

**MEASURING THE COST EFFECTIVENESS OF RICH CLINICAL
PRACTICE IN TEACHER PREPARATION: PART ONE,
UNDERSTANDING THE PROBLEM**

By

**Lawrence O. Picus
University of Southern California**

**David H. Monk
Pennsylvania State University**

**David Knight
University of Southern California**

August 2012

EXECUTIVE SUMMARY

The National Council for Accreditation of Teacher Education's (NCATE) 2010 report, *Transforming Teacher Education Through Clinical Practice: A National Strategy to Prepare Effective Teachers*, argues that the preparation of effective teachers requires programs to be "grounded in clinical practice and interwoven with academic content and professional courses" (NCATE, 2010, p. ii). The NCATE report further argues that such practices in teacher education may require more resources, but that such an approach will, in the long run, be more cost effective (p. iv). However, relatively little is known about both the costs and the effectiveness of greater reliance on rich clinical practice in teacher preparation. Moreover, at the present time, there is an emerging but not yet complete agreement in the field about what constitutes rich clinical experience. In this document, we share the results of a preliminary investigation that was commissioned by NCATE into the cost effectiveness of rich clinical practice in the preparation of teachers.

We began our analysis with a review of the literature of effective clinical experiences for pre-service teachers. We found recurring instances where experts in the field call attention to strategies that are believed to be effective, including: a focus on practice in teacher education courses; effective mentoring and coaching; coherence in the vision of teaching; integration of coursework and clinical experience; and strong partnerships between school districts and teacher education programs.

We turned next to a review of past efforts to conduct cost and cost effectiveness analyses of educational interventions of various kinds. The challenges associated with conducting cost and cost effectiveness analyses in education are well known, and we provide an overview of these issues along with a report on what past analyses of costs and effectiveness in education have revealed.

In order to estimate the resources necessary to provide the kinds of clinical experiences that are considered rich and effective, we developed a conceptual framework for categorizing the types and magnitudes of the relevant resources. Establishing the necessary ingredients for what has come to be known as rich clinical experiences is an important first step for studying the cost-effectiveness of pre-service teachers' clinical experiences. The framework we developed divides costs into three categories: start-up costs, ongoing costs, and financial incentives. We were also mindful of where the burden of the various costs rests. Specifically, we know that some costs are borne by the teacher preparation institution; some are borne by the cooperating school or district; and some are borne by the individual who is aspiring to become a teacher.

We make the case for conducting a large scale cost effectiveness analysis of rich clinical experiences in teacher preparation. We provide some insights into how such a study might best be designed and suggest types of teacher preparation programs that should be included. We also offer some first approximations of resource flows into the clinical components of several existing and quite varied pre-service teacher preparation programs. The purpose of these first approximations is to illustrate how the approach we

envision would work rather than to provide actual cost estimates. These need to be further refined within the larger study that we envision.

Much remains to be learned about the impact of different kinds of clinical experience on the preparation of effective teachers. While it is essential to gain definitive insights into what works and under what conditions, it is also vitally important to understand the resource requirements associated with the various options. It is only by taking account of costs as well as effectiveness that sound public policy can be crafted. We hope this report will stimulate interest in better addressing the resource dimensions of rich clinical experiences and the roles they need to play in teacher preparation.

MEASURING THE COST EFFECTIVENESS OF RICH CLINICAL PRACTICE IN TEACHER PREPARATION: PART ONE, UNDERSTANDING THE PROBLEM

1. Introduction and Background

Introduction

The purpose of this document is to conduct a preliminary investigation of the cost effectiveness of rich clinical practice in the preparation of teachers. In the National Council for Accreditation of Teacher Education (NCATE) 2010 report, *Transforming Teacher Education Through Clinical Practice: A National Strategy to Prepare Effective Teachers*, the authors argue that preparation of effective teachers requires programs to be “grounded in clinical practice and interwoven with academic content and professional courses.” (NCATE, 2010, p. ii). The report further argues that such practices in teacher education may require more resources, but that such an approach will, in the long run, be more cost effective (p. iv). However, relatively little is known about the cost effectiveness of greater reliance on rich clinical practice in teacher preparation. Moreover, at the present time, there is an emerging but not yet complete agreement in the field about what constitutes rich clinical experience.

This document is the first part of a proposed two-part investigation into assessing the cost effectiveness of rich clinical practice in teacher preparation. In this study, we describe our findings from a comprehensive literature review of clinical practices in teacher education, along with, a conceptual analysis of how to measure the costs associated with rich clinical practices. Finally we present some early results from a trial effort to estimate resource flows into several existing student teaching experiences for pre-service teachers. We hope these preliminary results will stimulate interest in conducting a more thorough, large-scale effort to assess the costs of rich clinical experiences in teacher preparation.

This study includes the following components:

- A research literature review of clinical practice that focuses on both traditional and alternative approaches to offering clinical experiences for teacher candidates. The literature review attempts to establish what is known about both the impact of different kinds of clinical experiences on teacher effectiveness and the associated costs.
- A conceptual framework that identifies the costs and benefits of clinical practice. The framework considers both what we know about clinical practice in teacher education as well as what we know more broadly about clinical preparation in other fields such as medicine.

- An assessment of the availability of data to conduct a comprehensive cost effectiveness analysis of clinical education programs using several examples of programs that currently include a variety of forms of clinical experiences for teacher candidates.

Our hope is to provide insights into what is required to conduct a more comprehensive, data based, analysis of clinical programs and to understand both their costs and benefits. Although, as described below, this is not a simple task, such an analysis would enable teacher preparation programs to better allocate scarce resources toward clinical training approaches that appear to be the most cost effective in preparing successful teachers.

Following this introduction, section two provides a summary of current literature on the effectiveness of rich clinical practice in teacher preparation. Section three provides a discussion of the concepts of costs and benefits in the field of education, and the development of a framework for analyzing the cost effectiveness of rich clinical practices. Section four offers insight into the types of programs that could be evaluated in a larger scale study focusing on traditional teacher preparation programs, alternative teacher preparation programs and on-line alternatives to the current approach of most schools of education. The fifth and final section shares conclusions and outlines the major components of a more extensive cost effectiveness study that might occur as a next step. We do not outline the specific details of such a study, but rather offer our view as to how it would be conducted generally with the understanding that NCATE is interested in pursuing this line of research further. We hope this report will prove to be helpful in the larger effort to assess the actual cost-effectiveness of rich clinical practice within teacher education.

Background

Table 1 identifies the number of institutions; schools of education, alternative teacher training organizations (Teach for America [TFA], The New Teacher Project [TNTP], and others), and district based teacher education programs that provide teacher training and would be impacted by changes in clinical experiences for teacher training. As the table shows, the United States Department of Education identified over 2,000 teacher education programs that enrolled over 724,000 students in the United States in 2008-09. Table 1 shows that nearly three-fourths of those programs can be classified as traditional teacher education programs, while among alternative programs, most are based in institutions of higher education (IHEs). Interestingly, although there are more IHE based alternative training programs, there are less than 5,000 fewer students in the non IHE based alternative programs. This suggests that alternative teacher education programs that are based in institutes of higher education enroll fewer students per program than those programs not based in institutes of higher education.

Table 1*Enrollment and number of teacher education programs in the United States, 2008-09*

	Total	Traditional	Alternative (IHE based)	Alternative (non IHE based)
Total Enrollment	724,173	642,448	43,186	38,539
Number of programs	2,054	1,458	431	164

Source: U.S. Department of Education, Office of Postsecondary Education. (2011).

Looking more deeply at the data on teacher training, we find that of the 724,173 students enrolled, 50 percent were taking part in supervised clinical experience during the 2008–09 school year, (USDOE, 2011).

It is clear that substantial numbers of teacher education students exist, all of whom are presumably in need of some kind of clinical experience as part of their training. While most (if not all) teacher education programs today have some form of student teaching or clinical experience, a richer experience may require more time and/or resources on the part of teacher trainees, teacher training institutions and the schools and school districts where the experience takes place. While it seems that richer clinical experiences would lead to substantial increases in costs, if it also results in improved teaching, it may well be a good investment. Before estimating the costs and benefits of alternative clinical experiences, it is helpful to understand more about the effect of clinical work in teacher training and to outline the approaches that can be used to measure the costs of changes in clinical experiences in teacher education. Our literature review provides insight into these issues in the following section.

2. Literature Review on Clinical Experiences for Teacher Education

Recent research has identified teacher effectiveness as the most important school resource for raising student achievement (Chetty, Friedman, & Rockoff, 2011; Aaronson, Borrow & Sander, 2007). Current policy recommendations include removing teachers with the lowest student test scores gains (Hanushek, 2010), investing in high quality professional development (Odden & Picus, 2008), and recruiting and training the highest quality teachers (Darling-Hammond & Baratz-Snowden, 2005). Policymakers, teachers, and school district leaders nationwide have lamented that teacher education programs lack the necessary capacity to prepare highly effective educators (Berry, 2010). In response to these challenges, researchers have begun to assess the relative merits of alternative approaches to teacher education that prepare teachers to be highly effective in the classroom (Grossman & McDonald, 2008).

Teacher education programs are structured in a variety of ways and graduate teachers with varying levels of expertise. Virtually all teacher education programs include some form of clinical experience that places aspiring teachers in actual classrooms, allowing them to practice skills learned in coursework without assuming the responsibility of a fulltime teacher. The design of clinical field experiences within teacher education programs varies widely across the country; however, according to Linda Darling-Hammond, this component is often “tacked onto the end, a short immersion into a confusing whirl of activity” (Darling-Hammond, p. 6, 1999), with little chance for reflection and refinement. Empirical research suggests that particular characteristics of clinical experience in teacher education programs are associated with later student achievement gains (Boyd, et al., 2009). Moreover, teacher survey data from multiple contexts have recognized field experience as the most important component of teacher education (Cochran-Smith & Zeichner, 2005; Guyton & McIntyre, 1990; Moore, 2010). Thus in an effort to expand the expertise of novice teachers, researchers and teacher educators have begun to identify high leverage strategies for improving the clinical experience within teacher education programs.

A panel of experts on teacher education called for a restructuring and expanding of field experiences for teacher candidates that includes improving mentoring, building partnerships between school districts and teacher education programs, and placing clinical practice at the heart of teacher preparation (National Council for the Accreditation of Teachers, 2010). Early evidence suggests that programs with these features show promise in raising student achievement and lowering teacher turnover (Boyd, et al., 2009; Darling-Hammond & Hammerness, 2005; Howey, 2011). Implementing such a framework would likely require reallocation and possible expansion of resources for school districts and teacher education programs. However, little is known about the actual costs of this new approach. Therefore, whether such reallocation and expansion of resources will be cost-effective compared to traditional clinical experiences has yet to be investigated. To address these issues, we explore the following two research questions:

1. To what degree does existing research differentiate among particular types of clinical experiences in terms of later teacher effectiveness?
2. To what degree has extant research identified effective practices of clinical experience with respect to the duration of the experience, its sequence in teacher education programs, and the amount of time spent in clinical experiences compared to time spent in coursework by the teacher candidate?

We consider the issue of costs associated with implementing clinical experiences within teacher education programs that employ research-based best practices in the next section of this report.

The first research question investigates the preparedness of teachers graduating from different teacher education programs in the United States. Research question two examines particular characteristics of clinical experiences that are found to increase teacher effectiveness. We focus on the sequencing, quality, and quantity of clinical experiences within a teacher education program as each of these components has implications for cost.

These research questions are addressed in three parts. Part one discusses the impact of career experience on teacher performance in general. Early career experience has been identified as one of the most impactful observable teacher characteristics for improving student outcomes (Clotfelter, Ladd & Vigdor, 2007; Kane, Rockoff & Staiger, 2006; King, 2010). However, some evidence suggests that the impact on student achievement of effective clinical experiences may equal that of teachers' early career experience (Boyd, et al., 2009). These findings provide a rationale for investigating effective practices of clinical experiences for teacher candidates. Part two describes learning theories that may provide guidance for the design of teacher education. Part three draws on extant literature to identify the characteristics of effective clinical experiences.

Part 1: Rationale for Improving the Clinical Experience

A four-year study of U.S. teacher education programs found that 63 percent of recent graduates reported feeling unprepared for classroom realities (Levine, 2006). At the same time, state departments of education identified only two percent of teacher education programs as "low performing" (USDOE, 2011). Although states rarely identify whole teacher education programs as low performing, teacher survey data suggest that some components, including clinical experiences, can be enhanced in ways that increase preparedness (Darling-Hammond & Bransford, 2005; NCATE, 2010). Evidence of the effect of classroom experience on teacher effectiveness assesses the extent to which teachers learn in the field and improve their practices. Research consistently shows that, on average, teachers with some classroom experience are more effective than those with no experience (Clotfelter, Ladd & Vigdor, 2007; Harris & Sass, 2007; Kane, Rockoff & Staiger, 2006; King, 2010; Ladd, 2008). Classroom teaching experience has a larger effect on student achievement than most observable teacher characteristics, including licensure test scores, obtaining a master's degree and National

Board certification (King, 2010). As teachers gain experience, they acquire job-embedded knowledge and understanding that informs their practice.

The effect of experience on student achievement diminishes over time, and the first year of teaching is particularly important (Kane, Rockoff & Staiger, 2006; Harris & Sass, 2007). For middle school math teachers in New York City, Boyd, et al. (2007) found that the first year alone accounted for more than half of the total return on experience throughout a teacher's career. Building on this research, Boyd, et al. (2009) investigated attributes of teacher education programs that led to higher student achievement gains after candidates had completed two years of teaching. During the first year in the classroom, teachers exposed to more practice-oriented coursework during their teacher education had a greater impact on student achievement gains, while content-related courses were effective only in the second year of teaching.

This finding suggests that while a strong understanding of the subject matter is important during the first year, it is also important for a teacher to be able to effectively manage classroom behavior. After the crucial first year of teaching, those teachers who are not exposed to opportunities to master classroom management learn these skills on the job, and the positive effect of content knowledge can be isolated (Boyd, et al., 2009). Indeed, previous studies have found that teachers learn classroom management skills during the first year of teaching, rather than in coursework (Merret & Whendall, 1993). Thus effective clinical experiences may enhance teacher candidates' ability to manage classroom behavior. Such an impact may also increase the marginal effect of content knowledge and thus the overall performance of first year teachers.

The impact of experience on teacher effectiveness varies across diverse school contexts. Teachers tend to improve their practice over time at a slower rate in high poverty schools (Hannaway, Sass, Figlio & Feng, 2009), suggesting that the actual impact of clinical experience is sensitive to school context. Investigating the distribution of teacher effectiveness between schools, Hannaway and her colleagues (2009) found that differences in the level of teacher experience between high and low poverty schools did not explain a substantial amount of the variation in teacher effectiveness. In contrast, the marginal effect of experience on student achievement differed dramatically across high and low poverty schools. For teachers in North Carolina, additional years of experience were associated with greater student achievement gains in low poverty schools, while in high poverty schools, the marginal the effect of experience for teachers was much smaller, though still positive. The impact of additional years of experience on teacher effectiveness motivates inquiry into pre-service teachers' clinical experience. However, such research must be sensitive to the impact of local school context as some clinical experiences may lead to greater learning opportunities than others (Anderson & Stillman, 2010). In summary, while improving clinical experiences shows promise for increasing teacher effectiveness, school context plays an important role in shaping the design and outcome of teacher candidates' clinical experiences.

Teacher education programs aim to produce learning experiences that mirror valuable on-the-job training. Several studies investigating teacher preparation have demonstrated that

particular types of learning experiences are more effective at preparing candidates (Hammerness, & Darling-Hammond, 2002; Koppich, 2000; Snyder, 2000). Unfortunately, content knowledge and a commitment to principles and ideals alone are not sufficient to prepare a teacher for success in the classroom (Kennedy, 2005). Even the best educational experience cannot fully prepare teacher candidates for the complex interactions of teaching and learning; however, clinical experiences provide valuable learning opportunities (Darling-Hammond, 1999). An understanding of effective clinical experiences may be more accessible through the use of contemporary learning theories.

Part 2: Clinical Experience Through a Learning Theory Framework

The structure and design of teacher education programs are not always aligned with practices supported by learning theories (Darling-Hammond & Bransford, 2005). Simply observing effective classroom instruction is not sufficient for candidates to gain the knowledge, skills, and dispositions required for excellent teaching (Sabers, Cushing & Berliner, 1991; Joyce & Showers, 2002). As noted above, teachers consistently report that field experiences are the most important aspect of their preparation. However, just as additional years of classroom experience have differential effects on teacher effectiveness (Hannaway, et al., 2009), field experiences differ in their effect on preparedness. In general, when teacher candidates are given the opportunity to apply newly acquired knowledge and skills in classroom settings and supported through coaching and mentoring, the benefits of practical experience enhance learning opportunities (Howey & Zimpher, 2010; Levine, 2010).

Experiential learning theories are most widely explored in the work of John Dewey (1902, 1938), who argued that people learn best through experience that involves feedback and reflection. As Dewey noted, learning through experiences is not a simple task; the inherent unpredictability of human interactions in practical settings presents challenges for productive learning. Scholars have built on these theories to highlight the importance of learning through experience (Bruner, 1990; Ericsson, 2002; Ericsson, Krampe & Tesch-Romer, 1993; Kolb & Fry, 1975). The concept of “deliberate practice,” first introduced by Anders Ericsson (2002), helps to explain the importance of coaching during skill development. David Kolb and Ron Fry (1975) developed the Experiential Learning Model, which suggests that learners must possess four key capacities in order to gain authentic knowledge through experience. Finally, in his influential book *Schoolteacher* (1975), Dan Lortie described challenges in developing into an expert teacher. Each of these applications of learning theory is discussed below in relation to teacher education.

Ericsson (2002) argued that experts are not born with innate talent; they develop skills through many hours of deliberate practice with guidance from expert coaches. Deliberate practice involves focusing on areas that individuals have not yet mastered (Ericsson, Krampe & Tesch-Romer, 1993). Importantly, not all practice leads to expert performance. Learners must practice with a high degree of concentration and reflection in order to conceptualize how to improve. Ericsson, Prietula and Cokely (2007) studied

how experts engage in practice across various domains including sports, music and medicine. Rather than simulating a formal competition, professional golfers practice by retaking the same shot several times before they move on to the next task. Under the guidance of an expert teacher, golfers learn to master particular shots through repeated practice, intense concentration and feedback. As individuals develop their skills, knowledge becomes innate and effective practices require less cognitive demand (Ericsson, Prietula & Cokely, 2007). Teacher candidates can engage in deliberate practice through the guidance of expert teachers within the school. As Moore (2010) points out, extending the length of clinical experiences beyond what traditional student teaching entails will not guarantee improved outcomes. Clinical experience that ignores the importance of guidance and reflection may not be as effective in providing valuable learning opportunities for novice teachers.

Teacher candidates benefit from some understanding of pedagogy prior to beginning their clinical experiences (Ball, Sleep, Boerst & Bass, 2009). The Experiential Learning Model (Kolb & Fry, 1975), originally developed for adult education, described four key elements that facilitate authentic learning through experience. First, learners are actively involved in a concrete experience. Second, they are able to reflect on that experience. Third, learners possess domain-specific analytical skills to formulate abstract concepts based on reflection. Finally, learners are able to employ newly learned concepts in other settings. This model suggests teacher candidates require some understanding of content and pedagogy prior to beginning clinical experience. Such prior knowledge may facilitate a teacher candidate's ability to understand abstract concepts developed through experience and reflection. As stated above, mentoring provided by cooperating teachers and faculty members can encourage reflection and help candidates apply new pedagogical expertise in other classroom settings.

Developing effective teachers necessitates conceptualization of teacher candidates' prior knowledge and understanding of pedagogy. Lortie (1975) first described the problem of the "apprenticeship of observation" to explain dispositions of beginning teachers as they enter the field. Pre-service teachers naturally bring preconceptions of teaching acquired as young students in elementary and secondary school. In contrast to beginning lawyers or doctors, most novice teachers have already been exposed to many hours of teaching. This observation reveals the explicit activities of teachers: leading discussion, lecturing and grading papers, but students are not exposed to activities such as lesson planning, setting goals, and analyzing trends in student work. Engaging in deliberate practice is necessary to develop these important skills. Simply observing effective instruction is insufficient; the wider lens of experiential learning theories suggests the need for clinical experiences to move beyond a focus on teacher observation (Darling-Hammond & Hammerness, 2005). The following section draws on theory as well as empirical research to describe five characteristics of effective practices of clinical experience.

Part 3: Characteristics of Effective Clinical Experiences

Existing on teacher education research has identified strategies for ensuring that prospective teachers are exposed to high impact clinical experiences (Boyd, Grossman, Lankford, Loeb & Wyckoff, 2009; Guyton & McIntyre, 1990). The efficacy of these strategies depends on how candidates are prepared in general, thus rather than examining clinical experiences in isolation, this review explores teacher preparation holistically. The literature identifies five key attributes of clinical experiences within teacher education that are associated with increased teacher preparedness. These include: 1) focus on practice in teacher education courses; 2) mentoring and coaching; 3) coherence in the vision of teaching; 4) integration of coursework and clinical experiences; and 5) partnerships as the driving force for change and improvement. While these key elements emerged from a review of the literature, we see them reflected in the ten design principles described in the NCATE Blue Ribbon Panel report. Each of these characteristics is described in turn below.

(1) Focus on Practice in Teacher Education Courses

The first characteristic relates broadly to teacher preparation in general. As noted in the literature, clinical experiences in isolation “may not ensure either the occasion to encounter certain kinds of teaching problems or the impetus to develop and demonstrate particular skills,” (Darling-Hammond & Hammerness, 2005, p. 419), thus teacher candidates benefit from coursework that involves practical concerns of teaching (Ball & Cohen, 1999). Additionally, the impact of clinical experiences on teacher preparedness depends, to some degree, on the content of coursework in the preparation program (Downey & Cobbs, 2007), thus a discussion of coursework recommended by extant research is warranted.

Researchers have not reached consensus on the type of coursework most effective at increasing teacher preparedness. Practice in teacher education coursework typically refers to courses that focus on the daily work of teachers, as opposed to theoretical foundations of learning and pedagogy (Lampert, 2010). Subject area coursework refers to classes in the candidates’ field of teaching. While some practice-oriented courses are associated with increased teacher preparedness (Boyd, et al., 2009; Harris & Sass, 2007), not all practice-based classes better prepare teachers. For example, Kennedy (2005) found that attending to narrow areas of practice in teacher education caused English teachers to focus heavily on technical aspects of writing such as grammar and conventions rather than students’ capacity to communicative ideas effectively. In addition, research suggests that teacher candidates who enrolled in more content area coursework were associated with higher levels of student achievement compared to teachers with less subject area preparation (Monk, 1994). While both practice-oriented and subject area coursework show promise for improving teacher preparedness, an emerging theme from the literature suggests specific types of practice-based courses can be particularly effective (Ball, et al., 2009; Boyd, et al., 2009; Darling-Hammond & Hammerness, 2005). Evidence from New York City schools indicated that more coursework on state curriculum standards during teacher preparation predicted higher student achievement gains for first year teachers (Boyd, et al., 2009). Programs with more practice-based coursework that involved planning a guided reading lesson or

analysis of student math work were also associated with higher student achievement gains. Although research has begun to identify coursework that is most effective for preparing teachers, the complexities of teaching and learning make it difficult to generalize these studies to diverse school contexts.

Hiebert and Morris (2009) identified the two central problems facing teacher education programs in the United States: a) the lack of a solid knowledge base for what teachers should know to enter the profession and b) a lack of understanding for how best to teach this content. Quantitative analyses provide evidence of the effectiveness of courses focused on practice. However, such studies provide little insight into aspects of practice appropriate for coursework or pedagogical approaches for the teaching of practice. Ball, et al. (2009) argued that resolving these two central problems is essential for improving teacher education. Without a professionally agreed upon curriculum for practice-based coursework, teacher candidates' learning experiences become a function of the particular orientation of individual instructors and cooperating teachers (Hiebert & Morris, 2009). The paucity of established pedagogy for teaching practice and the lack of support for new teacher educators leaves instructors to decide on their own the best methods to teach practice. Fortunately, strategies to address these challenges are beginning to emerge in the literature. We discuss strategies to alleviate each of these problems next.

a) Identifying practices appropriate for coursework. Deciding the particular knowledge and skills a teacher candidate will learn either in the field or during coursework represents a formidable challenge for teacher educators. As noted, there is a lack of a well-established knowledge base for best practices in teaching (Hiebert, Gallimore & Stigler, 2002) and the requisite knowledge for effective teaching has not been succinctly identified. As reported by Ball, et al. (2009), teacher educators at the University of Michigan focus on the most fundamental elements of teaching, which they refer to as “high-leverage practices¹,” (Ball, et al., 2009, p. 460). While particular practices may vary with content and context, some examples include preparing a lesson, facilitating a rich class discussion, and assessing the nature of individual students' learning difficulties. In that study, high leverage practices were identified based on two criteria, generalizability and teachability. Generalizable practices include those that can be applied in diverse settings, are frequently used by teachers, and improve the learning of all students. Teachable practices are those that can be: articulated and taught to teacher candidates, reconsidered in an increasingly sophisticated manner, and practiced in the field by beginning teachers (Ball, et al., 2009).

In addition to identifying practices that are generalizable and teachable, studies have recognized the necessity of teacher candidates to study content-specific pedagogy (Ball & Forzani, 2009; Grossman & McDonald, 2008; Horowitz, Darling-Hammond & Bransford, 2005; Shulman, 1986). As Ball and Forzani (2009) note, “reading or writing well is necessary but insufficient to supply the knowledge and skill needed to help others learn to read and write,” (p. 500). Similarly, mathematics teachers must identify not only when students answer questions incorrectly, but also what line of thinking led that student

¹ This concept has also been adopted by Grossman, Hammerness, and McDonald (2009), Franke and Chan (2007), and by Suzuka, et al. (2009).

to the mistaken solution (Ball, et al., 2009). Horowitz, Darling-Hammond and Bransford (2005) describe assessment strategies in mathematics courses in which particular incorrect answers reveal a student's misunderstanding of a problem. For instance, in the division of fractions, one incorrect answer may suggest a student is struggling with division, while another may reveal that a student does not understand the concept of fractions (Horowitz, Darling-Hammond & Bransford, 2005).

b) Methods for teaching practice. A second challenge to focusing teacher education courses on practice is establishing effective methods to teach practice-oriented classes. Grossman and her colleagues (2009) compared methods used in the teaching of professional practice for teachers, clergy members, clinical psychologists. Their study found that the teaching of practice is often discussed in terms of representations, decomposition, and approximations of practice. As described by Cohen and Ball (1999) as well as Lampert and Ball (1998), representations of practice may include curriculum materials, examples of student work, video of expert teachers or example lesson plans. Silverman, Welty and Lyon (1995) also describe narrative accounts of classroom dilemmas as useful representations of practice. Decomposition of practice involves breaking down particular aspects of teaching for intensive study, encouraging the development of a shared technical language for teaching (Lortie, 1975). Finally, approximations of practice use simulated experiences in controlled settings that might include role-play exercises or practicing informal assessment of students through use of video. Sometimes referred to as micro-teaching (Allen & Wang, 1996), approximations provide teacher candidates with opportunities to engage in deliberate practice (Erikson, 2002).

The NCATE Panel (2010) described these pedagogical methods of teacher preparation as laboratory experiences. They rely heavily on technology, providing teacher candidates with “opportunities to learn through on-line and video demonstrations, analyzing case studies representing both exemplary practice and common dilemmas, and participating in peer and micro-teaching,” (NCATE, 2010, p. 10). Providing such technologies in schools requires districts procure necessary equipment and train staff to use the new technologies. As Grubb (2009) argues, ensuring the effectiveness of compound school resources such as technology-based interventions requires that school districts train employees to use technology.

The Panel (2010) also suggests that in order to further establish the knowledge base of teaching practices appropriate for coursework, and pedagogical approaches to teach such practices, teacher education programs need a core clinical faculty of educators. These claims are supported in other literature, which highlights a reliance on adjunct faculty as teacher educators in schools of education (Darling-Hammond & Hammermass, 2005; Wolf-Wendel, Baker, Twombly, Tollefson & Mahlios, 2006). At the same time, teacher educators are expected to draw on their own classroom experience; Moore (2010) argues that clinical faculty “should themselves have demonstrated accomplished or at least highly effective teaching, and periodically have to *re-demonstrate* it. That ability should be demonstrated within the PK-12 context and within the teacher preparation program itself,” (p. 8). The NCATE Panel suggests higher education “create dual assignments for

faculty with an ongoing role as teachers and clinical educators in schools [and] shift their reward structure to value work in schools by including clinical faculty lines in promotion and tenure requirements,” (p. 20). In summary, procuring and learning to use technology as well as establishing a core clinical faculty are necessary steps towards refocusing teacher preparation coursework on effective practice. Unfortunately, these measures require a significant investment for teacher education programs, and the return on such an investment remains unclear.

(2) Mentoring and coaching during clinical experience

A second component of an effective clinical experience involves intensive coaching and mentoring. Simply placing teacher candidates in the presence of well-established and highly effective teachers does not guarantee that teacher candidates will master pedagogical skills. Mentors can enhance candidates’ capacity to respond to difficult classroom situations (Britzman, 1991). For instance, structured opportunities to reflect on field experiences provide teacher candidates opportunities to learn about specific aspects of teaching (Moore, 2010). Studies of professional learning for pre-service and in-service teachers have identified effective strategies for improving instruction and raising student achievement (Yoon, et al., 2007).

An emerging paradigm in research on professional development suggests traditional learning experiences for teachers that are short term, removed from the school setting and lack coherence, are ineffective at raising student achievement (Darling-Hammond, et al., 2009). A three-year study by Desimone and her colleagues (2002) investigated specific features of teacher professional development associated with instructional change. Teachers reported altering their instruction when learning experiences involved active learning, when there was coherence in professional development throughout the school year, and when teachers collectively participated. In summary, extant research suggests effective professional learning for teachers is based in the school community, requires active and collaborative teacher participation, and creates opportunities for extended learning over time.

Closely analyzing the practices of one effective mentor of new teachers, Feiman-Nemser (2001) identified four key strategies mentors can use to enhance professional learning. First, mentors help teachers identify specific ways to improve instruction. Feiman-Nemser described mentors’ identification of “openings,” that referred to situations in which teachers self-identify areas of improvement. When teachers are given choice in their own professional development, they are likely to be more motivated to learn (Hord & Sommers, 2007). Second, mentors help new teachers understand theory and develop a shared technical language (Lortie, 1975) to articulate practical classroom issues. Such language allows novice teachers to seek help from experienced teachers while maintaining a professional accountability (Little, 2003). Third, mentors also help identify areas novice teachers are highly skilled or showing improvement. By pointing out areas of growth, mentors help teacher candidates and new teachers “visualize their evolving style, clarify what they need to work on, and concretize their own vision of good teaching,” (p. 23). Finally, an effective mentor models lesson planning and effective

classroom teaching. The concept of cognitive apprenticeships (Collins, Brown & Holum, 1991) describes mentors' use of thinking out loud so that candidates can learn how teachers think through potential lessons. The presence of teachers that can model culturally relevant pedagogies increases the likelihood that new teacher will incorporate such pedagogies into their own practice (Rodriguez & Sjostrom, 1995). Modeling classroom teaching also allows new teachers an opportunity to envision one type of effective teaching; such experiences are more effective when accompanied with follow up discussions that probe teacher candidates' interpretation of the observation (Feiman-Nemser, 2001; Killion & Harrison, 2006).

As suggested by the NCATE Panel (2010), teacher candidates can receive mentoring from cooperating teachers, school-based coaches and teacher education faculty. Candidates have more opportunities to build knowledge during clinical experiences when placed with effective cooperating teachers (Anderson & Stillman, 2010). In addition, faculty oversight during student teaching is associated with student achievement gains for first year teachers (Boyd, et al., 2009). Unfortunately, mentoring programs for teachers vary widely in terms of intensity, commitment and effectiveness (Shields, et al., 2001). Mentoring and coaching require a significant investment for school districts (Miles, Odden, Fermanich & Archibald, 2004), and some evidence identifies cost as an impediment to the implementation of coaching programs in schools (Cortina, 2011). Few studies have examined the cost or cost-effectiveness of mentoring or instructional coaching (Borman & Feger, 2006; Knight, 2012), and further research in this area is warranted.

(3) Coherence in the vision of teaching

Snyder (2000) defined coherence in the vision of teaching as including both consistency between courses within the teacher education programs as well as between coursework and clinical experiences. In case studies of nine teacher education programs, Tatto (1996) found that teacher candidates were better prepared when programs were more coherent and had a strong vision of what effective teaching looks like. Building coherence among courses can be challenging because adjunct clinical faculty often design and teach classes in isolation of other faculty members (Darling-Hammond & Hammerness, 2005). Collaboration among clinical faculty in some teacher education programs can facilitate improved coherence among courses (Gallagher, Griffin, Parker, Kitchen & Figg, 2011).

The disconnect between what teachers learn during coursework, and the reality experienced in the classroom can hinder learning during clinical experiences (Feiman-Nemser & Buchmann, 1985; Gore & Zeichner, 1991; Stillman & Anderson, forthcoming; Zeichner, 2010). LaBoskey and Richert (2002) conducted case studies of two teacher education students during student-teaching experiences, finding that when school staff and university faculty have similar goals of a student-teaching program, clinical experiences have a stronger impact on the development of pre-service teachers' pedagogical skills. Conversely, if faculty members expect candidates to teach in ways that differ from cooperating teachers, professional learning during clinical experiences

may be hindered (LaBoskey & Richert, 2002). Feiman-Nemser and Buchmann (1985) used vignettes of pre-service teachers to uncover challenges during student-teaching experiences. Their findings suggest that if coursework and clinical experiences contrast in term of espoused ideas of teaching and learning, students-teachers may feel discouraged and confused in applying their knowledge.

Reviewing 93 empirical studies, Wideen, Mayer-Smith & Moon (1998) found that effective teacher education programs offer consistent long-term support for teacher candidates. In many instances, school districts have little input in placement decisions of pre-service teachers and such decisions are not made systematically (Darling-Hammond & Hammerness, 2005). Although teacher education faculty are often removed from classroom settings, they have traditionally had sole responsibility for determining whether student-teachers fulfill their requirements during clinical experiences (NCATE, 2010). Enhanced coherence between clinical experiences and teacher education coursework can be facilitated through improved partnerships between schools, districts, and preparation programs (Howey & Zimpher, 2010).

(4) Integration of coursework and clinical experiences

Research suggests clinical experiences should take place throughout teacher education, rather than as a culminating experience (Andrew, 1990; Ball & Forzani, 2009; Chin & Russell, 1995; Darling-Hammond & Hammerness, 2005). The NCATE Panel (2010) posit that effective teacher preparation is clinically based and “fully integrates content, pedagogy, and professional coursework around a core of clinical experiences,” (p. 8). Andrew (1990) found that teachers with student-teaching experiences that were integrated into coursework, rather than included at the end, on average, spent more time evaluating student work and interacting with students’ parents and other teachers. The notion of a spiral curriculum (Bruner, 1977) describes an approach where students relearn material in increasingly complex fashion. Thus integrating coursework with clinical experiences encourages teacher candidates to gain a deeper understanding of complex teaching practices.

As noted above, some subject areas of teacher education are well suited for coursework; these include content-specific pedagogy, leaning to construct lesson plans and developing content knowledge (Grossman, et al., 2009). Other subject areas, such as classroom behavior management, may be more easily learned within the context of a school setting (Merret & Whendall, 1993). However, extant research provides less guidance for determining the optimal amount and sequence of clinical experience (Boyd, et al., 2009). Some teacher education programs involve as many as seven clinical experience placements throughout the program (Laine, Laine & Peavey, 1999), although many include only a single capstone field experience for teacher candidates (Darling-Hammond, 1999).

Determining the most appropriate sequence for clinical experiences is challenging because local context plays a strong role in determining what teachers gain from classroom experience (Hannaway, et al., 2009). Research has not reached consensus on

how clinical experiences should be distributed throughout teacher education programs. On the one hand, experience in the classroom is likely to facilitate enhanced learning opportunities in teacher education coursework. Prior teaching experience for candidates is associated with improved performance in methods courses (Denton, 1982). On the other hand, observations of effective teaching may be ineffective if students do not know what to look for. For instance, Grossman, et al. (2009) argue that students should be able to identify individual micro-practices that an instructor engages in while teaching. Stevens and Hall (1999) refer to “disciplined perception” to describe a students’ ability learn by observing teachers. To maximize the impact of clinical experiences, students must be able to decompose individual actions and interpret what is observed (Feiman-Nemser & Buchmann, 1985; Stevens & Hall, 1999). In general, past studies have found that teachers have a greater ability to apply learning to practice when the clinical experiences take place over an extended period of time and is concurrent with theory-based coursework (Chin & Russell, 1995; Gore & Zeichner, 1991).

While the ideal sequence of clinical experiences is not widely agreed upon, researchers have made more progress in establishing recommendations for the quantity of clinical experiences necessary to adequately prepare teachers. Current literature suggests many teacher education programs in the United States place teacher candidates in classrooms for too little time (Castle, 2008). Howey (2010) described a hypothetical teacher preparation experience that involves intense clinical experience, beginning early in the teacher education program and extending to the final semester. As the teacher candidate progressed through the program, clinical experiences involved more responsibility and more time spent in schools; leading to a total of five district field placements (Howey, 2010).

Darling-Hammond (1999) argued that pre-service teachers should be provided with clinical experiences that last at least thirty weeks. Alternatively, the Boston Teacher Residency places teacher candidates in urban schools for one year with increasing levels of instructional responsibility; these teachers are more likely to remain in schools after three years than graduates of other programs. (Berry, Montgomery & Snyder, 2008). To conclude, while it remains somewhat unclear what the ideal quantity of clinical experiences, research suggests such experiences should be interwoven throughout coursework. Table 2 below shows the average number of hours required in preparation programs in the United States, revealing that the majority of time teacher candidates devote to field experiences takes place during the capstone student-teaching experience.

Table 2*Average number of hours required for clinical experiences by program type, 2008-09*

	All preparation programs	Traditional	Alternative (IHE-based)	Alternative (non IHE-based)
Prior to student-teaching	172	177	151	169
During student-teaching	557	514	725	901

Source: U.S. DOE, Office of Postsecondary Education. (2011). Higher Education Act Title II Reporting System.

(5) Partnerships as the driving force for change

The final characteristic of effective clinical experiences is a heavy reliance on partnerships. Ultimately, the above four characteristics: practice based coursework, coaching, coherence, and integration of coursework and clinical experiences, can only be achieved by first establishing partnerships between school districts and teacher education programs. Institutional partnerships move beyond the traditional triad between teacher candidates, the cooperating teacher and clinical faculty (Valencia, Martin, Place & Grossman, 2009).

Effective partnerships have emerged in a limited number of teacher education programs across the country. Professional Development Schools are designed to provide ideal settings for clinical experiences and are often characterized as built on partnerships between schools and university-based teacher preparation programs (Holmes Group, 1995). According to the Holmes Group Report on professional development schools, “faculty and students in schools of education should work predominantly in professional development schools rather than on college campuses; education schools should join together to form an interconnecting set of networks at local, state, regional, and national levels to ensure better work and accountability” (p. iv). Such schools emphasize inquiry into teaching practices, provide systems of support for new teachers and encourage collaboration between teachers, school-based coaches and university faculty (Sandholtz & Dadlez, 2000). Unfortunately, the practices employed in Professional Development Schools are not always equal, leading to conflicting findings about how effective these schools are at preparing teachers (Mantle-Bromley, 2002).

The NCATE Panel (2010) refers to partnerships explicitly as a vehicle for improving teacher preparation. Partnership between school districts and teacher education programs may facilitate increased opportunities for mentoring from school-based staff and clinical faculty as well as better coherence between teacher preparation coursework and school-based practices. For instance, clinical faculty may select schools for teacher candidates

that are better aligned with the vision of effective teaching and where more coaching is available. As with the other characteristics of effective clinical experiences, this reform will require increased investment from departments of education and reallocation of resources at the school level.

In the next section of this report, we discuss cost analysis methods commonly used in educational research.

3. Cost Analysis Methods: Applications to Teacher Professional Development and Teacher Education, and a Suggested Cost Framework for Clinical Experiences

We address the costs associated with restructuring and expanding clinical experiences within teacher education programs in three parts. First, part one reviews methods commonly employed in cost analyses in education. These studies draw on the concept of cost, developed in economics literature (Levin & McEwan, 2001; Stiglitz, 2000). Next, part two reviews research investigating the total spending on, and effectiveness, of teacher education and professional development. Studies examining the investment in professional development typically utilize a framework of expenditure, rather than cost, a distinction we discuss below. Finally, part three describes the specific components of effective practices of clinical experience in terms of cost and provides a framework for conducting an analysis of the economic cost of effective clinical experiences.

Cost Analyses Methods

Here we describe the methods commonly used in educational cost analysis. Studies that incorporate measures of effectiveness compare the opportunity costs of alternative resource allocations to inform policymakers and school leaders of efficient use of limited resources (Stiglitz, 2000). Such studies employ the “ingredients” method to measure costs, which is comprised of three steps (Levin & McEwan, 2001). The first step is to list the quantity and quality of all required resources of the program or initiative. Second, prices are attached to each resource, usually based on national average market values. Finally, costs are apportioned according to the party that bears each cost (Levin & McEwan, 2001). When measures of effectiveness are available, analysis can compare the cost-effectiveness of alternative resource allocations and assess the merit of potential tradeoffs. Below we describe four particular challenges that can arise in conducting rigorous educational cost analyses.

(1) Differences between costs and expenditures

Strictly speaking “costs” are measures of the minimum level of opportunities foregone in order to achieve a particular outcome or result. Foregone opportunities are often assessed in monetary terms and it is therefore common to associate costs with dollars.

Expenditures, in contrast, are measures of resource flows regardless of the outcomes achieved. Put differently, it is possible to spend much more to achieve a given result than is actually necessary and as a consequence expenditure measures can significantly exceed actual costs.

Expenditures are also frequently measured in terms of dollars. Given the common dollar metric for costs and expenditures, the two concepts are frequently conflated. It is also the case that measures of expenditures are easier to obtain than are measures of costs with the result that cost analyses frequently rely on expenditure data. While expenditure data can

be useful in gaining insights into costs, the disconnection between expenditures and results needs to be kept in mind.

(2) *Difficult to measure costs*

King (1994) utilized the ingredients method (Levin & McEwan, 2001) to assess the cost of three comprehensive school reform models: Slavin's *Success for All*, Levin's *Accelerated Schools* and Comer's *Schools Development Program*. To determine the various ingredients, King examined the publications and descriptions of each model (Center for Research on Effective Schooling for Disadvantaged Students, 1992; Hopfenberg et al., 1990; Slavin, et al., 1989). She then interviewed the developers of each model in order to obtain a more accurate assessment of the resources required when programs are implemented. The range of these estimates was large. According to the *Accelerated Schools* model, the district must hire between zero and two social workers and zero to one program facilitators. This discrepancy alone causes the total cost of the low and high estimates of the total cost to differ by \$150,000.

Step two of the ingredients method involves placing a value on each ingredient. King (1994) was not able to collect empirical data from school sites, so she provided a low and high estimate for each model based on program developer interviews. Each of the three models required some participation of parents, which represents an ingredient that is difficult to assign a monetary value. To address this challenge, King (1994) did not convert this ingredient into monetary terms; instead she chose to leave parental involvement time as simple quantities since estimates are made only for comparison purposes. While this strategy prevents tallying up a total cost for each model, King was still able to make useful comparisons, based on budgetary expenditures and required volunteers and personnel time.

There are important lessons from King's (1994) approach that are applicable to our analysis of the costs of clinical experiences. In many instances, alternative clinical experiences may not require any more time for the candidates, but instead reallocate the way time is spent. This is a key point. If the use of rich clinical practice shifts the uses of time away from low effectiveness uses and toward high effectiveness uses of time, there will be net gains in effectiveness with no increase in cost.

Given the difficulty of identifying the costs of inputs such as the time candidates spend in preparation programs, it may be more straightforward to compare these costs in units of time, rather than in monetary terms. Moreover, an expanded role for clinical mentors or cooperating teachers may blur the distinction between services provided by the teacher education program and those provided by schools. In this case, a cost analysis might examine how resources are reallocated between traditional schools of education and the schools where student teaching takes place. In other words, if there are fewer courses in a teacher preparation program and more time in clinical activities, it seems possible there will be less need for traditional teacher education faculty at Ed Schools and more effort on the part of supervising teachers.

(3) *Implicit costs*

Levin, Catlin and Elson (2010) analyzed the cost of implementing three alternative literacy programs, *Read 180*, *Questioning the Author* and *Reading Apprenticeship*, at various sites across the United States. Data were collected through interviews with the sponsor or developer of each intervention, a review of all materials describing the intervention, and interviews and direct observations at specific school sites implementing each reform.

Because the authors attempted to compare costs based solely on actual activities and decisions made at the school level, all values of ingredients were standardized using market prices and national averages; school personnel were assumed to work 1,440 hours per year. Some costs involved in educational reforms are implicit, as they do not reflect actual expenditures. For instance, when districts chose to reduce class size and extend class periods, as is recommended by the developers of *Read 180*, Levin, et al. (2010) calculated the number of additional teachers a district would need to hire in order to prevent the reduction of resources devoted to other school programs. Similarly, when a district did not require purchasing additional computers, no explicit expense was incurred; however, all sites physically used computers for *Read 180*, so the implicit costs of these computers were included.

Reforming of teacher education programs towards a clinically-based approach would result in both explicit and implicit costs. As Levin, Catlin and Elson (2010) demonstrate, in addition to purchasing new resources, school districts sometimes implement reform by reallocating existing resources. While reallocating resources for new purposes does not result in explicit costs for school districts, these changes represent implicit costs and are included in rigorous costs analyses (Levin & McEwan, 2001). In the case of our study, we include the implicit costs required to restructure schools of education and school districts to implement clinically-based teacher education.

(4) *Marginal costs*

It is common for cost analyses of educational interventions to focus on marginal costs. Marginal cost is defined in economics literature as the forgone opportunities, or additional resources required, to produce some outcome (Stiglitz, 2000). Educational cost analysts measure marginal cost by comparing the cost of educational interventions, while excluding costs incurred as part of the general education program (Levin & McEwan, 2001). For instance, Parrish (1994) conducted a cost analysis of five instructional models for limited English proficient (LEP) students. The study provides a useful example of the difficulty in isolating marginal cost because all LEP programs in Parrish's study involved components of the general education program. As an example, changes in class size for each LEP program explained a significant portion of the per-pupil cost (Parrish, 1994). Some LEP models called for decreased class size, while others did not and smaller classes typically require additional teacher personnel (Krueger, 2003). At the same time, since pullout classrooms decrease the class size of regular

classrooms, one might expect pullout classrooms to lower the burden on general education classrooms, thus lowering the cost. Previous cost analyses have chosen to adjust the cost of regular education instruction to correct for the decreased class size of regular classrooms when LEP students have been temporarily pulled out (Carpenter-Huffman & Samulon, 1981). Parrish decided to exclude this ingredient from the analysis on the basis that teachers face an added burden when students are temporarily pulled out of class, rather than a reduction in their responsibilities. When identifying ingredients that are required of an educational program, the cost analyst must make specific assumptions regarding how aspects of these programs affect student learning and which components of the intervention represent marginal costs.

Parrish (1994) excluded some marginal costs that were included in previous cost analyses (Carpenter-Huffman & Samulon, 1981). For instance, Parrish determined salaries were equal for bilingual and monolingual teachers, therefore, the cost of one teacher for each designated LEP class was not seen as an additional cost. In a similar study, Carpenter-Huffman and Samulon (1981) assigned lower salaries for bilingual teachers on the basis that they are less experienced on average and thus are lower on the salary scale. Parrish deemed this a short-term phenomenon and viewed the cost of bilingual and monolingual teachers as equal, thereby basing estimates on cost, rather than local expenditure. As Parrish notes, determining which additional costs to attribute to LEP programs presented challenges during the research process because of the inherent subjectivity involved in determining the purpose of educational resources. Parrish's study exemplifies how only the costs of an intervention above and beyond traditional schooling are included.

In summary, rigorous cost and costs-effectiveness analyses employ the ingredients method and include as much of the total cost as the data allow. Implicit costs, marginal costs and costs that are difficult to measure are all included in educational cost analyses. Implicit costs represent reallocations of resources that are not explicitly reflected as budget expenditures. Marginal costs include only those resources required in addition to the regular education program. Determining which resources represent marginal costs can be a challenge in the research process because distinguishing which costs represent additional costs involves subjective decisions of the analyst (Parrish, 1994). Studies that utilize the ingredients method (Levin & McEwan, 2001) to analyze the cost of an educational program are designed to include all required resources, assign appropriate values to those ingredients, and differentiate the resources in terms of who bears each cost. The following section reviews studies of expenditure, rather than cost, in teacher professional development.

Applications to Teacher Professional Development and Teacher Education

Teacher professional development and pre-service teacher training require time commitments of teachers, principals and other educational professionals, which represent costs to the school district. Personnel time required for a particular program or intervention is a valuable finite resource, yet as noted above, these costs are rarely distinguished as expenditures in a school budget (Levin & McEwan, 2001). Thus in the

studies of teacher professional development expenditure reviewed below, comparing the costs to implement educational interventions or programs requires in-depth analysis of personnel time commitments.

Few studies of teacher education incorporate measures of cost-effectiveness. We could find only one such study, conducted by Denton and Smith (1985), which compares the cost of two paths to certification. The authors assessed the cost-effectiveness of two pathways into teaching available within a university-based teacher preparation program. They found that the certification program for non-education majors was more cost-effective for the College of Education compared to the program for education majors at the same College. Because both programs involved a culminating student-teaching component, it is not possible from the data to discern the relative cost-effectiveness of the clinical experience.

There have been several studies that attempt to measure district wide expenditures on professional development. These studies provide insights into how educational cost analysis is conducted and what key cost components are involved in teacher training.

Moore and Hyde (1981) conducted one of the earliest studies of professional development expenditures. That study examined staff development for teachers in three urban school districts in California. Findings indicated that district investment was between 3.28 percent and 5.72 percent of total district spending. In addition, the cost of teacher salaried work time represented 32 to 62 percent of the total expenditure. The total investment per teacher surpassed by 50 times the estimates of district leaders surveyed at the time of the study. Miller, Lord and Dorney (1994) analyzed the costs of professional development efforts in four urban districts across the United States. Their study found districts spend between 2.2 and 3.4 percent of the total budget on professional development; personnel time represented the majority of these costs.

Little et al. (1987) expanded on the work of Moore and Hyde (1981) by examining the investment from both public and private sources. Staff development activities across 30 California school districts were estimated to represent 4.52 percent of total district expenses and 5.09 percent when including teachers' uncompensated contributions. The proportion of expenditure on teacher salaried work time was 7.2 percent of total expenditure on professional development, a wide discrepancy from that found by Moore and Hyde. This inconsistency is due, in large part, to methodological differences between the two studies. Little et al. (1987) considered only professional development days as reallocated teacher salaried work time, while Moore and Hyde (1981) included all scheduled meetings or routine activities devoted to teachers' professional learning. Professional development are largely concerned with personnel time allocations. As Levin and McEwan (2001) point out, all reallocated salaried work time required for an intervention should be included in a cost analysis. Indeed, that personnel time represents the majority of cost is a common finding in educational cost analyses (Levin & McEwan, 2001).

Drawing on these studies, Odden and his colleagues (2002) constructed a new framework for analyzing whole district professional development expenditures. Odden, et al. listed six categories of resources that comprised staff development. These categories included 1) teacher time; 2) training and coaching; 3) administration; 4) materials, equipment and facilities; 5) travel; and 6) tuition and conference fees. This new framework was adopted by Miles, et al. (2003) in a study of professional development expenditures in five geographically diverse urban districts. In many aspects, the framework resembles that of other professional development cost frameworks developed over the past 30 years (Miller, et al., 1994; Little, et al., 1987; Moore & Hyde, 1981); however, this more recent cost analysis includes some deviations from previously used approaches. While the methods of data collection have not changed dramatically, aspects of the analysis, particularly how costs are classified, have continually evolved as analysts have gained more insight into educational processes.

Killeen, Monk and Plecki (2002) drew on national longitudinal data to analyze spending on professional developing at the district level. Between 1992 and 1998, the national average spending on professional development for teachers was estimated at approximately three percent, and this figure was relatively stable during the 1990s. Education Resource Strategies (2009) synthesized much of this research, finding that teacher time is consistently the largest cost component of professional development, typically representing about 65 percent of total spending. In general, the cost of programs that involve recruiting and training human resources are largely made up of personnel salaried work time. Cost analyses of such programs must pay close attention to how staff is allocated and how staff members apportion their own salaried work time to various activities.

In the following section, we present a framework for measuring the cost of clinical experiences.

A Proposed Cost Framework For Clinical Experiences

Research has yet to investigate the cost of clinical experiences within teacher education programs. As is clear in the tables below, many of the costs are difficult to estimate without empirical data, in particular, the start-up costs. That being said, establishing the necessary ingredients to effective clinical experiences represents an important first step for potential cost-effectiveness studies of clinical experiences. The NCATE Panel's (2010) call for a revamping of teacher education programs is ambitious; however, the Panel remains confident that such reallocation and expansion of resources will be cost-effective.

It will require reallocation of resources and making hard choices about institutional priorities, changing selection criteria, and restructuring staffing patterns in P-12 schools. Clinically based programs may cost more per candidate than current programs but will be more cost-effective by yielding educators who enter the field ready to teach, which will increase productivity and

reduce costs associated with staff development and turnover. (NCATE, 2010, p. iv).

Without a rigorous investigation of costs and effects of the proposed reforms, cost-effectiveness claims are unsubstantiated, although extant research demonstrates the potential for effective clinical experiences to be worth the investment. The resources involved in such a reform can be divided into three categories, start-up, ongoing and financial incentives. Start-up costs are those that are incurred at the beginning of the program, and represent one-time costs, while on-going resources reflect costs that are incurred in order to maintain effective clinical experiences.

Table 3 describes start-up costs, which are comprised of four main ingredients: core clinical faculty, revised curriculum, school district-teacher education program partnerships and coaching and mentoring. As suggested by the NCATE Panel (2010), teacher education programs will need to hire more tenure-track core clinical faculty to support effective clinical experiences. Clinical faculty will also need to establish a shared-vision of how oversight of clinical experiences and student-teaching will take place. School districts will also incur some upfront costs in order to establish partnership with teacher education programs. In calculating yearly cost, start-up costs are adjusted to present value and adjusted for personnel turnover. Costs of technology are not included, as such resources will likely represent a small portion of overall program costs.

Table 3

Start up costs for developing effective clinical experiences within a teacher education program

Resource	Component	How data may be collected	How cost is calculated
Core clinical faculty	Cost of hiring necessary tenure track or clinical faculty	Review program budget documents to assess the cost of hiring additional tenure track or clinical faculty members.	Multiply the number of additional faculty members needed by the total cost of hiring such an employee.
	Personnel time required to develop systems to support the oversight of clinical experiences	Interview faculty members to assess quantity of time required to establish a system of oversight, feedback and evaluation.	Multiply the number of hours staff members devoted by the hourly salary for each staff member.
Clinically based curriculum within teacher education programs	Personnel time required to revise curriculum by refining clinical experiences and determining which practice-based courses to offer and in what sequence	Interview faculty members to identify the quantity of time required to revise curriculum, with agreed upon clinical experience schedules and coursework.	Multiply the number of hours staff members devoted by the hourly salary for each staff member.
School district-teacher education program partnerships	Personnel time required to establish partnerships for shared decision-making in selecting field experience locations, collaborating teachers, and school-based coaches.	Interview faculty members and school district personnel to identify the resources required to design a system of shared oversight and establish shared decision-making.	Multiply the number of hours required to develop the described partnerships by the hourly salary for each staff member.
Coaching or mentoring at placement schools	Cost of identifying collaborating teachers, including initial professional development.	Interview school district personnel about the resources required to identify collaborating teachers and provide start up professional development.	Multiply the number of hours required by the hourly salary for each staff member involved; add the cost of initial professional development.
	Cost of hiring coaches or identifying expert teachers into the coaching role, including initial professional development.	Review school district budget documents to assess the cost of hiring a school-based coach and interview coaches to identify the FTE allocated to mentoring teacher candidates.	Divide the cost of hiring coaches and providing start up professional development by the percentage FTE coaches allocate to mentoring teacher candidates.

The second set of resources required for effective clinical experiences represent ongoing costs. These resources are required throughout the life of the program. Ongoing costs include personnel time required to provide: 1) faculty oversight of clinical experiences; 2) ongoing development of clinically based curriculum within teacher education programs; 3) coaching or mentoring at placement schools; 4) salaried work time of cooperating teachers; 5) time teacher candidates spend in clinical experiences; and 6) outside consulting fees. Ongoing costs are described below in Table 4.

Table 4*Ongoing costs for effective clinical experiences within a teacher education program*

Resource	Component	How data may be collected	How cost is calculated
Faculty oversight of clinical experience	Additional time within the salaried work day for clinical faculty to oversee field placements.	Interview clinical faculty to assess the amount of time devoted to this activity.	Multiply the total FTE clinical faculty devote to overseeing field placements by the total yearly compensation.
Development of clinically-based curriculum	Personnel time devoted to continuing development of curriculum within teacher education program.	Interview clinical faculty to assess the amount of time devoted to this activity.	Multiply the total FTE faculty devote to developing of curriculum by total yearly compensation.
	Personnel time of the coach required to meet with the teacher candidate.	Interview instructional coaches to assess the number of hours devoted to collaborating with teacher candidates.	Multiply the number of hours by the hourly wage for each coach.
Coaching or mentoring at placement schools	Ongoing professional development for school-based coaches or mentors	Interview instructional coaches and school and district staff to determine the total expenses and staff time devoted to provide coaches with professional development.	Calculate the percentage of time school-based coaches devote to collaborating with teacher candidates and multiply this number by the total cost of ongoing professional development.
	Time within the salaried work day to collaborate with teacher candidates	Interview cooperating teachers about the amount of hours per week devoted to collaborating with teacher candidates.	Multiply the number of hours by the hourly wage for each cooperating teacher.
Teacher candidate time	Time teacher candidates devote to clinical experiences	Interview teacher candidates to assess the quantity of time devoted to clinical experience.	Multiply the FTE percent of time teacher candidates are involved with clinical experience by the teacher candidate's by yearly salary.
Outside consulting	Consultants may be used to facilitate placement of teacher candidate and maintain partnerships.	Interview school and district leaders to assess the quality and quantity of outside consulting.	Assign an appropriate cost to consulting based on quantity and quality; using actual expenditure is likely to be a good estimate of actual cost.

The final category of resources required for effective clinical experiences are financial incentives. The NCATE Panel (2010) urged policymakers to establish incentives for cooperating teachers, school districts and teacher candidates. Without financial incentives, cooperating teachers may be less motivated to collaborate with teacher candidates. Additionally, if school districts are not provided financial stipends to accept teacher candidates, districts have may have less incentive to ensure pre-service teacher receive adequate mentoring and feedback from school-based coaches. Table 5 identifies incentives that may be required to improve clinical experiences in teacher education programs.

Table 5

Financial incentives required for clinical experiences within a teacher education program

Resource	What is being incentivized?
Collaborating teachers	Stipends for working with teacher candidates
Schools and school districts	Providing mentoring and coaching to teacher candidates
Teacher candidate	Choosing to work in hard to staff schools ^a

^a More research on recruiting teachers into hard to staff schools is warranted, as teachers are not always intrinsically motivated by monetary incentives (Darling-Hammond, 1997). Financial incentives may not be required or even effective in this process. Rather, processes can be put in place that encourage teacher candidates to understand the potential benefits of working in hard to staff schools.

4. Potential Outcomes of Clinically Based Teacher Education

As noted above, teachers consistently report that field experiences are the most formative component of their preparation (Levine, 2006; Moore, 2010). We are interested in whether outcomes for teacher candidates vary according to the sequencing and structuring of alternative approaches to clinical experiences within teacher education programs. Variations in the structure and sequencing of clinical experiences have a wide range of potential outcomes for teacher candidates. The NCATE (2010) report suggests that clinically rich teacher education programs would lead to better-prepared teachers and may benefit from “cost savings in staff development and reduced teacher turnover likely to result from better preparation” (p. 23). In addition, the report argues that improved school-university partnerships may lead to better matching of beginning teachers, a change that may improve effectiveness and decrease teacher turnover. In Table 6 below, we organize these potential outcomes into six categories: changes in teacher effectiveness, changes in instructional coach or mentor effectiveness, changes in the turnover rate of teachers, better matching between schools and teacher candidates, creating of instructional teams to work on school improvement goals, and reduced costs for retraining of teachers.

Table 6

Potential outcomes associated with changes in the sequencing and structuring of clinical experiences for pre-service teachers

Potential outcome	Measurement
Changes in teacher effectiveness	Teacher observations
	Classroom observations of student engagement
	Surveys and interviews with students and teachers
	Teacher value-added to student test scores
Changes in instructional coach or mentor effectiveness at the school	Surveys and interviews with teachers
	Value-added to student test scores for teachers working with instructional coaches
Changes in the number of teachers leaving the profession	Teacher voluntary attrition rate ^a
	Surveys and interviews with teachers
Better matching between schools and candidates	Interviews with teachers, principals and teacher training institution faculty
The creating of instructional teams to work on school improvement goals	Teacher observations
	School observations of faculty collaboration efforts
	Principal and teacher interviews and surveys
Reduced costs for retraining of teachers	Surveys and interviews related to time and effort for teacher retraining
	Analysis of district and school budgets
	Surveys of teacher training institutions regarding follow-up needs of graduates

^a The effect of clinical experiences on attrition rate would have to be adjusted for external factors such as economic conditions and educational policies at the federal, state, district, and school level.

5. Estimating the Cost Effectiveness of Clinical Experiences

As the discussion in the previous section suggests, estimating the cost effectiveness of rich clinical experiences as identified by the NCATE Panel Report (2010) is a complex undertaking. The difficulty is characterized by both the lack of a clear definition of a rich clinical experience and the complexity of identifying the marginal costs of alternative clinical experiences. Moreover, researchers to date have made real but still limited progress toward understanding the links between clinical practice and improved teaching, much less improved student performance. Indeed, a glaring gap in the research literature is how little is known about the degree to which substitution possibilities exist among alternative types of resources being invested in teacher preparation. Thus, a larger cost study can identify the cost differentials (if any) between existing clinical experiences and alternative approaches, and will help us understand more about the cost effectiveness of alternative programs.

Our approach to the conduct of a larger scale study would be to apply the cost frameworks for development (Table 3) and ongoing (Table 4) costs of alternative clinical programs to a group of traditional and alternative teacher education programs to provide comparative cost estimates. At a minimum such comparisons would need to include the following:

- Traditional teacher education programs at large public universities – there are multiple options for such programs including the California State Universities, and the public universities in many other states.
- Alternative teacher education programs that have established alternatives to traditional clinical practices.
- Alternative clinical experiences managed directly through school districts (There are a number of such programs in California, for example)
- Alternative clinical experiences offered through non-IHE or school district teacher development and training programs such as TFA or TNTP.
- On-line teacher education programs and the ways in which clinical experiences are adapted to the use of technology including on-line video and digital recording of teaching experiences for review with faculty at a later date
- Adapting technology to traditional school of education programs

To get a sense of how one might approach a cost study of any of these programs, we developed a small purposeful sample of four teacher preparation programs for which we conducted preliminary (non-comprehensive) cost assessment. The four programs are one of the undergraduate teacher education programs at Penn State University, the teacher-training component of the MATCH charter school in Boston, and two parallel teacher-training programs at the University of Southern California Rossier School of Education –

the MAT@USC on-line and the MAT@USC on campus programs. These data serve as an illustrative example to begin what we believe will be a fruitful analysis and discussion.

Penn State offers teacher credentials within Pennsylvania, and we put together estimates of the resources being invested in the capstone (semester long) student teaching experience. These estimates include the resources supporting university employed supervisors, the travel costs of the university-based supervisors along with their computer equipment, the honoraria paid by the university to the cooperating teachers and districts, the time invested by cooperating teachers (where the costs are borne by the school district), and the university's administrative structure that oversees placements and assessments of the student teachers' progress.

The MATCH program provides its own in-house clinical experiences for teachers it trains, sing school hire coaches and supervising practitioners, along with support from its own administrative staff.

The two USC programs have identical curriculum and are similar in terms of the structure and design of the clinical experience. The on-campus program relies on placement coordinators to pair master teachers with teacher candidates. In addition, guided practice faculty members supervise approximately ten students per term. The USC online program is a nationally focused teacher-training program with students throughout the world. A unique aspect of the on-line program is its partnership with a private firm that supports the identification of cooperating schools and teachers. Guided practice faculty members also provide supervision to teacher candidates in the on line program.

Estimates of the resources flowing into these programs are reported in the Appendix. However, at this time we are unable to estimate costs for the online USC program because much of this information is proprietary to the university's partner.

In addition to the teacher education programs described above, there are other examples around the United States of programs that are taking the necessary steps to improving pre-service teachers' clinical experience. The NCATE report (2010) describes several of these programs, which we summarize below in Table 7.

An empirical inquiry into the cost-effectiveness of alternative approaches to structuring clinical experiences could compare the relative costs and effectiveness of some of these models. In addition, researchers could compare the cost-effectiveness of rich clinical experiences with that of traditional teacher education programs. A number of sampling alternatives for such studies exist. One option is to simply compare the cost effectiveness of traditional and clinically rich programs across two institutions in the same geographical area – assuming they could be found. It may be possible to compare programs that have shifted from traditional to clinically rich programs to understand the cost implications for the institution, the participating schools sites and the individual teacher candidates. We might also look at comparably redesigned programs in different institutions to see if alternative cost structures impact the cost effectiveness of each program. This would require understanding both the changes at the teacher training

institution and any changes implemented in the participating schools and school districts as well. Finally institutions like USC, which offers its MAT both on line and in a traditional classroom approach, offer the opportunity to compare alternative approaches to teacher training and the cost effectiveness of each.

Table 7

Teacher education programs that have implemented new approaches to clinical experiences for teacher candidates

Teacher Education Program	Promising practice
Baylor University	Established a partnership with Waco Independent School District with shared funding strategies to facilitate intensive clinical experiences for teacher candidates.
California State University Long Beach	Established a partnership with Long Beach Unified School District, as well as Long Beach City College and Long Beach community organizations to improve teacher matching with schools during clinical experiences and initial job placement.
National Louis University	University faculty in the Academy for Urban School Leadership visit local schools and communities to gain an understanding of the roles teacher candidates will need to fill.
St. Cloud State University	Mentor teachers co-teach with teacher candidates during clinical experiences.
Teacher U at Hunter College	Established a partnership with Uncommon Schools, Knowledge is Power Program, and the Achievement First charter school organizations that emphasizes mentoring of teacher candidates during clinical experiences.
University of Chicago	The Urban Teacher Education Program at the University of Chicago provides students with annual stipends during a two-year teacher education program for students who commit to teach for five years in Chicago Public Schools.
University of Massachusetts Boston	The Boston Teacher Residency program facilitates a partnership between Boston Public Schools, the Boston Plan for Excellence, and the University of Massachusetts Boston and provides teacher candidates with a year-long guided clinical experience.
University of Northern Iowa, Eastern Michigan, Emporia State University, Longwood College, and Southeast Missouri State	Implemented the Integrating New Technologies Into the Methods of Education (INTIME) model, which incorporates online video demonstrations, micro-teaching, and analysis of case studies into teacher education methods courses. The INTIME model promotes the use of technology for both teacher education faculty and beginning teachers.

Note: These examples of promising practices in teacher candidates' clinical experiences are drawn from the NCATE (2010) Blue Ribbon Panel report.

6. Conclusions

This report established a rationale for improving clinical experiences for teacher candidates, provided a theoretical framework through which to view professional learning for teachers, identified characteristics of effective clinical experiences, and presented a conceptual framework that summarizes the potential costs of implementing a clinically based teacher education program. We then applied this cost framework to four teacher education programs and reported each programs' expenditures on clinical experiences. Finally, we presented potential outcomes of improving the clinical experiences for teacher candidates and described how a potential analysis of cost-effectiveness may be designed.

More research is needed to investigate ideal sequence and loading of clinical experience, innovative ways to learn practice in teacher educating programs, and multiple approaches to assessing teacher effectiveness. Ultimately, improving instruction in United States schools, particularly in hard to staff urban schools, may help narrow the achievement gap, and provide students with enhanced educational experiences.

References

- Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in Chicago Public High Schools. *Journal of Labor Economics*, 24(1), 95-135.
- Abbott, A. (1988). *The system of professions*. Chicago, IL: University of Chicago Press.
- Allen, D. & Wang, W. (1996). *Micro-teaching*. Beijing, China: Hsin Hua Publishers
- Anderson, L. & Stillman, J. (2010). Opportunities to teach and learn in high-needs schools: student teachers' experiences in urban placements. *Urban Education*, 45(2), 109-141
- Alvarez, H. (2007). The impact of teacher preparation on responses to student aggression in the classroom. *Teaching and Teacher Education*, 23, 1113-1126.
- Andrew, M.D. (1990). Differences between graduates of 4-year and 5-year teacher preparation programs. *Journal of Teacher Education*, 41(2), 45-51.
- Ball, D. L. & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In L. Darling-Hammond and G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (p. 3-32). San Francisco, CA: Jossey-Bass
- Ball, D. L. & Forzani, F. M. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education*, 60(5), 497-511.
- Ball, D. L., Sleep, L., & Boerst, T., Bass, H. (2009). Combining the development of practice and the practice of development in teacher education. *The Elementary School Journal*, 109(5). 458-454.
- Barnett, W. S. (1985). Benefit-cost analysis of the Perry Preschool Program and its policy implications. *Educational Evaluation and Policy Analysis*, 7(4), 333-342.
- Baumgartner, F., Koerner, M., & Rust, F. (2002). Exploring roles in student teaching placements. *Teacher Education Quarterly*, 29, 35-58.
- Berry, B. (2010). Teacher education for tomorrow. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Berry, B., Montgomery, D., Curtis, R., Hernandez, M., Wurtzel, J., & Snyder, J. (2008). "Urban Teacher Residencies: A New Way to Recruit, Prepare, Develop, and Retain Effective Teachers for High-Needs Districts," *Voices in Urban Education Summer*. 13-23.

- Berry, B., Montgomery, D. & Snyder, J. (2008). "Urban Teacher Residency Models and Institute of Higher Education: Implications for Teacher Preparation," commissioned by the National Council for Accreditation of Teacher Education, August, 2008, Washington, D.C.
- Borman, J. & Feger, S. (2006). *Instructional Coaching: Key Themes from the Literature*. Providence, RI: The Education Alliance, Brown University.
- Borman, G.D., & Hewes, G.M. (2002). The long-term effects and cost-effectiveness of Success For All. *Educational Evaluation and Policy Analysis*, 24(2), 243–266.
- Boyd, D.J., Grossman, P.L., Lankford, H., Loeb, S. & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis*, 31(4), 416-440.
- Boyd, D., Lankford, H., Loeb, S., Rockoff, J.E. & Wyckoff, J. (2007). The narrowing gap in New York City teacher qualifications and its implications for student achievement in high-poverty schools." CALDER Working Paper 10. Washington, DC: The Urban Institute.
- Britzman, D. (1991). *Practice makes practice*. Albany: State University of New York Press.
- Bruner, J.S. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.
- Bruner, J.S. (1977). *The process of education*. Cambridge, MA: Harvard University Press.
- Bullough, J. & Draper, R. J. (2004). Making sense of a failed triad: Mentors, university supervisors, and positioning theory. *Journal of Teacher Education*, 55(5), 407-420.
- Carpenter-Huffman, P. & Samulon, M. (1981). Case studies of delivery and cost of bilingual education. Santa Monica: Rand Corporation.
- Carver, C.L. & Feiman-Nemser, S. (2009). Using policy to improve teacher education: Critical elements and missing pieces. *Educational Policy*, (23)2, 295-328.
- Castle, S. (2008). Student Learning in a Professional Development School and a Control School. *Professional Educator*, 32(1), 1-15.
- Center for Research on Effective Schooling for Disadvantaged Students. (1992). Information to schools considering adoption of Success for All. Baltimore: Author.
- Chetty, R., Friedman, J.N. & Rockoff, J.N. (2011). The long-term impacts of teachers:

- Teacher value-added and student outcomes in adulthood. NBER Working Paper No. 17699. Cambridge, MA: National Bureau of Economic Research.
- Chin, P. & Russell, T. (1995, June). *Structure and coherence in a teacher education program: Addressing the tension between systematic and the educative agenda*. Paper presented at the Annual Meeting of the Canadian Society for the Study of Education, Montreal Quebec, Canada.
- Clarke, P.J & Thomas, C.D. (2008). Teachers' perceptions of connections and disconnects between their alternative preparation and teaching in urban classrooms. *Urban Education, 44*(2), 144-159.
- Cliff, R.T. & Brady, P. (2005). Research on methods courses and field experiences. In Cochran-Smith, M. & Zeichner, K. (Eds.). *Studying teacher education: The report of the AERA panel on research and teacher education*. Mahwah, NJ: Lawrence Erlbaum Publishers.
- Clune, W.H. (2002). Methodological strength and policy usefulness of cost-effectiveness research. In H.M. Levin & P.J. McEwan (Eds.). *Cost-Effectiveness and Educational Policy*. Yearbook of the American Education Finance Association.
- Cochran-Smith, M. & Zeichner, K. (2005). *Studying teacher education: The report of the AERA panel on research and teacher education*. Mahwah, NJ: Lawrence Erlbaum Publishers.
- Collins, A., Brown, J.S. & Holum, A. (1991). Cognitive apprenticeship: Making things visible. *American Educator, 15*(3), 6-11, 38-46.
- Cortina, L. (2011). "School Administrators and the Professional Learning Of General Education Teachers Related To Gifted Education: A Delphi Study." Doctoral dissertation, Seton Hall University.
- Clotfelter, C.T., Ladd, H., & Vigdor, J.L. (2007). How and why do teacher credentials matter for student achievement?. CALDER Working Paper 2. Washington, DC: The Urban Institute.
- Darling-Hammond, L. (1999). Professional Development for Teachers: Setting the Stage for Learning from Teaching. Center for the Future of Teaching and Learning. Retrieved from <http://www.nctaf.org/documents/DoingWhatMattersMost.pdf>
- Darling-Hammond, L. (1997). *Doing what matters most: Investing in quality teaching*. New York: National Commission on Teaching and America's Future, Teachers College, Columbia University

- Darling-Hammond, L. & Baratz-Snowden, J. (2005). *A good teacher in every classroom: Preparing the highly qualified teachers our children deserve*. San Francisco, CA: John Wiley & Sons.
- Darling-Hammond, L. & Berry, B. (1999). Recruiting Teachers for the 21st Century: The Foundation for Educational Equity. *Journal of Negro Education*, 68(3), 254-279.
- Darling-Hammond, L. & Bransford, J. (2005). *Preparing teachers for a changing world*. San Francisco, CA: Jossey-Bass.
- Darling-Hammond, L. & Hammerness, K. (2005). The design of teacher education programs. In L. Darling-Hammond & J. Bransford, (Eds.), *Preparing teachers for a changing world* (pp. 390-441). San Francisco, CA: Jossey-Bass.
- Darling-Hammond, L., Wei, R.C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional Learning in the Learning Profession: A Status Report on Teacher Development in the United States and Abroad. School Redesign Network at Stanford University. National Staff Development Council.
- Denton, J. (1982). Early field experience influence on performance in subsequent coursework. *Journal of Teacher Education*, 33(2), 19-23.
- Denton, J.J. & Lacina, L.J. (1984). Quantity of professional education coursework linked with process measures of student teacher. *Teacher Education and Practice*, 39-64.
- Denton, J., & Smith, N., (1985). Alternative Teacher Preparation Programs: A Cost-Effectiveness Comparison. *Educational Evaluation and Policy Analysis*. 7(3), 197-205.
- Desimone, L., Porter, A., Garet, M., Yoon, K.S. & Birman, B. (2002). Effects of professional development on teachers' instruction. *Educational Evaluation and Policy Analysis*, 24(2), 81-112.
- Dewey, J. (1938). *Experience and education*. New York: The Macmillan company.
- Dewey, J. (1902/1965). The relation of theory to practice in education. In M. Borrowman (Ed.), *Teacher Education in America: A Documentary History* (pp. 140-171). New York: Teachers College Press. (Original work published 1904).
- Downey, J., & Cobbs, G. (2007). "I actually learned a lot from this:" A field assignment to prepare future preservice math teachers for culturally diverse classrooms. *School Science and Mathematics*, 107(1), 391-403.
- Ericsson, K.A. (2002). Attaining excellence through deliberate practice: Insights from the study of expert performance. In M. Ferrari (Ed.), *The pursuit of excellence in education* (pp. 21-55). Hillsdale, NJ: Erlbaum.

- Ericsson, K.A., Prietula, M.J. & Cokely, E.T. (2007). The making of an expert. *Harvard Business Review*, 85, 114-121.
- Ericsson, K.A., Krampe, R. & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100(3), 363-406.
- Education Resource Strategies. (2009). *Teaching Quality: The First Priority*. Watertown, MA: National Institute for Excellence in Teaching.
- Evans, R. (1996). *The human side of school change: Reform, resistance, and the real-life problems of innovation*. San Francisco: Jossey-Bass.
- Feiman-Nemser, S. (2001). Helping novices learn to teach: Lessons from an exemplary support teacher. *Journal of Teacher Education*, 52(1), 17-30.
- Feiman-Nemser, S., & Buchmann, M. (1985). Pitfalls of experience in teacher preparation. *Teachers College Record*, 87, 53-65.
- Franke, M. L., & Chan, A. (2007). *Learning about and from focusing on routines of practice*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Gallagher, T., Griffin, S., Parker, D., Kitchen, J. & Figg, C. (2011). Establishing and sustaining teacher educator professional development in a self-study community of practice: Pre-tenure teacher educators developing professionally. *Teaching and Teacher Education*, 27(5), 880-890.
- Garet, M.S., Cronen, S., Eaton, M., Kurki, A., Ludwig, M., Jones, W., Uekawa, K., Falk, A., Bloom, H.S., Fred Doolittle, F., Pei Zhu, P., & Szejnberg, L. (2008). The impact of two professional development interventions on early reading instruction and achievement. *National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences*. Washington, DC: U.S. Department of Education (September).
- Garet, Michael S., Andrew J. Wayne, Fran Stancavage, James Taylor, Kirk Walters, Mengli Song, Seth Brown, Steven Hurlburt, Pei Zhu, Susan Sepanik, and Fred Doolittle. 2010. *Middle School Mathematics Professional Development Impact Study: Findings After the First Year of Implementation*, NCEE 2010-4009. Washington, DC: Institute of Education Sciences.
- Goldhaber, D. (2011). Licensure: Exploring the value of this gateway to the teacher workforce." In *Handbook of the Economics of Education, Vol. 3*, edited by Eric A. Hanushek, Stephen Machin, and Ludger Woessmann. Amsterdam: North Holland: 315-339.

- Goldhaber, D., & Brewer, D.J. (2000). Does teacher certification matter? High school teacher certification status and student achievement." *Educational Evaluation and Policy Analysis*, 22(2), 129-145.
- Goodfellow, J. & Sumison, J. (2000). Transformative pathways: Field-based teacher educators' perceptions. *Journal of Education for Teaching*, 26(3), 245-257.
- Gore, J.M. & Zeichner, K. (1991). Action research and reflective teaching in preservice teacher education: A case study from the United States. *Teaching and Teacher Education*, 7(2), 119-136.
- Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E. & Williamson, P. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record*, 111(9), 2055-2100.
- Grossman, P. & McDonald, M. (2008). Back to the future: Directions for research in teaching and teacher education. *American Educational Research Journal*, 45(1), 184-205.
- Guyton, E., & McIntyre, D.J. (1990). Student teaching and school experiences. In W.R. Houston (Ed.), *Handbook of research on teacher education*. (pp. 514-535). New York: MacMillan.
- Hammerness, K. & Darling-Hammond, L. (2002). Meeting old challenges and new demands: The redesign of the Stanford Teacher Education Program. *Issues in Teacher Education*, 11(1), 17-30.
- Hannaway, J., Sass, T., Figlio, D., & Feng, L. (2009). Value added of teachers in high-poverty schools and lower poverty schools: Implications for management and policy. *CALDER Working Paper*. Washington, DC: The Urban Institute.
- Hanushek, E. (2010). The economic value of higher teacher quality. National Bureau of Economic Research, Working Paper 16606.
- Harris, D.N. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, 95(7-8), 798-812
- Harris, D.N., & Sass, T.R. (2007). Teacher training, teacher quality, and student achievement. *CALDER Working Paper 3*. Washington, DC: The Urban Institute.
- Hiebert, J., & Morris, A. K. (2009). Building a knowledge base for teacher education: An experience in K–8 mathematics teacher preparation. *Elementary School Journal*, 109(5), 475–490.
- Hiebert, J., Gallimore, R., & Stigler, J. W. (2002). A knowledge base for the teaching profession: What would it look like and how can we get one? *Educational*

- Researcher*, 31(5), 3–15.
- Holmes Group. (1995). *Tomorrow's schools of education: A report of the Holmes Group*. East Lansing, MI.
- Hopfenberg, W.S., Levin, H.M., Meister, G., & Rogers, J. (1990) Accelerated schools. Unpublished manuscript, Stanford University, Accelerated Schools Project, Palo Alto, CA.
- Hord, S. & Sommers, W. (2007). *Leading professional learning communities: Voices from research and practice*. Austin: Southwest Educational Development Laboratory
- Howey, K. (2011). A framework for setting priorities and building partnership prototypes. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Howey, K. (2010). This is not your grandfather's student teaching: Kenji's clinically driven teacher education. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Howey, K. & Zimpher (2010). Educational partnerships to advance clinically rich teacher preparation. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Igra, D. (2004, April). *Intentional and unintentional modeling in medicine*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.
- Isenberg, E., Glazerman, S., Bleeker, M., Johnson, A., Lugo-Gil, J., Grider, M., Dolfen, S., & Britton, E. (2009). Impacts of Comprehensive Teacher Induction: Results From the Second Year of a Randomized Controlled Study. *National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences*. Washington, DC: U.S. Department of Education (August).
- Kane, T.J., Rockoff, J.E., & Staiger, D.O. (2006). What does certification tell us about teacher effectiveness? Evidence from New York City. Working Paper 12155. Cambridge, MA: National Bureau of Economic Research.
- Kennedy, M. (2005). *Inside teaching*. Cambridge, MA: Harvard University Press.
- King, J.A. (2010). The impact of teacher experience: examining the evidence and policy implications. *National Center of Longitudinal Data in Education Research*.
- King, J.A. (1994). Meeting the educational needs of at-risk students: A cost analysis of three models. *Educational Evaluation and Policy Analysis*, 16(1), 1-19.

- Killeen, K., Monk, D. & Plecki, M. (2002). School district spending on professional development: Insights available from national data. *Journal of Education Finance*, 28(1), 25-49.
- Killion, J. & Harrison, C. (2006). *Taking the lead: New roles for teachers and School-based coaches*. Washington, DC: National Staff Development Council.
- Knight, D.S. (2012). Assessing the cost of instructional coaching. *Journal of Education Finance*, 38(1), 52-80.
- Kolb, D. & Fry, R. (1975). Toward an applied theory of experiential learning. In C. Cooper (Ed.), *Theories of Group Process*. London: John Wiley.
- Koppich, J. (2000). Trinity University: Preparing teacher for tomorrow's schools. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation in a five-year program* (pp. 1-48). Washington, DC: American Association of Colleges for Teacher Education.
- Krueger, A.B. (2003). Economic considerations and class size. *The Economic Journal*, 485(113), 34-63.
- LaBoskey V.K. & Richert, A.E. (2002). Identifying good student teaching placements: A programmatic perspective. *Teacher Education Quarterly*, 29(2), 7-34.
- Ladd, H.F. (2008). Value-Added modeling of teacher credentials: Policy implications. Paper presented at the second annual CALDER research conference, "The Ins and Outs of Value-Added Measures in Education: What Research Says," Washington, D.C., November 21.
- Laine, C., Laine, M, & Peavy, E. (1999). Prospective English teachers: Initial experiences in urban classrooms. *American Reading Forum Yearbook*. Whitewater, WI: University of Wisconsin—Whitewater
- Lampert, M. (2010). Learning teaching in, from, and for practice: What do we mean? *Journal of Teacher Education*, 61(1-2), 21-34.
- Lampert, M. & Ball, D. (1998). *Teaching, multimedia, and mathematics: Investigations of real practice*. New York: Teachers College Press.
- Lazear, E.P. (2003). Teacher incentives. *Swedish Economic Policy Review*, 10(3): 179-214.
- Levin, H.M., Catlin, D., Elson, A. (2010). Adolescent literacy programs: Costs of implementation. New York, NY: Carnegie Corporation of New York.

- Levin, H.M., Glass, G., & Meister, G. (1987). A cost-effectiveness analysis of computer-assisted instruction. *Evaluation Review*, 11, 50–72.
- Levin, H.M. & McEwan, P. J. (2001). *Cost-effectiveness analysis: Methods and applications* (2nd Ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Levine, M. (2010). Developing principles for clinically based teacher education. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Levine, A. (2006). *Educating school teachers*. Washington, DC: Education Schools Project.
- Lewis, J., Scott, S.E., & Murray, O.T. (2012). Leading with practice: Preparing beginning teachers to do the interactive work of teaching.
- Lortie, D.C. (1975). *Schoolteacher: A sociological study*. Chicago: University of Chicago Press.
- Little, J.W. (2003). Inside teacher community: Representations of classroom practice. *Teachers College Record*, 105, 913–945.
- Little, J.W., Gerritz, W.H., Stern, D.S., Guthrie, J.W., Kirst, M.W., & Marsh, D.D. (1987). Staff development in California: Public and personal investments, program patters, and policy choices. San Francisco, CA: Far West Laboratory for Educational Research and Development.
- Mantle-Bromley, C. (2002). The status of early theories of professional development school potential. In Irma N. Guadarrama, J. Ramsey, and J. L. Nath (Eds.) *Forging Alliances in Community and Thought: Research in Professional Development Schools*. Greenwich, CT: Information Age Publishing (3-30).
- Merrett, F. & Wheldall, K. (1993). How do teachers learn to manage classroom behavior? A study of teachers' opinions about their initial training with special reference to classroom behavior management. *Educational Studies*, 19(1), 91-106.
- Mezirow, J. (1981). A critical theory of adult learning and education. *Adult Education Quarterly*, 32(1): 3-24.
- Miles, K.H., Odden, A., Fermanich M., Archibald, S., & Gallagher, A. (2003). Inside the black box of school district spending on professional development: Lessons from comparing five urban districts. *Journal of Education Finance*, 30(1), 1-26.
- Miller, B., Lord, B., & Dorney, J. (1994). Staff Development for teachers: A study of configurations and costs in four districts. Newton, MA: Educational Development Center.

- Monk, D. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review*, 13(2), 125-145.
- Monk, D.H., & King, J.A. (1993). Cost analysis as a tool for education reform. In S. L. Jacobson & R. Berne (Eds.), *Reforming education: The emerging systemic approach* (pp. 131–152). Thousand Oaks, CA: Corwin Press.
- Moore, R. (2010). Teacher leaders advise on clinical preparation. Prepared for the National Council for the Accreditation of Teacher Education (NCATE).
- Moore, D. & Hyde, A. (1981). Making sense of staff development: An analysis of staff development programs and their costs in three urban districts. Chicago, IL: Designs for Change.
- National Academies Press. (2008). The cost-effectiveness of certification as a means for improving teacher quality. In Hakel, M.D., Koenig, J.A., Elliot, S.W. (Eds). *Assessing Accomplished Teaching: Advanced-level certification programs*. Washington, D.C.: National Academies Press.
- National Council for Accreditation for Teacher Education (2010). Transforming Teacher Education Through Clinical Practice: A National strategy to prepare effective teachers. Report of the Blue Ribbon Panel on Clinical Preparation and Partnerships for improved student learning.
- National Research Council (2010). *Preparing teachers: Building evidence for sound policy*. Washington, D.C.
- Norman, P. J. & Feiman-Nemser, S. (2005). Mind activity in teaching and mentoring. *Teaching and Teacher Education*, 21(6), 679-697.
- Odden, A., Archibald, S., Fermanich, M. & Gallagher, A. (2002). A cost framework for professional development. *Journal of Education Finance*, 28(1), 51-74.
- Odden, A. & Picus, L.O. (2008). *School finance: A policy perspective*. New York, NY: McGraw Hill.
- Orland-Barak, L. (2002). The impact of the assessment of practice teaching on beginning teacher: Learning to ask different questions. *Teacher Education Quarterly*, 29(2), 99-122.
- Parrish, T. (1994). A cost analysis of alternative instructional models for limited English proficient students in California. *Journal of Education Finance*, 19(3), 256-278.
- Rodriguez, Y. & Sjostrom, B. (1995). Culturally responsive teacher preparation evident in classroom approaches to cultural diversity: A novice and an experienced

- teacher. *Journal of Teacher Education*, 46, 304-311.
- Rogoff, B., Paradise, R. Arauz, R.M., Correa-Chavez, M. & Angelillo, C. (2003). Firsthand learning through intent participation. *Annual Review of Psychology*, 54, 175-203.
- Sandholtz, J. & Dadlez, S. (2000). Professional development school trade-offs in teacher preparation and renewal. *Teacher Educational Quarterly*, 27(1), 7-27.
- Schön, D.A. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey Bass.
- Shields, P.M., Humphrey, D.C., Wechsler, M.E., Riel, L.M., Tiffany-Morales, J., Woodworth, K., (2001). *The status of the teaching profession 2001*. Santa Cruz, CA: The Center for the Future of Teaching and Learning.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Silverman, R., Welty, W. & Lyon, S. (1995). *Case studies for teacher problem solving*. New York, NY: McGraw Hill.
- Slavin, R.E., Madden, N.A., & Karweit, N.L. (1989). Effective programs for students at risk: Conclusions for practice and policy. In R. E. Slavin, N.L. Karweit & N.A. Madden (Eds.), *Effective programs for students at risk*. (355-372). Needham Heights, MA: Allyn & Bacon.
- Snyder, J. (2000). Knowing children—understanding teaching: The developmental teacher education program at the University of California, Berkeley. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation in the undergraduate years* (pp. 97-172). Washington, DC: American Association of Colleges for Teacher Education.
- Stevens, R., & Hall, R. (1998). Disciplined perception: Learning to see in technoscience. In M. Lampert & M. L. Blunk (Eds.), *Talking mathematics in school: Studies of teaching and learning* (pp. 107–149). Cambridge, England: Cambridge University Press.
- Stiglitz, J.E. (2000). *Economics of the Public Sector*. (3rd Ed.). New York, NY: W.W. Norton & Company.
- Stoud, K.M. (2009). Teach for America adds largest number of new teachers and regions in 20-year history. Press release retrieved from the following website:
http://www.teachforamerica.org/newsroom/documents/20090528_Teach_For_America_Adds_Largest_Number_of_Teachers_in_History.htm
- Snyder, J. (2000). Knowing children—understanding teaching: The developmental

- teacher education program at the University of California, Berkeley. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation at the graduate level* (97-172). Washington, DC: American Association of Colleges for Teacher Education.
- Tatto, M.T. (1996). Examining values and beliefs about teaching diverse students: Understanding the challenges for teacher education. *Educational Evaluation and Policy Analysis*, 18(2), 155-180.
- Tabacbnick, B.R. & Zeichner, K.M. (1984) The impact of the student teaching experience on the development of teacher perspectives. *Journal of Teacher Education*, 35(6), 28-36.
- U.S. Department of Education, Office of Postsecondary Education, Preparing and Credentialing the Nation's Teachers: The Secretary's Eighth Report on Teacher Quality; Based on Data Provided for 2008, 2009 and 2010, Washington, D.C., 2011.
- U.S. Department of Education, Office of Postsecondary Education, The Secretary's Sixth Annual Report on Teacher Quality: A Highly Qualified Teacher in Every Classroom, Washington, D.C., 2009.
- U.S. Department of Education, *Our Future, Our Teachers: The Obama Administration's Plan for Teacher Education Reform and Improvement*, Washington, D.C., 2011
- Valencia, S., Martin, S., Place, N. & Grossman, P. (2009). Complex Interactions in Student Teaching: Lost Opportunities for Learning. *Journal of Teacher Education*, 60(3), 304-322
- Vygotsky, L.S. (1978). *Mind in society: The development of higher psychology processes*. Cambridge, MA: Harvard University Press.
- Walsh, K., & Jacobs, S. (2007). *Alternative Certification Isn't Alternative*. Washington, DC: Thomas B. Fordham Institute (September).
- Wilson, S., Floden, R. & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge, gaps, and recommendations*. Research report prepared for the U.S. Department of Education. Seattle, WA: Center for the Study of Teaching and Policy.
- Wideen, M., Mayer-Smith, J. & Moon, B. (1998). A critical analysis of the research on learning to teach: Making the case for an ecological perspective on inquiry. *Review of Educational Research*, 68(2), 130-178.
- Wolf-Wendel, L. Baker, B.D., Twombly, S., Tollefson, N., & Mahlios, M. (2006). Who's teaching the teachers? Evidence from the National Survey of Postsecondary

- Faculty and the Survey of Earned Doctorates. *American Journal of Education*, 112, 273-300.
- Yoon, K. S., Duncan, T., Lee, S. W.Y., Scarloss, B., & Shapley, K. (2007). Reviewing the evidence on how teacher professional development affects student achievement (Issues & Answers Report, REL 2007-No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved on August 2nd, 2010 from http://ies.ed.gov/ncee/edlabs/regions/southwest/pdf/REL_2007033.pdf
- Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college-and university-based teacher education. *Journal of Teacher Education*, 61(1), 89.
- Zeichner, K. (2000). Ability-based teacher education: Elementary teacher education at Alverno College. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation in the undergraduate years* (pp. 1-66). Washington, DC: American Association of Colleges for Teacher Education.

Appendix

Per Student Teacher Expenditures*

Cost Category	PSU	MATCH	MAT@USC (on-line)***	MAT@USC (traditional)
University hired supervisors	1,459			1,000
Travel for university hired supervisors	73			45
University provided equipment	8			10
University provided administrative support	477			500
University paid honoraria to cooperating teachers/districts	215			700-1000
Cooperating teacher time**	2,350	0		2,350
School hired coaches	0	2,000		0
School hired supervision practitioners	0	100		
School provided administrative support	0	2,500		
School provided equipment	0	#		
Totals	4,582	4,600		4,605-4,905

***PSU Fringe figured at 32%; Match fringe self-reported; USC fringe figured at 33%.**

****Cooperating teacher time estimated at 50 hours per one semester student teacher. Hourly salary for teachers figured at \$47 inclusive of fringe (figured at 25%)**

***** University partner's proprietary information**

data not available.