are the criticisms of traditional teacher education. Arthur Levine (2006) and Secretary Duncan (Teachers College, Columbia 2009) cite problems that affect both approaches to teacher education.

Footnotes

[1] The *Maryland Approved Alternative Teacher Preparation Directory* (n.d.) lists10 teacher preparation programs run jointly by the county, the local schools, and a community college.

[2] The term *alternate certification* appears frequently in the research but does not refer to two or more kinds of teacher certification. The term more precisely refers to alternate routes to state certification. See, however, the 2009 Mathematica Policy Research study of the American Board for Certification of Teacher Excellence (ABCTE)-certified math teachers in Florida.

[3] United States District Court, Northern District of California No. C07-4299PJH.

[4] This review follows the convention in much of the research on alternate routes: AC refers to alternate certification; TC refers to traditional certification.

[5] This survey and population study of 6,310 tenth- and twelfth-grade science and math students and 3,469 teachers found no relationship between teacher subject matter major and student achievement in science.

[6] Differences between teacher populations, student populations, and preparation programs made general conclusions difficult.

[7] In noting the different conclusions reached by Raymond and colleagues (2002) and Darling-Hammond and colleagues (2002), Kane and colleagues (2006) commented, "it is difficult to reconcile these two results because of major distinctions between their empirical specifications and the dependent variables they examine" (p. 2).

[8] The variation among mentors is described in Grossman and Loeb (2008) and in two books by TFA alumnae (Foote, 2008; Ness, 2004). These two narratives underline the deep significance of mentoring for new teachers just starting in challenging classrooms.

[9] This question harks back to issues explored by Wilson and colleagues (2001) and others seeking to discover critical elements in teacher preparation programs.

[10] School Under Regents' Review—a designation of poor school performance akin to failure to achieve Adequate Yearly Progress (AYP).

[11] Recently expanded to Memphis, Philadelphia, and New York City—New Visions for Public Schools, Hunter College. See www.teacherresidencies.org**.** Bank Street College has also worked toward a residency program with several schools in New York City.

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The Effectiveness of Varied Pathways of Teacher Education in the United States: What Research Says about Alternative and Traditional Routes and Providers

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General Issues Associated with the Topic

For many reasons, in the United States there has been a shift in teacher certification programs. Where once institutions of higher education were exclusively responsible for training teachers, now a variety of alternative programs[1] are targeted to address the crucial need for teachers in our nation's schools, especially in high-poverty neighborhoods.

Reasons for this shift in certification include an increasing shortage of teachers due largely to improved career opportunities for women over the past thirty years (Corcoran, 2007), increases in school enrollment (Loeb & Miller, 2006), and mandates for reduced class sizes and hiring only qualified teachers resulting from No Child Left Behind (NCLB). Furthermore, over the next decade, a massive exodus of Baby-Boomers is expected as about one-third of our veteran teachers retires (Duncan, 2009). This mass departure is expected to rapidly increase the nation's need for more teachers in the near future. Recognizing the need for teachers, NCLB supports, with funding, alternative certification programs.

Teachers are required by law to be certified; however, individual states may decide the requirements. Today, all states offer some form of alternative route to certification. It is estimated there are 130 alternative routes currently offered in the United States (www.teach-now.org/intro.cfm). Between 1996 and 2006, the number of individuals issued alternative teaching certificates exploded from 7,200 to 59,000 (Peterson & Nadler, 2009). Approximately one-third of new hires in recent years have achieved certification through alternative pathways (Feistritzer & Chester, 2002). Despite the rising popularity of alternative pathways, however, research on these programs is lean.

Potential advantages and disadvantages of the various pathways have become critical issues of debate. While critics of traditional programs argue their course requirements are unnecessary and excessive (Finn, 2003; Hess, 2001), critics of alternative choices predict that easing up on course requirements ensures insufficient preparation (Darling-Hammond, 2006). Graduation requirements also vary, as well as the amount and type of support systems set up within the program. Even in programs in which course work is similar, the structures of field work contrast. In traditional programs, graduates complete a student teaching component while many alternative programs allow candidates to begin teaching in classrooms prior to graduating. As a nation, we

are fortunate to have a wealth of programs with diverse aspects to study so we can determine which are the most effective and which components are worth developing further (Cochran-Smith & Zeichner, 2009).

The opportunity to explore the effectiveness of various components of teacher education must be made a priority as the nation seeks new, more effective ways to train the next generation of skilled teachers and to advance student learning. This literature review will examine the current research on the topic of alternative and traditional teacher certification routes and providers by exploring the following questions:

In what ways do alternative and traditional pathways vary?

How do teacher practices and effectiveness on student achievement vary by chosen route to teacher certification?

The Search

This reviewer conducted a search for research reports and policy-oriented briefs, executive summaries, and articles that would shed light on the questions at hand regarding the effectiveness of varied pathways. This review focuses mainly on the description and comparison of various components of alternative programs in an effort to inform readers who are perceived to be highly knowledgeable about and experienced with traditional programs. When traditional programs are discussed, it is primarily in comparison to alternative programs rather than other traditional programs.

Sources include several educational research databases and Internet searches such as

1. Education Multi-database Search (EBSCO)—searches several databases at once, including the following:

   a. Education Research Complete—includes all aspects of education, such as policy, funding, curriculum instruction, administration, and related social issues;

   b. Educational Resource Information Center (ERIC)—includes abstracts and citations for more than 1,000 education publications; and

   c. Professional Development Collection—provides full text for approximately 500 education journals, of which about 350 are peer-reviewed.

2. Regional Educational Laboratory Program—Ask a REL is a collaborative reference desk service. It provides citations of references on research-based education questions.

3. Google—websites of specific programs, especially those on which no research seems to be published.

This reviewer submitted the research questions to the Regional Educational Laboratory Program and also sought the assistance of a reference librarian from SUNY College at

Oneonta's Milne Library to ensure the most relevant and current research available had been gathered.

Criteria for inclusion of a resource in this review was determined by

1. The date of publication: The most current information available has been included.

2. Source: Peer-reviewed journal articles, government documents, and nationally funded papers have been given priority.

3. Methodology: The number of candidates studied, selection process, and representation have been noted. Random control trial studies have been given priority.

4. Existing knowledge base: For some programs, the research base is so slim or nonexistent that organization websites and internal studies have been cited.

The final compilation of materials consists of a group of resources that explores the issues from various perspectives. While the number of resources is extensive, it does not substantially support a comprehensive answer to the proposed questions. Many gaps exist that indicate needs for further, extensive research. To date, not all alternative programs have been studied to determine the effectiveness of their individual components. In fact, few have undergone rigorous comprehensive examinations. However, this review reflects the perspective proposed by Zeichner and Schulte (2001) that rather than being disappointed by the results and lack of evidence that any one model of alternative or traditional certification program is definitively superior to another, it is more productive to consider the wide range of quality components that comprise all models. From this perspective we can move forward to evaluate what makes an effective program.

This literature review represents a critical look at the resources currently available for review and does not address emergency permits or waivers or programs that seek to improve teacher quality beyond initial certification, such as National Board Certification (Cavalluzzo, 2004; Goldhaber & Anthony, 2007). The reader should keep these caveats in mind while appraising these results.

A description of some of the alternative programs follows in the next section to inform the reader. Having knowledge of the general components of the programs that are most prominently written about in current research will help illuminate and focus the remaining sections of this review.

Some of the Major Alternative Programs

Before answering the questions posed for this review, we will look at several popular alternative pathways. Doing so will familiarize readers with the overall structures and components of programs and how they influence a program's perceived effectiveness. Two well-established programs and one relatively new program are discussed here. Teach For America, the New York City Teaching Fellows program, and Urban Teacher Residencies exemplify the discrepancies that exist among alternative programs.

Teach For America

Probably one of the most familiar alternative pathways, Teach For America (TFA) recruits successful graduates from highly competitive universities to commit to two-year teaching assignments in hard-to-staff districts (Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005; Laczko-Kerr & Berliner, 2002). Minimal training—an eight-week summer program of basic course work and student teaching—is provided, and then candidates are placed into high-need public school classrooms to teach. Initially, the program provided no further training beyond the summer work; however, states are beginning to require recruits enroll in a teacher education program upon hiring. Course work and improved teaching supervision are increasingly being mandated by some states as well. Despite the training from TFA staff and the added teacher education requirements imposed by some states, the program is still frequently viewed as one that recruits elite, enthusiastic individuals for whom extensive formal teacher training is not as necessary as it is for less select college graduates.

The program perpetuates placement of trainees in rural or poor urban districts, some of the most needy low-income schools and minority students in the nation. Critics of the program declare that placing inexperienced, untrained teachers in classrooms contradicts research that asserts teachers are one of the most critical contributors to improving student learning (Darling-Hammond, 1994, 1997; Rivkin, Hanushek, & Kain, 2000; Shields et al., 2003). Evidence suggests TFA's training does not adequately prepare candidates for success with these students of need, even though recruits are noted for being intelligent and enthusiastic. Darling-Hammond (1994, 2001) finds TFA recruits to lack particularly in classroom management and knowledge of fundamentals in teaching and learning. Cooperating teachers attribute these failings to limitations of the training program in providing adequate instruction and guidance in pedagogy and theory along with lack of evaluation and feedback from program staff.

Studies of TFA have reached mixed and somewhat contradictory conclusions. Several provide evidence that students of TFA-trained teachers show comparable achievements when weighed against similarly experienced teachers in similar schools (Darling-Hammond et al., 2005; Decker et al., 2005; Glazerman, Mayer, & Decker, 2006). Decker and colleagues conclude students with TFA teachers achieve better mathematics scores and the same reading scores as students with non-TFA teachers. However, in these studies, the comparison set of teachers is untrained, uncertified, emergency-placed teachers. Furthermore, they do not control for other teacher, student, and school variables. Laczko-Kerr and Berliner (2002) found students of TFA teachers do poorly on academic tests in mathematics, reading, and language arts when measured against comparably experienced certified teachers. However, this study does not account for prior achievement of students. Other discouraging studies report that a majority of recruits apply to TFA because they feel it is their best alternative in light of their "circumstances and indecisiveness at the time" (Stevens & Dial, 1993, p. 70), opposing the perception of enthusiasm previously reported.

This brings us to Darling-Hammond and her colleagues' (2005) study of a large data set of over 200,000 test scores from Houston, Texas. The data links student achievement and characteristics with their teachers' certification, experience, and academic degrees and provides insight into the effectiveness of TFA recruits. Darling-Hammond (1994) and Darling-Hammond and colleagues (2005) claimed that TFA can actually "hurt"

children. They found that over a period of six years, fourth- and fifth-grade students' gains on six reading and mathematics tests are higher when their teachers are certified prior to teaching. TFA recruits are less effective than their certified counterparts. After two or three years, when TFA recruits become certified, they do about as well in supporting student learning; however, nearly all of the TFA teachers then leave within 3 years. Attrition rates are generally twice as high for TFA teachers than for non-TFA teachers. This study concludes that teachers' effectiveness and student learning are strongly related to teacher certification and the status of the teacher in the TFA program.

Finally, Glazerman and colleagues' (2006) report on a randomized experiment to investigate the impact of TFA on student achievement and other outcomes. They found while TFA teachers have a positive impact on students' math achievement, no impact was apparent on reading achievement. The size of the impact on math scores, however, was only about 15% of a standard deviation, which would be equivalent to about one month's instruction. The general conclusions did not offer substantial results, but contradicted previous claims that TFA programs may have caused harm to students (Darling-Hammond, 1994; Darling-Hammond et al., 2005).

New York City Teaching Fellows

According to its website, New York City Teaching Fellows (NYCTF) is the largest local alternative pathway to teacher education certification in the country. (Go to http://www.nycteachingfellows.org for a full description of the program.) Launched in 2000 to address the most severe teacher shortage in New York City's public school system in decades, the Fellowship attracts recent college graduates, mid-career professionals, and even retirees to teach in hard-to-staff schools, some of the City's lowest-performing schools.

Application requirements for entry into the NYSTF program mandate a 3.0 grade point average (GPA) or higher in a Bachelor's of Arts program, U.S. citizenship or permanent residence status in the United States (U.S. Department of Education, 2002a). The degree program from which the applicant graduates does not have to be a teacher education program, and the applicant does not have to hold certification in teaching. The applicant must, however, speak English fluently. While certification is offered in all grades and content areas, the program is especially eager to recruit applicants interested in teaching bilingual education, English, Spanish, science, mathematics, or special education.

NYSTF is a two-year program. Candidates work toward certification and their Master's degree simultaneously. The program includes a two-month training session during the summer followed by placement as teachers in high-needs schools for two academic years. School- and university-based mentors are assigned to the candidates as they continue to teach and go to classes to complete Master's degree course work.

In a nonexperimental study, using comprehensive data of teachers and their students, Kane, Rockoff, and Staiger (2006) found elementary students of NYCTF teachers scored 0.01 standard deviation (SD) lower on their reading tests than students of teachers with traditional certification. This difference is equivalent to two days of classroom instruction. No differences were evident on mathematics tests. Kane and colleagues also concluded that after their first year of teaching, NYCTF teachers showed more improvement than traditionally trained teachers do.

Seemingly contradictory results were found by Boyd and his colleagues (2005). They found students with first-year NYCTF teachers scored 0.02 to 0.05 SD lower in mathematics and reading than students with first-year traditional teachers did. After the NYCTF graduates taught for two or three years, their students' achievement scores were equal to those of students with teachers holding traditional certification.

Urban Teacher Residencies

Founded in 2007, Urban Teacher Residencies (UTRs) is an innovative program that embodies best practices in its screening, recruiting, training, placing, and inducting of "residents" for urban school districts. UTRs are gaining attention due to the inability of traditional and other alternative routes to teacher certification to meet the growing and demanding needs of urban districts for high-quality and diverse teachers committed to long-term careers in schools with high needs. The development of UTRs in major school districts is supported by the passage of the Higher Education Opportunity Act. Millions of dollars have been allocated to the development of UTRs nationwide. (Further information about the program is available at http://www.utrunited.org.)

A report by Berry, Montgomery, Curtis, Hernandez, Wurtzel, and Snyder (2008), out of the Center for Teacher Quality, investigated two UTR programs—the Boston Teacher Residency (BTR) and Chicago's Academy for Urban School Leadership (AUSL). Residents are selected according to district-aligned needs. The criteria are described as rigorous. During the first year of the program, residents integrate their Master's-level course work with a year of intensive classroom residency where they co-teach under the supervision of an experienced, trained mentor. In the second year, residents are given their own classroom but continue to receive mentoring. BTR and AUSL were found to effectively

1. Integrate education theory with classroom practice;

2. Provide apprenticeship under an experienced, trained mentor;

3. Cultivate collaboration among a cohort of residents going through the program together;

4. Cultivate partnerships among schools of higher education, school districts, and nonprofit organizations;

5. Meet district needs;

6. Support residents even after being hired as teachers; and

7. Differentiate career goals for experienced teachers.

In Berry and colleagues' (2008) study, school administrators ranked UTR graduates' skills as highly competent. The UTR website claims, "The retention rate for [UTR graduates] beyond those crucial first three years is 85%."

As UTRs are relatively new programs, the research on them is sparse. However, both

the BTR and AUSL have commissioned outside researchers to examine the effectiveness of their graduates in improving student achievement to be available in the near future.

Other Notable Programs

Of course, there are many other programs that have been identified as successful in recruiting and training teachers via alternative routes. A "successful program" is defined by the U.S. Department of Education's Office of Innovation and Improvement (2002a) as one that "…attracts and selects the right candidates…, offers a carefully thought-out, research-based curriculum that is coherent and flexible…, provides effective support to candidates…, [and] is committed to its own continuous reflection and improvement" (p. 7). Unfortunately, this reviewer found no substantial reports of research to support either the effectiveness or lack thereof. While some programs espoused they were based on research, none could be found to have been subjects of systematic research themselves. However, several are described here to extend readers' understanding of possible purposes and components of alternative programs before going on to explore how these components may influence a program's effectiveness.

Hillsborough County, Florida. Some programs, such as the alternative certification program offered by the School District of Hillsborough County, Florida, respond to the need for specific subject-area teachers (U.S. Department of Education, 2002a). (Go to http://www.sdhc.k12.fl.us/Recruit/CertificationSteps.asp for a full description of the program.) The Hillsborough County program seeks to expand the pool of teachers in Florida schools by admitting non-education majors who hold a college degree in a specific subject area (e.g., science and mathematics). The Hillsborough County program supplements the content knowledge with which the recruit enters the program with instruction in pedagogical knowledge through a 180-day timeline in which course work (eight required courses) and field work (an internship year) are completed concurrently. Course work is in the form of district-sponsored classes taught by teachers employed by the district. No current research espousing the effectiveness of this program is available.

Wichita Area Transition to Teaching. The Wichita Area Transition to Teaching program in Wichita, Kansas requires applicants to have a major in their desired certification area and the same general education courses as all Wichita State University teacher-education students (U.S. Department of Education, 2002a). They must also be admitted to the Wichita State University graduate school and have a minimum of two years' employment in an occupation related to their content area specialty. Their two-year classroom experience begins once the applicant is hired by a school district. A school-based mentor and a peer consultant are assigned, and twenty observations with written feedback occur within the two year internship. (Go to http://webs.wichita.edu/?u=coedt2t&p=/index for a full description of the program.) Although the program sports a 90% complete rate and reports 85% of its graduates have remained in education, there is no systematic research available that supports the effectiveness of its graduates on student achievement.

Northeastern California Partnership for Special Education. The Northeastern California Partnership for Special Education in Chico, California partners with California State University and 57 local educational agencies, and the U.S. Department

of Education's Office of Special Education and Rehabilitative Services (U.S. Department of Education, 2002b). It seeks to increase the number of special education teachers in the northeast area of California.

This program targets the recruitment of under-represented groups in special education, specifically people with disabilities, males, and ethnically diverse applicants. It boasts that it has eliminated the need for special education emergency credentials in its areas of service. (Go to http://www.csuchico.edu/psed/credential/internships.shtml for a full description of the program.) No current research is available on the effectiveness of this program.

Alternative Programs within New York State

The National Center for Alternative Certification website, found at http://www.teach-now.org/myresults.cfm, offers information on the various programs available in New York State. Below are links to these programs. Information on the history of, entry requirements for, and a full description of each program is provided. In the online version of this special issue of *Excelsior,* these links are live. This issue may be found on the New York Association of Colleges for Teacher Education website at www.nyacte.org.

State Alternate Routes to Teacher Certification

- Alternative Teacher Certification - Transitional B (A)
- Individual Evaluation (Transcript Evaluation) (G)
- Internship Certificate (E)
- Visiting Lecturer (K)

Local Alternative Teacher Certification Programs

- Bronx - New Teacher Residency Program
- Brooklyn - Teaching Fellows Program/ Brooklyn College
- Brooklyn - The Alternative Teacher Preparation Program (Transitional B)
- Brooklyn - The Alternative Teacher Preparation Program (Transitional B)
- Buffalo - The Alternative Teacher Preparation Program (Transitional B)
- Jamaica - New York City Teaching Fellows
- New Rochelle - The Alternative Teacher Preparation Program (Transitional B)
- New York - Childhood General Education
- New York - NYC Teaching Fellows at City College
- New York - The Alternative Teacher Preparation Program (Transitional B)
- New York - The Alternative Teacher Preparation Program (Transitional B)
- New York - The Alternative Teacher Preparation Program (Transitional B)
- Newburgh - Alternative Certification - Transition B
- Rochester - Urban Teachers for Tomorrow
- Saratoga Springs - Empire State College Master of Arts in Teaching Program
- Staten Island - CSI/NYCDOE Teaching Fellows Program
- Utica - The Alternative Teacher Preparation Program (Transitional B)
- West Bronx - The Alternative Teacher Preparation Program (Transitional B)

How Alternative and Traditional Pathways Vary

Now that we have looked at some examples of alternative pathways and have a contextualized understanding of the complexity of how their components vary, we will examine the common main components and look further at how various pathways are distinguished by how they structure these components.

Across the United States, both traditional and alternative programs vary widely (Walsh & Jacobs, 2007). There is no standard list of criteria that all traditional and alternative certification programs must meet. To further complicate the issue, the distinctions between traditional, university-based teacher preparation, and alternative routes to certification are not clear-cut (Zeichner & Schulte, 2001). Peterson and Nadler (2009) explained that in approximately 50% of the states, there is not much difference between traditional and alternative paths. Alternative programs have become diluted and compromised by the fact that colleges and universities have begun to dominate this enterprise and have blurred the line between alternative and traditional programs. Furthermore, Boyd and colleagues (2005) concluded that "the variation in effectiveness within pathways is far greater than the average differences between pathways" (p. 1). With that said, one can see how comparing and contrasting programs as a whole would be inefficient and futile. That is why, instead, this section analyzes the components that comprise these programs.

In most states, teacher candidates seeking traditional teaching certification must graduate from college teacher-education programs. These programs are typically comprised of about 30 credit hours of course work. When seeking traditional certification, teacher candidates must complete a supervised student teaching component upon successful completion of the course work. Prospective teachers pursue programs within the state in which they hope to teach so they graduate with the course work and grade-appropriate degree required for certification in that particular state (Peterson & Nadler, 2009). This reviewer assumes to a large degree readers are highly familiar with traditional, university-based programs and, therefore, will highlight alternative programs.

One of the variables that so overwhelmingly affects the ability to compare and contrast alternative programs to each other and to traditional pathways is that they vary so widely in the key elements that make each of them unique. Alternative programs may mandate the completion of requisite course work but have little or no student teaching component. Divergent structures and qualifications, such as who is allowed to apply, exist. For example, the Troops to Teachers Program provides funds to "recruit, prepare, and support former members of the military services as teachers in high-poverty schools" (p. 8). Structurally, some alternative programs are managed by private providers and others by schools of education or school districts. Researchers have begun to try to make sense of the variability among programs be devising classification systems (see Decker et al., 2005; Feistritzer & Chester, 2002).

In this section, variances among alternative and traditional pathways in admissions criteria and recruitment (i.e., education background, work and classroom experiences), supervision, field work and student teaching assignments, course work, and candidate experiences (i.e., retention, knowledge, efficacy, and beliefs) are defined and described. Within each component, current research in that category is highlighted, comparing and distinguishing programs when such data was found to be available and presenting information that acts to clarify perceptions or misconceptions about a program.

Admissions Criteria and Recruitment

Most alternative programs attract well-educated, talented people (Humphrey, Wechsler, & Hough, 2008). Selecting and recruiting alternative certification candidates involves screening applicants based on a number of criteria. Depending on a program's assumptions about who will become effective teachers, these programs typically set predetermined requirements for admission, such as a minimum overall undergraduate GPA or a minimum GPA in certain courses (Constantine et al., 2009). Factors such as academic excellence and educational background, previous career and classroom experience, or membership in an identified minority group may determine if a candidate is eligible for a program.

Academic Selectivity and Educational Background

Research demonstrates that a teacher's educational background can influence student learning (Wayne & Youngs, 2003). Overall, alternative route teachers are more likely to have come from a high-ranked university vs. a less competitive one (Humphrey et al., 2008). Teach For America, which requires a GPA of 3.0 and accepts approximately 17% of its applicants, recruits well-educated people from prestigious universities (Walsh & Jacobs, 2007). New York City Teaching Fellows, which targets mid-career teachers and accepts 12% of applicants, is not only interested in a person's level of education but also his or her career experiences. NYCTF requires a 2.75 GPA for admittance into the program.

TFA and NYCTF are not representative of all programs, however. Walsh and Jacobs (2007) report in their study of 49 alternative programs that overall alternative programs "too often admit weak candidates" (p. 22). Of the programs studied, 80% report they have a minimum GPA admission requirement or incorporate a GPA requirement into a holistic approach to admissions; the typical GPA is 2.5. Fourteen percent of the programs accept 90 to 99% of those who apply. One-fourth of the programs in the study accept virtually all applicants. Walsh and Jacobs hypothesize the cause for such high acceptance rates might be due to the pressure from states to accept as many applicants as possible to fill teacher shortages.

Previous Career and Classroom Experiences

Career-changers are frequently associated with application to alternative programs; however, in actuality, Humphrey and colleagues (2008) found 42% of applicants were either full-time students or in education already immediately before going into the alternative program. Also, they found nearly 50% of the applicants had classroom experience prior to entering.

Minority Standing

Alternative programs often aim to diversify the pool of new teachers in the field (Humphrey et al., 2008). Research confirms that retaining minority teachers can raise the achievement of minority students in schools. Yet, only 14% of the teachers in the United States in 2004 were Hispanic or African American (Peterson & Nadler, 2009).

Alternative programs have been said to effectively open the doors and recruit minorities into the field of education (Humphrey & Wechsler, 2005). Alternative programs enroll a higher percentage of African Americans and other minorities than traditional programs do (Constantine et al., 2009; Peterson & Nadler, 2009; Zeichner & Schulte, 2001). Peterson and Nadler state that "…minorities are represented in the teaching force to a greater extent in states with…alternative certification than in other states" (p. 3). While there is no evidence that universally links a teacher's race to student achievement, Dee (2004) and others have found positive, statistically significant effects on student achievement when African American teachers are matched to students of the same race (Constantine et al., 2009).

Mentoring and Supervision

Due to most alternative programs' heavy emphasis on apprenticing candidates through on-the-job training, mentoring is one of their prominent components. Supervision may come from university supervisors or a staff member of the program. Humphrey and colleagues (2008) found a variance of responses from receiving no feedback from program staff or university supervisors to receiving feedback on at least a monthly basis.

Some programs offer mentoring, or personal and individual support from a colleague during the program graduate's first year of teaching, as demonstrated in the previous discussion of sample programs. The amount of time and types of activities on the mentoring agenda vary (Humphrey et al., 2008).

Field Work, Student Teaching, and School Assignments

Field work (i.e., time spent observing, interacting with, and tutoring children) and student teaching (i.e., the final semester in which the teacher candidate is placed in a classroom to culminate the program) also vary among programs. The number of hours, weeks, and school days a teacher candidate is expected to "solo" is inconsistent among programs. As well, the number of supervised observations with feedback and the amount of time teacher candidates are expected to attend seminars and meetings beyond the school-day expectations are different (Constantine et al., 2009).

Humphrey and colleagues (2008) found school context played an important role in a teacher's development. Candidates working in schools with adequate supplies, strong support from colleagues, and strong leadership were more likely to plan to stay in teaching and stated they viewed their growth and confidence as higher than those who did not. However, many school contexts in alternative programs were characterized by a lack of teacher support and high needs of the student population. Candidates in Humphrey and colleagues' study expressed they were overwhelmed by undisciplined students, an absence of leadership and camaraderie, and a lack of supplies.

Course Work and Instruction

The amount of hours and content of the course work are the primary differences between alternative and traditional pathways. Constantine and colleagues (2009) propose these differences could lead to "differences in teacher effectiveness, as measured by

classroom practices or student achievement" (p. 4). Therefore, it is important to think critically about this component.

First, consider the amount of hours of course work required. The number of total hours of course work and instruction (i.e., seat work or contact hours spent in a class with an instructor) required by alternative programs ranges from 75 to close to 800 (Constantine et al., 2009). Traditional programs vary just as widely, from 240 to almost 1,400 total hours. Some states show no difference in the number of required course hours between alternative and traditional routes. However, other states require alternative programs require just a fraction of the amount of course work required of traditional routes (Walsh & Jacobs, 2007). These wide spans are due largely to the fact that the number of hours is dictated by State policies regarding teacher certification programming. Course work involves instruction in pedagogical practices and theoretical background related to topics such as content area instruction, classroom management, child development, and student assessment.

Humphrey and colleagues (2008) added that course work made "a major contribution to teachers' sense of efficacy and professional growth" (p. 36) when it was relevant to what candidates viewed as their immediate needs and was directly tied to the candidates' previous experiences. Candidates of the seven alternative teacher certification programs Humphrey and colleagues studied reported course work did not adequately and confidently contribute to their ability to teach students with special needs, to teach English language learners, and to teach literacy and mathematics.

Next, consider the course content. Early studies looking at the correlations between student achievement and the teacher's course content have had mixed, inconclusive results (Goe & Stickler, 2008). In 1994, Monk found students scored higher in mathematics when their teachers had taken more versus fewer mathematics courses in college. However, in follow-up studies, researchers (Monk, 1994; Goldhaber & Anthony, 2007) have found few similar benefits in other content areas (i.e., English, history, and science). Harris and Sass (2007) found positive correlations between teachers who were successful in courses focusing on pedagogical content knowledge and math test scores, but no evidence that course work in theory, class management, and instruction improved student achievement.

Boyd and colleagues (2005, 2006) have been conducting a national experiment using data on students in grades three through eight in New York City schools. They are studying the effectiveness of teachers in alternative programs with reduced course work before classroom teaching. Initial results indicate typically there is no difference in student achievement between students with teachers from alternative programs and students with teachers with temporary licenses. Evidence indicates also that when compared to teachers from a traditional program, students of teachers with reduced course work before teaching often show smaller initial gains in mathematics and English language arts. However, a majority of the differences dissolve as the teachers become more experienced. Many of the differences are 2 to 5% of a standard deviation.

Finally, the timing of course work may influence student achievement. Typically, in traditional pathways teacher candidates complete their course work prior to being hired as a teacher. In alternative pathways, those accepted into the program teach and work on course and program requirements simultaneously. Harris and Sass (2007) and Goldhaber and Anthony (2007) found there is a negative impact on student achievement when the candidate teacher was required to plan, teach, and complete course work within the same timeframe.

Candidate Experiences

Other than the various structures associated with the components of a teacher certification program just discussed, several related aspects can be associated with teacher practices and effectiveness. For example, the affects of teacher retention, efficacy, and beliefs are factors that contribute to student learning.

Retention. While some alternative programs are more effective than others at training teachers who stay in education for at least three years after completing the program, the existing research on retention is mixed (Darling-Hammond, 1994). As demonstrated in the sampling of alternative programs described earlier in this review, different programs espouse different goals. A program's goals determine the characteristics and structure of the program. In Humphrey and colleagues' 2008 study, they found programs' goals regarding teacher retention varied. For example, for one program in their study, Milwaukee's Metropolitan Multicultural Teacher Education Program (MMTEP), retention is a primary goal. Therefore, their strategy is to recruit teachers' aides already committed to working within the Milwaukee public schools. Contrastingly, TFA's primary goal is to develop leadership, not retain teachers. Only 11% of TFA candidates report planning to teach for 10 years or more. This may have something to do with the lack of passion for teaching expressed earlier. Only 12% of TFA candidates report that teaching has always been their calling. Humphrey and colleagues propose that perhaps one way to increase attrition is to recruit people who are predisposed to staying in the field.

Teacher Efficacy. Humphrey and colleagues (2008) found in their study of alternative programs, that candidates with prior classroom experience were significantly more confident in their abilities to teach than candidates with no experience. Eighty-seven percent of candidates with prior experience reported they felt they possessed the necessary skills and knowledge to be effective teachers. This number compared to 68% of candidates who had no experience. Further research is needed to determine the correlation between a program's requirements for prior teaching experience or training and a candidate's efficacy.

Suell and Piotrowski (2006) studied teachers' efficacy in skills designated in the Florida Education Accomplished Practices in alternative programs connected with the University of West Florida. They found teachers trained through the alternative approaches express similar levels of competence as those from traditional degree programs. The number of candidates in this study is minimal, however; replication with significant numbers is needed.

Teachers' Beliefs. Zeichner and Schulte (2001) conclude from their review of literature on peer-reviewed research on alternative teacher certification programs that program structure does not seem "…to make a difference in determining the impact of a program on prospective teachers' beliefs about teaching" (p. 271). None of the programs' structures were found definitively to influence the ideas teachers had about teaching. Evidence does not support the presence of conditions attributed to developing a teacher's beliefs about teaching, such as a common vision of good teaching or close relations between schools and colleges or universities. Further research is needed.

How Teacher Practices and Effectiveness on Student Achievement Vary

In February of 2009, one of the most comprehensive reports available on the subject of alternative pathways was prepared for the Institute of Education Sciences (IES). The report, "An Evaluation of Teachers Trained through Different Routes to Certification," was based on a well-implemented, randomized controlled trial study of 63 schools in 20 school districts that had recently hired teachers trained through alternative pathways (Constantine et al., 2009). The study tested 2,600 students at the beginning and again at the end of the academic year to determine teacher effectiveness and student achievement. The IES study revealed existing variations in teacher preparation approaches and, to some degree, offered opportunities to explore the effect of diverse components of training.

The Executive Summary (Constantine et al., 2009) reported the following main findings regarding teacher practices and effectiveness:

1. "There is no statistically significant difference in performance between students of [alternatively certification] teachers and those of [traditionally certified] teachers" (p. xvii). The differences in mathematics and reading scores were not statistically significant. Forty-nine percent of students of alternatively certified teachers scored higher than their counterparts in reading and 44% scored higher in mathematics. In conclusion, a teacher's chosen pathway to certification, according to this study, is not likely to provide valuable information regarding expectations for student achievement.

2. "There is no evidence from this study that greater levels of teacher training course work were associated with the effectiveness of [alternatively certification] teachers in the classroom" (p. xviii). When compared to students of high-course work traditionally certified teachers, students of high-course work alternatively certified teachers did not score statistically differently. The same was true for low-course work alternatively and traditionally certified teachers. Correlational analysis did not demonstrate that the amount of course work was even associated with student achievement. Therefore, we cannot conclude that alternative programs with high levels of course work requirements produce more effective teachers than those with lower levels.

3. "There is no evidence that the content of course work is correlated with teacher effectiveness" (p. xix). There is no statistically significant relationship between the content of the teacher's training—including required hours of pedagogy and field work—and students' test scores. Further, there is no statistically positive relationship between student achievement and a teacher having majored in education.

Closing Remarks

There are many unresolved issues and uninvestigated concerns regarding teacher preparation programs. Research substantiating the effectiveness of the component teacher training methods and approaches is sparse despite the expansion of new and varied pathways of teacher certification. Evidence supporting either the effectiveness or lack thereof has not been collected in through systematic, comprehensive methods and, to a large degree, is not conclusive.

Many studies have relied on graduates' and programs' self-reports and have struggled with collecting adequate response rates from widely distributed teacher surveys (Boyd et al., 2006; Owings, Kaplan, Nunnery, Marzano, Myran, & Blackburn, 2005). This lack of conclusive evidence makes it difficult for hiring administrators to be certain of the implications of hiring individuals trained through alternative pathways. Policymakers should be concerned about these implications as well.

In spite of the lack of systematic research and the high stakes of this debate, given the severity of teacher shortages, the current trend is to ease entry into teaching by expanding the promotion and creation of alternative pathways (Zeichner & Schulte, 2001). Traditional programs in the 1,300 or more universities and colleges with teacher education programs will not be able to address the issues of shortages themselves.

New York State's Agenda

Over the past several months, a flurry of press releases, summaries, and emails originating from the New York State Education Department (NYSED) have been forwarded to this reviewer. An official NYSED News Release dated November 16, 2009, included the headline, "Regents Prepare to Transform Teacher Preparation and Recruit Skilled Teachers to High-Needs Schools." In this release, Regents Chancellor Merryl H. Tisch was quoted as saying, "Teacher quality is the single most important variable in student achievement…. The Regents…have begun to create a 21st-century model for teacher development."

This release and a summary memorandum from Joseph P. Frey to the Higher Education Committee dated December 8, 2009, explain that the Regents are discussing recommendations to authorize colleges, universities, research centers, cultural institutions, non-profit organizations, and others to develop clinically rich programs to certify teachers to work in high-needs schools. The Board of Regents would award Master's degrees to program completers of registered pilot programs offered by non-collegiate institutions. Furthermore, conceptual recommendations include "allowing secondary-level certification applicants to use alternative means to demonstrate content-knowledge with work experience and acceptable rigorous examinations in combination with undergraduate/graduate level course work."

At publication of this review, the Regents are discussing the implementation of pilot teacher preparation programs and drafting the "Clinically Rich Teacher Preparation Program Standards." In a memorandum from Joseph P. Frey to the Higher Education Committee dated January 26, 2010, that shares the draft of standards, one notes programs will be asked to integrate research on best teaching practices that support approaches for teacher education that are clinically based, provide opportunities for candidates to engage in the community's culture to understand the unique needs of

students, integrate theory into practice, and allow adequate time for candidates to develop pedagogical skills.

As informed educators, readers will take everything learned from this review and become active in continuing to explore the issues related to teacher certification.

Footnote

[1]For the purposes of this review, *alternative certification program* is defined as "those teacher education programs that enroll non-certified individuals with at least a bachelor's degree offering shortcuts, special assistance, or unique curricula leading to eligibility for a standard teaching credential" (Adelman, 1986, p. 2). Further, the use of the term will reflect Zeichner and Schulte's (2001) reference to programs that are alternative to the *traditional* 4- to 5-year undergraduate teacher education programs, including those with reduced standards and those that hold their candidates to the same standards as university- and college-based undergraduate programs.

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- What does research tell us about effective uses of new technologies to improve student learning and teaching?
- What are effective uses of online courses in teacher education?_
- What knowledge and skills should teacher education programs provide for assessing effects of technology on learning in the classroom?
- What should teachers know about technology for students with special needs?
- What challenges do teacher education programs face in preparing teachers for applying instructional technology in their teaching careers?
- How are teacher education programs addressing the following new technologies for use in classrooms?
  - Social networking (Facebook, MySpace, etc.)
  - Web 2.0 tools (wikis, blogs, and nings)
  - Gaming, virtual worlds, and alternative realities
  - Student Response Systems
  - Interactive presentation systems (SmartBoards, etc.)
  - Cell phones, iPods, or other mobile devices

- How should teacher education programs prepare teachers to negotiate legal, ethical, and equitable uses of technology in classrooms?
- What are effective teacher preparation models for university and K-12 collaboration?
- What are future trends for using technology in teaching and learning?