You Can’t Teach What You Don’t Know: 
Examining and Improving Teacher Preparation 

by 

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Abstract

Teachers have a major impact on the lives of children, however there is no general agreement about what constitutes a great teacher or how to prepare one. With more preparation programs being created each year, this is a crucial time for exploring how to best prepare teachers for the classroom. This thesis examines the research on teacher preparation in light of six different ways to define and measure effectiveness, concluding that research tends to emphasize teachers’ attitudes and student cognition (achievement) instead of looking at teachers’ behavior in the classroom or student motivation. It then uses this research to enumerate the best practices as suggested by the literature. The final section makes suggestions for further research and highlights ideas from psychology that could be useful in overcoming the challenge of providing every child a highly effective teacher.
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The 1,200 plus teacher preparation programs across the United States differ widely in program structure and quality (Ingersoll et al., 2007). At best, teacher education equips educators with the skills they need to be effective and continue developing as professionals throughout their career. At worst, teacher education provides an abundance of seemingly irrelevant knowledge, several wasted years, and a smattering of experiences that create an uninformed and precarious foundation for practice. With the number of preparation programs increasing each year (Ingersoll et al., 2007), this is a crucial time for research focusing on the unsolved problem of how to adequately train tomorrow’s teachers.

Increased recognition of the importance of education combined with the Federal mandate given in No Child Left Behind and the acknowledgement that effective teachers have lasting impact on their students highlight the alarming lack of consensus about what makes a good teacher and how to create one. Research shows that students with an effective teacher can progress as much as two grade levels in one year while those with an ineffective teacher progress half a grade level or less on tests of academic achievement (Ripley, 2010). This effect is amplified by the fact that many low-income students fall further behind each year as their school environments fail to foster and retain the skills of highly effective teachers (Darling-Hammond, 2007). Ensuring that every classroom is staffed by a highly competent teacher
requires that teacher preparation programs review the work they are doing, examining
the impact of current preparation practices on teacher effectiveness.

Central to the effectiveness of teacher preparation is an understanding of how
the outcomes of preparation are being measured. The existing research employs a
variety of outcome measures to gauge the effectiveness of teacher preparation,
indicating that preparation can have a positive impact on teacher performance
(Darling-Hammond, Holtzman, Gatlin, & Heilig 2005; Boyd, Grossman, Lankford,
Loeb & Wyckoff, 2008). Despite these findings, teacher education programs rarely
reflect the best practices cited in the literature.

This thesis is divided into four sections. The first section focuses on dissecting
the way teacher effectiveness is being measured in the literature in order to give a
better picture of the way outcomes are being valued in teacher education. The second
section of the thesis aims to examine existing research on teacher preparation in order
to illuminate which practices in teacher preparation are supported by empirical
evidence and which are not. The third section enumerates the best practices suggested
by the research. The final section makes suggestions for further research and
highlights ideas from psychology that are not central in discussions about teacher
preparation but that, if incorporated into preparation programs, provide potential
solutions to some of the current shortcomings of teacher education.
Part 1: Measuring Effectiveness

Any attempt to categorize teachers’ effectiveness must have a procedure for evaluating their work. Few people would believe the claim that a specific teacher is effective without proof. The same is true on a large scale; defining what it means to be an effective teacher requires a mechanism for determining who meets those qualifications. While measurement is important for specifying who is an effective teacher, it is also particularly important for researchers and teachers who are working to understand the effects of different components of teacher preparation or specific instructional techniques.

When practices are implemented in education, those practices need to be evaluated to determine how beneficial they are in the classroom. Measurement is essential for understanding the consequences of teachers’ actions because it provides a way of assessing whether the practices in use are actually having the intended effects. This is particularly necessary when looking for practices that can be implemented on a large scale, as teacher preparation research often aims to do. Standard methods of measurement also provide a means through which different practices can be compared to determine which is more effective.

Outcome Measures

There are six common ways that the outcomes of education (and specifically teacher education) are operationalized in the literature: (i) teacher affect, (ii) teacher behavior, (iii) teacher cognition, (iv) student affect, (v) student behavior, and (vi)
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student cognition. Each approach includes a broad range of outcomes and can be measured in a variety of ways. These six methods have been used to determine the effects of different components of teacher preparation. This thesis looks at six of the most frequently researched aspects of teacher preparation: (i) mentors, (ii) cohorts, (iii) content knowledge, (iv) linking theory and practice, (v) challenging assumptions, and (vi) reflective practice. Each of these research areas is analyzed to determine what evidence of their effectiveness exists and the methods that were used to gather this evidence. 62 studies looking at these components of teacher preparation were categorized by the outcomes the researchers evaluated in the study. The distribution of outcome measured used is shown in Table 1 and Table 2. Table 1 contains the results for teacher affect, behavior and cognition and Table 2 includes the results for student affect, behavior and cognition.
Table 1

*Outcome Measures Used to Assess the Effects of Teacher Preparation on Teacher Affect, Behavior, and Cognition*

<table>
<thead>
<tr>
<th>Outcomes Measures</th>
<th>Teacher Affect</th>
<th>Teacher Behavior</th>
<th>Teacher Cognition</th>
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Table 2

*Outcome Measures Used to Assess the Effects of Teacher Preparation on Student Affect, Behavior, and Cognition*

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<th>Student Cognition</th>
<th>Student Behavior</th>
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<tr>
<td><strong>Challenging Assumptions</strong></td>
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<td><strong>Cohorts</strong></td>
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<td><strong>Content Knowledge</strong></td>
<td>Appleton (2008), Ball et al. (2005), Hill et al. (2005), Hill (2009)</td>
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<td><strong>Reflective Practice</strong></td>
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<td><strong>Theory and Practice</strong></td>
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**Teacher affect.** Measuring teacher affect means evaluating how teachers feel, which can include looking at how much they enjoy what they are doing, assessing their attitudes about teaching, or investigating how effective, confident, or prepared they feel. This type of data is typically collected through questionnaires or interviews. Much of the teacher preparation literature takes this approach, especially when looking at the effects of cohorts, challenging one’s assumptions, and reflective practice. For example, a study by Beck & Kosnik (2001) used a series of questionnaires to assess the effects of cohorts on the well-being of their prospective teachers, asking questions about their expectations and impressions of the program, what they learned from the experience, and how prepared they felt to begin working as a teacher in their own classroom. Another place where researchers often analyze teacher affect is in looking at prospective teachers’ initial views of children or learning and how they change over time through interviews (Schultz, Jones-Walker, & Chikkatur, 2008; Holt-Reynolds, 2002; Bell, 2002) or prospective teachers’ reflective writings (Baldwin, Buchanan, & Rudisill, 2007; Ryan, Carrington, Selva, & Healy, 2009; Tiezzi & Cross, 1997).

**Teacher behavior.** In addition to looking at affect, there are many different ways to measure teachers’ behavior. Examples include looking at how teachers handle behavior management, how long they stay in the field of teaching, and which practices they employ in their classroom. To truly assess teachers’ behavior, researchers must observe the teacher in the context of her classroom rather than asking teachers about her behavior. Actual observations and analyses of teachers’
behavior (as opposed to self-reported behavior) are most prevalent in the research looking at the effects of mentors on prospective or beginning teachers. Many studies (Evertson and Smithey, 2000; Feiman-Nemser and Parker, 1992; Roehrig, Bohn, Turner, & Pressley, 2008; Stanulis et al., 2009) observe teachers to see how mentoring affects their behavior. Some of these observations were done using the Classroom AIMS Instrument, an evaluation tool developed from the literature on effective teaching that provides descriptions of exemplary teacher behavior practice in the categories of classroom Atmosphere, Instruction/content, Management, and Student engagement (Roehrig et al., 2008). Research on the effects of mentoring has also looked at another important component of teachers’ behavior: retention. Looking for components of teacher preparation or induction support that boost retention and could be applied in other programs would have nation-wide benefits, as currently 40-50% of teachers leave within the first five years of teaching (Ingersoll et al., 2007).

**Teacher cognition.** Cognition is the third measurable outcome for teachers, referring primarily to the knowledge that teachers have, both about pedagogy and about the subject matter they are teaching. Research in this area often looks at the knowledge teachers lack or how different amounts of knowledge impact the way teachers teach. However, many of the studies that are working to understand the relationship between content knowledge and student achievement tend to use proxy variables like scores on basic skills tests, courses taken, or degrees attained (Hill, Rowan, & Ball, 2005) rather than actually measuring teacher’s knowledge. Other scholars take a different approach, arguing that the important component of content
knowledge is a teacher’s ability to understand the knowledge and use it in their teaching (Hill et al., 2005). This type of knowledge is often assessed through specially designed metrics (Ball et al., 2005; Phelps, 2009) or self identified increases in cognition (Appleton, 2008; A. Berry, Loughran, Smith, & Lindsay, 2009; Goodnough, 2009).

**Student cognition.** The same three measurement approaches (affect, behavior, and cognition) can also be used for students. Student cognition, often characterized by their educational achievement, is the outcome that is most emphasized by the current school system and is typically measured by standardized test scores. Cognition, however, encompasses much more than the rote skills tested on standardized tests, including conceptual understanding, writing ability, spatial and logical reasoning, numerical and verbal ability, problem solving, and critical thinking.

Few studies concerning teacher preparation evaluate the effects of a particular program or program component on student cognition. There is a cluster of studies examining pedagogical content and several studies have also looked at student cognition as it relates to mentors (Strong, 2006; Villar & Strong, 2007; Everston & Smithey, 2000). The few studies that do exist generally use standardized tests to assess student cognition rather than looking at conceptual understanding or other components of cognition.

**Student behavior.** Another outcome that can be measured is student behavior, including how engaged or attentive students are during class, dropout rates, or overall behavior (both positive and negative). A limited number of studies have
taken this approach, with a few (Johnson, 2009; Evertson & Smithey, 2000) examining how student engagement changes when teachers are mentored. In an economic analysis of mentoring, Villar & Strong (2007) looked at the number of students attaining diplomas and enrolled in Advanced Placement (AP) classes. On the whole, however, there is a paucity of studies that take student behavior into account.

**Student affect.** The last and least used metric is that which measures student affects, or how students feel. This can be assessed by looking at students’ attitudes about school, learning, or a particular teacher. It also includes measures of students’ self-confidence. Example of research that takes this approach are studies done by Stipeck, Feiler, Daniels, & Milburn (1995) and Stipeck et al. (1998) that assess the effects of teachers’ beliefs on their students, using a variety of tasks to evaluate students’ motivation, attitudes towards school, and perceptions of their competence. Though this is not the only study that looks at student affect, it is certainly not a common outcome measure in the research on teacher education or teaching practices.

Though researchers may be able to agree on the different ways to measure the outcomes of education, each person will prioritize the outcomes differently depending on his or her view of the purpose of education. For example, someone who views education as the transfer of knowledge will prioritize evaluating student cognition and supporting components of teacher education that have the biggest effects on student achievement. On the other hand, someone who views the point of education as the socialization of children will view students’ affect and behavior, such as how they feel about themselves and how they interact with other children, as the most
important factors. Though this diversity of measurements is central to understanding the effects that teachers have on their students and that teacher preparation programs have on prospective teachers, it also complicates the existing challenge of defining what it means to be an effective teacher.
Part 2: The Evidence

This section of the thesis analyzes some of the most widely discussed components of teacher preparation through the lens of these six components presented above, aiming to understand how the evidence for the effectiveness of these factors is determined. This section is broken down into two parts: the four core areas of impact (Development of Content Knowledge, Capacity to Challenge Assumptions, Ability to Engage in Reflective Practice, and Ability to Enact Theory-Guided Action) and two structures that are used in the context of training (Mentoring and Cohorts). For each structure or area of impact, the existing evidence is considered in light of the measurement outcomes presented above.

Four Core Areas of Impact

The literature suggests that there are four core areas that teacher preparation addresses: (i) the ability to engage in theory-guided action, (ii) the development of content knowledge, (iii) the capacity to challenge assumptions and (iv) the ability to engage in reflective practice. The majority of the research on teacher preparation falls under one of these four categories.

Ability to engage in theory-guided action. A major challenge of teacher education has been and continues to be how to effectively integrate theory and practice (Allen, 2008; Ketter & Stoffel, 2008) so that teachers can engage in action guided by theory. The failure of teacher education programs to successfully respond
to this challenge is illustrated by the fact that over 60% of teacher education alumni in a national survey “report[ed] that schools of education do not prepare their graduates to cope with the realities of today’s classrooms” (Levine, 2006). This is true in countries outside the United States as well; in a sample of all Dutch teacher education alumni, only 41% rated their preparation as good or very good (Korthagen & Kessels, 1999). In many teacher preparation programs, teachers take an assortment of poorly integrated courses that focus on theory but not practice, but many of these ideas disappear as students complete their field experiences (Korthagen & Kessels, 1999) and encounter school cultures and teachers whose views of teaching are inconsistent with those taught in the preparation program (Smagorinsky, Cook & Johnson, 2003).

Recognizing this problem, there has been a recent trend in the opposite direction, emphasizing practice and largely ignoring theory, implicating teacher education as no more than a time to learn the tricks of the trade (Korthagen, 2006). As Korthagen (2006) noted, “This meant that a basic problem was still not being addressed adequately, much less solved, namely, how to connect theory and practice in such a way that teachers would be able to handle the problems of everyday teaching through theory-guided action (p. 1021).” The question of how to effectively integrate theory and practice is the most crucial piece of teacher preparation, yet it is seems to be one of the most difficult to figure out.

*Why the gap exists.* There are many reasons for the typical discrepancy between what teachers are being taught and what they need to know to be successful in the classroom. This gap is reflective of the gap between research and practice; the
commonly used language says that while K-12 teachers work “in the trenches” each day, dealing with the realities of today’s schools, college professors and researchers sit in their “ivory towers”, discussing ideas without a realistic conception of what it’s like to be in the classroom (Ketter & Stoffel, 2008). Using this language is problematic because it sets up a power differential that only makes communication more difficult. As a result, much of what is being taught in teacher education programs is not readily applicable to the classroom setting because it is often taught by college professors, not classroom teachers.

*Professionalization.* Another possible explanation for this gap is that for many jobs, establishing a theoretical foundation has helped professionalize the field (Korthagen & Kessels, 1999). Many people are working to professionalize teaching to make it more respected. Following this, the large body of knowledge about education should be creating the foundation of the field. However, this knowledge base is large and incohesive, covering a specific set of topics but lacking the empirical rigor required to truly understand cause and effect. In addition, teacher education programs have yet to figure out how to disseminate this knowledge so that it is useful. In education, the push toward professionalization has created a desire to make use of as much of the existing knowledge as possible, thus creating a system in which the experts, or researchers, teach preservice teachers what they know, using assignments rather than providing hands-on experiences in an effort to help preservice teachers apply what they are learning to the classroom (Korthagen, 1999).

An exception to this phenomenon is the action research movement, which attempts to
remedy the problem by encouraging teachers to be researchers as well, particularly within the context of their own classrooms, schools, and districts. Though this may be a helpful way of giving teachers the skills they need to improve their practice and begin to understand action can be guided by theory, it cannot be the only method teacher preparation programs use to solve this problem.

*Lack of reflection.* Korthagen & Kessels (1999) also provide several other reasons for the gap, or what he calls the “transfer problem.” First, students are not given the opportunity to acknowledge or reflect on their assumptions (see Challenging Assumptions for more information on this topic). Prospective teacher’s preconceived notions about education are often different than what the students are being taught in their classes and reflect how the preservice teachers were taught as students (Tiezzi & Cross, 1997). Such ideas, if not explicitly addressed, are generally difficult to change and could be the reason that preservice teachers are not successfully using the theories they are taught (Enterline, Cochran-Smith, Ludlow, & Mietscu, 2008). If prospective teachers do not acknowledge their initial conceptions, when taught theories of education or other relevant information, they will incorporate the new information into their preexisting world view rather than changing their view to accommodate the new information (Lunenberg, Korthagen, & Swennen, 2006; Stofflett & Stoddard, 1994).

*Lack of relevance.* Second, people more readily learn information that is relevant to their lives. If students of education have not experienced situations or problems relevant to the theory they are learning, they have no understanding of why
the theory is useful or why they should learn it (Korthagen, 2006). Prospective teachers who do not have relevant experience to relate their material to will have a more difficult time engaging with and thinking critically about the material because they cannot relate it back to anything meaningful and have no basis for understanding when such ideas would be useful or how they would play out in the classroom. It is also possible that teachers are learning the information, but they cannot generalize the knowledge to make it useful in another context (Scheeler, 2008).

*Lack of tacit knowledge.* Third, in the middle of a class full of students, teachers do not have the time to pause and reflect on the theories they have been taught to determine how to handle the situation at hand; they need immediate and accessible solutions. This is especially true when teachers first enter the classroom; they must master classroom management before even beginning to think about curriculum design or lesson implementation (Elliott & Stemler, 2008; Ketter & Stoffel, 2008). Though theories of behavior, motivation, or learning are helpful in figuring out how to respond to students, teachers do not have the luxury of pressing pause and consulting their notes from last week’s class on behavior management to draft the appropriate response. They must respond immediately with a plan that will solve the problem. Knowing how to respond to these challenges quickly is a form of tacit knowledge that develops with experience, is procedural in nature and is context-specific, making it difficult to both articulate and learn (Elliott & Stemler, 2008). The development of this knowledge has been correlated with teachers’ effectiveness in the classroom. The question remains if there is a way to help prospective teachers
develop these skills during their preparation so that they can be more effective once they are in the classroom.

Korthagen & Kessels (1999) provides a model through which tacit knowledge grounded in theory could develop. They argue that people have gestalts, or behavior patterns that are prompted in response to a specific situation. When people reflect on these gestalts, often because they encounter a new situation or are prompted to do so by another individual, they begin to develop schemas, or “conscious mental representations of concepts and relationships (Korthagen & Kessels, 1999, p.10)”.

These schemas help teachers become aware of the components that make up their gestalts and the relationships between these components. They are simultaneously connected to specific situations, yet allow teachers to begin to generalize across different situations. At this point, a teacher can reflect on his or her schemas, looking at the logical connections between them. “Some relationships in the schema may appear to be a logical consequence of others, or may themselves appear to be if-then relationships that apply to a large variety of situations (Korthagen & Kessels, 1999, p.10).” At this level, the teacher develops a theory, or “definitions, axioms (basic relationships), and logically derived propositions (Korthagen & Kessels, 1999, p.10).”

After a period of time, the teacher becomes aware of their schemas and theories and undergoes a level reduction, reducing the entire theory to a gestalt that can be used in a more intuitive way. This allows the teacher to act instinctively and immediately with actions that are based in theory. To teach prospective teachers to use the theories in their practice with this model, the theories must be introduced at a time when
prospective teachers will be able to apply them. Under this model, prospective teachers would benefit most from learning theory at the point where they move from schema to theory. This is the point where they will be able to take the new knowledge they are learning and understand what it is saying, compare it to their experiences, and then use it to drive and explain their behavior. This model supports the idea that teachers need experience to build off of theory, as highlighted by the second explanation for the gap between theory and practice.

**Potential solutions.** Despite the centrality of theory and practice gap, there is limited literature looking at how to actually solve this problem. Feldman (2006) argues that a gradual release of responsibility within field experiences can promote flexible, adaptive teaching strategies that reflect theory. With this approach, the desired behaviors are first modeled and demonstrated. After this, the prospective teacher works collaboratively with a mentor and then engages in guided practice and independent practice before applying their ideas in a new situation. Alternating field experiences with classes can also promote the connection between theory and practice (Korthagen & Kessels, 1999). In a preparation program designed with this idea in mind, approximately 70% of graduates said they felt well prepared compared to the typical 40% (Korthagen & Kessels, 1999). A third potential method of integrating theory and practice involves evaluating one’s discourse as an instrument through which prospective teachers can identify gaps in their knowledge (Orland-Barack & Yinon, 2007). These approaches all seem to be useful in trying to bridge the theory-practice divide.
Evidence linking theory-guided action to teacher effectiveness. There have been few studies done that look at how integrating theory and practice influences anything other than teacher affect. Most of this research investigates how reflection allows prospective teachers to identify the gaps in their knowledge or how well prospective teachers felt they were taught to integrate theory and practice, overlooking whether or not teachers can actually implement specific practices in the classroom. The literature ignores factors such as teacher retention, teachers’ instructional techniques, student motivation, student achievement, and understanding how to develop theory-based lessons, even though these are the outcomes that have significant consequences for student learning. Despite the fact that this area has been identified as one of the biggest challenges within teacher education, there is no research comparing how different methods of bridging theory and practice influence teachers’ ability to engage in theory-guided action.

Development of content knowledge. Helping teachers continue to develop their content knowledge and learn how to apply it in the classroom is an important component of teacher preparation. Research on this topic typically looks at the relationships between teachers’ GPAs, SAT scores, PRAXIS scores, coursework, certification status or type of college and their students’ achievement in the classroom, but has primarily led to inconclusive results. In a review of studies looking at teacher characteristics and student achievement published between 1975 and 2002, Wayne & Youngs (2003) found that teachers’ college rating and test scores had a
positive correlation with student achievement. Despite this general finding, little is known about how specific characteristics of colleges or skills assessed on such tests relate to effectiveness. Wayne & Youngs (2003) also found that the relationship between coursework, degree, or certification and student achievement varies by subject. Mathematics was the only subject for which increased coursework or certification improved student achievement, but the studies evaluated only looked at high school mathematics teachers and did not separate mathematics education degree from mathematics degrees. Other analyses have found that test scores have a positive effect on student achievement with larger effects for math than reading (Clotfelter, Ladd, & Vigdor, 2007).

**Current practices.** To determine what is actually being taught in teacher preparation programs, the National Center for Teacher Quality completed two studies (Walsh, Glaser, & Wilcox, 2006; Greenberg & Walsh, 2008) evaluating the quality of elementary mathematics and reading preparation provided by undergraduate education programs. They looked at the syllabi and textbooks for approximately 70 programs for each study, determining what content is being covered in reading and mathematics classes. Walsh et al. (2006) found that the majority of education schools are not teaching the science of reading despite the fact that it has wide scientific backing and teachers who know this information are more effective in the classroom. Courses often describe the process of learning to read as a natural process, similar to learning to speak, though there is no research to support the idea. In an analysis of textbooks used in these classes, Walsh et al. (2006) found that they do not cover the
science of reading (and in fact, contain information that blatantly contradicts scientific findings) and fail to teach prospective teachers how to determine with which aspects of reading their students struggle.

The study of mathematics education (Greenberg & Walsh, 2008) reached similarly alarming conclusions, observing that a very small number of education schools teach the mathematics content that elementary school teachers need to know and that there is very little consensus among schools concerning what content teachers need to learn. The mathematics textbooks were not evaluated as satisfactory, particularly because of the way they allotted time to the different areas of mathematics teachers need to know about. Areas like algebra, deemed most important by the researchers, received little if any attention. The authors also found that teachers were not rigorously assessed; rather than being tested on questions that teachers should be able to answer, requiring knowledge beyond that of what they will be teaching, the majority of assessments only included elementary level math questions. These two studies (Greenberg & Walsh, 2008; Walsh et al., 2006) thus concluded that there is much work to be done in the area of elementary mathematics and reading preparation for teachers. It is not that the knowledge teachers need is unavailable; it is just not included in many teacher preparation programs. Given the lack of consensus among programs about what mathematics content is necessary for teachers, disseminating information about what teachers need to know would help to unify the field and have the potential to significantly improve the quality of teacher education in these areas.
Though there has been no larger scale study done of the science courses in teacher education programs, many researchers (Howes, 2002; Stofflet & Stoddard, 1994) have noted that many science teachers lack a comprehensive understanding of the knowledge they will be teaching to their students, possibly because prospective teachers have learned science through the very methods that reforms are trying to replace. Many prospective teachers also hold misconceptions or naïve theories about science that are similar to those held by elementary school students, however this finding is true for a majority of college graduates, not just prospective teachers (Stofflet & Stoddard, 1994). Studies (Howes, 2002) have also shown that prospective teachers do not have appropriate visions of scientific inquiry or a good grasp of scientific concepts, both of which are crucial for providing a quality science education. This lack of knowledge is particularly important because when teachers are not confident in their science knowledge, they are more likely to use the same didactic teaching methods that reform efforts are trying to remove from the classroom, emphasizing memorization and rote skills and failing to heighten student engagement or create deep conceptual understanding (Stofflet & Stoddard, 1994). In addition to having a lack of knowledge, prospective teachers often have negative perceptions of science and lack confidence in their ability to learn the material and then present it to their students (D. Smith, 2000). Watters & Ginns (1995) found that many teachers held negative self-efficacy beliefs and that these beliefs originated from negative high school science experiences. However, these views could be
changed when prospective teachers experienced a positive learning environment and received support.

**Evidence linking content knowledge to teacher effectiveness.** Most of the studies about content knowledge look at how teachers’ knowledge of the subject they are teaching relates to their students’ achievement. However, studies rarely breakdown this content knowledge into basic or complex skills (Ball, Hill, & Bass, 2005), making it difficult to know how to help teachers improve their knowledge. Some studies have related content knowledge to teachers’ behavior, showing that teachers who lack a solid understanding of the material they are teaching are more likely to use didactic teaching methods (Stofflett & Stoddard, 1994). However, little is known about how this impacts other behavioral factors such as retention.

Though content knowledge concerns how much teachers know, few studies actually look at what teachers know about the subjects they are teaching. Some research investigates how prospective teachers’ science content knowledge changes during the duration of a class about teaching science (A. Berry et al., 2009; Goodnough & Hung, 2009; Stofflett & Stoddard, 1994), but few studies look at how teachers come to understand the material they are taught, especially for math or reading. The studies that do look at teachers’ knowledge generally only test teachers on the knowledge that their students will need to know and don’t test background knowledge that would help make teachers more effective in the classroom. In addition, few studies look at how changes in teachers’ content knowledge change student behavior or specific aspects of student cognition like flexibility or critical
thinking skills.

**Pedagogical content knowledge.** While it seems that how much a teacher knows and understands about the subject they are teaching should, to some extent, mediate the quality of education they are capable of providing, many researchers argue that there is another component of teacher’s knowledge, called pedagogical content knowledge, that is the crucial component (Appleton, 2009; Ball et al., 2005; Ball, Thames, & Phelps, 2008; Goodnough, 2009; Krauss, Baumert, & Blum, 2008; Phelps, 2009). Pedagogical content knowledge (PCK), first introduced by Shulman in the 1980s, is the knowledge that teachers need to know about subject matter content to teach students (Hill et al., 2005) and also entails knowing the best, most useful ways of representing and explaining the subject to allow others to understand it (Ball et al., 2008).

PCK is often broken down into four different categories. The first is common content knowledge, or the skills and knowledge used in settings used other than teaching. This means knowing the content they are teaching, being able to recognize wrong answers or incomplete definitions, and using terms correctly. The second is specialized content knowledge, or knowledge and skills unique to teaching. This means finding patterns in student errors or knowing which unconventional methods of solving math problems can be used consistently to get the right answer. It also means being able to provide explanations that can be understood by the students. The third is knowledge of content and students, which means being able to anticipate what students will think and what they will find confusing, knowing what students will find
interesting and motivating, and anticipating how they will do when given a task to complete. The fourth is knowledge of content and teaching, or knowing how to sequence the content being presented, choosing the best examples to help students grasp the concept at hand, and instructional methods (Ball et al. 2008).

Though PCK began as a theory, research has recently provided empirical evidence in support of the theory. Ball et al. (2005) have been working for over a decade to identify the knowledge that elementary teachers need to be effective in mathematics and have developed ways of testing that knowledge. They began by observing teachers, looking at the “work of teaching”, asking questions such as “what do teachers do in teaching mathematics, and in what ways does what they do demand mathematical reasoning, insight, understanding and skill,” (Ball et al., 2005, p. 17). One central idea they discovered is the importance of mathematical language and how and when to use mathematical terms. After many observations and analyses of teaching practices, Ball et al. (2008) then developed an assessment designed to evaluate both common and specialized content knowledge, including test questions that reflected the observation-based hypotheses they had created. These contained questions about student errors, atypical problem solving methods, and how to explain concepts well, among others.

When this test was given to over 700 teachers as part of a larger study that also measured student achievement, several important results were found. First, teachers’ common and specialized knowledge significantly predicted the size of students’ test score gains. For each standard deviation in teachers’ content
knowledge, their students gained two and a quarter points on the achievement test used (the TerraNova) or approximately one half to two thirds of a month of additional growth. This was a stronger predictor of achievement than teacher characteristics (mathematics courses taken, years of experience, or certification status) or the amount of time teachers spent on mathematics in the classroom. The effect size was equivalent to that of socioeconomic status (Ball et al., 2005). Second, teachers of low SES students were found to have reliably less content knowledge than their counterparts in higher SES schools (Ball et al., 2005). This finding is particularly significant given that content knowledge rivals SES for effect size; that is, a teacher with more content knowledge can help eliminate the achievement gap between poor and wealthy students, but only if poor students have teachers with the necessary content knowledge.

A similar vein of work is beginning to sprout in the subject of reading. Phelps (2009) designed an assessment similar to Ball et al.’s (2005) that looked at what teachers do in teaching reading. The questions on their assessment (the CKTR) fall into one of two topics, comprehension or word analysis, and cover content, knowledge of content and teaching, and knowledge of teaching and students. To see whether teachers hold knowledge that differs from common reading ability, Phelps (2009) gave this assessment, along with a measure of reading comprehension and vocabulary knowledge, to elementary school teachers and normal adults. While there was no difference between their reading abilities, there was a significant difference between the two groups’ performance on the CTKR, with the most significant
differences coming from the knowledge of content and teaching and knowledge of
content and students. This shows that reading instruction does demand a specialized
form of professional knowledge that normal adults do not have. However, this study
did not link this knowledge to students’ achievement in the classroom. Though there
has been some work done in science (Appleton, 2009; Goodnough, 2009; D. Smith,
2000; van Driel, Verloop, & de Vos, 1998), the work is primarily conceptual and has
not yet yielded a way to measure PCK in science.

No current literature looks at the development of PCK during teacher
preparation, but there is evidence that PCK can be acquired through professional
development (Ball et al, 2005; Goodnough, 2009; Weiss & Miller, 2006) and it is
likely that any learning that takes place during professional development could also
be obtained during a teacher preparation program. According to Ball et al., (2005), a
development program focused on proof, analysis, exploration, communication, and
representations led to increased PCK. One commonly explored way of acquiring this
knowledge is through mentors (Appleton, 2008; B. Berry, Montgomery, & Snyder,
researchers can be resources in the classroom as they help teachers implement new
curriculum. Having the support of researchers in the classroom who have more
background knowledge about the subject can help teachers reach a wider variety of
learners and successfully design and carry out more engaging activities with their
students (B. Berry et al., 2008).

Evidence linking content knowledge to teacher effectiveness. Even with
evidence that teachers have PCK, it is important to verify that increased PCK for each subject does improve student achievement. The work on PCK in mathematics has been linked to achievement with impressive results; the effects of PCK can rival those of SES. However, similar tests must be created and distributed in other subject matters to determine if the effect size remains the same. It is possible that it does not, given that other coursework and certification have a much bigger effect on student achievement for mathematics than other subjects (Wayne & Youngs, 2003).

Appealing to common sense makes it seem as though the relationship between PCK and student achievement would be consistently positive and significant. Certainly an increased ability to understand student errors, choose appropriate examples, and give good explanations of concepts seems like it would improve students’ mastery of the material. However, it is only with evidence of this relationship that educators or researchers will be able to assert the importance of helping teachers acquire this knowledge and at this point in time, little systematic evidence yet exists.

Research on pedagogical content knowledge has shown that there is a set of knowledge, at least for mathematics, unique to good teachers (Ball et al., 2005), but it has not been looked at in relation to how the existence of PCK changes teachers’ behavior in the classroom or how prepared teachers feel. Does merely having this increased knowledge lead to benefits in the classroom or changes in behavior? If teachers are better taught how to use the information, does that make them even more effective? In addition to looking at student cognition as measured by test scores,
research needs to investigate the more nuanced effects of having a teacher with increased PCK: do students understand the material more quickly? Do they get less frustrated? Do they remember the material for longer? Do they develop a deeper and more complex understanding of the material?

Other important areas of research include refining definitions what this knowledge looks like and spreading it to other subject areas besides elementary mathematics and reading. It is also important to develop a greater understanding of how teachers can obtain this knowledge and the most effective way of teaching it to teachers. This is important both for teacher preparation programs and for professional development directed at veteran teachers. Teacher preparation programs must take the steps needed to expand the pedagogical content knowledge teachers need to succeed in the classroom.

**Capacity to challenge assumptions.** A crucial part of being a teacher is being able to respond to the needs of one’s students. Given the increasing number of minority students in the education system, it is particularly important that teachers are aware of the issues these students face and informed about how to support their students through these issues. To develop this understanding, teachers must unearth and challenge their own assumptions, both about minority or low-income students and about teaching in general. Challenging assumptions means becoming aware of the often unspoken views behind one’s actions and figuring out how to transform those views into more constructive ones. Completing this process during teacher
education programs rather than waiting until the teacher has a classroom of his or her own leaves teachers better equipped to deal with the problems their students are facing.

Teachers need to be forced to challenge their assumptions for many different reasons. Though most students in urban schools are students of color and student populations are rapidly becoming more diverse, the majority of their teachers are white women, most of who have little cross-cultural knowledge or experience (Bell, 2002; Cross, 2003; Sleeter, Torres, & Laughlin, 2004). In addition, these teachers are often unaware of the pervasive discrimination and racism their students face on a regular basis (Sleeter et al., 2004) and may even hold racist views themselves (Cross, 2003).

Teachers often enter the classroom with inaccurate or uninformed beliefs about schools, students, and teaching (Ryan, Carrington, Selva, & Healy, 2009, Ryan & Healy, 2009a). Many assume that their students will have life experiences similar to their own (Baldwin, Buchanan, & Rudisill, 2007) even though their students often come from very different backgrounds. A number of prospective teachers have low expectations of students of color (Bell, 2002; Wade, 2000) and believe that children are unmotivated and unwilling to learn and intentionally cause problems in the classroom (Baldwin et al, 2007; Shultz, 1996). These strongly held beliefs may have been developed over a lifetime of observation (Tiezzi & Cross, 1997) and can be difficult to change (Enterline et al., 2008).
These incorrect assumptions, if left unchallenged, have detrimental effects on the teacher’s ability to learn and to teach. They restrict what preservice teachers are “willing and able to learn about teaching and learning in schools” (Tiezzi & Cross, 1997) and can have a significant impact on how prospective teachers understand their field experience (Wade, 2000). As an educator, such beliefs can also lead teachers to design lessons or curricula to which their students cannot relate (Baldwin et al., 2007; Enterline et al., 2008). These assumptions also influence how teachers view their responsibilities and the purpose of their work, how they approach and challenge inequities, what expectations they believe to be acceptable, and how they adjust their curriculum to reflect the traditions and backgrounds of their students (Enterline et al., 2008). Unchallenged assumptions or a lack of awareness of students’ situations also make it difficult for teachers to recognize bias in school or classroom practices or acknowledge and deal with the racism within the school system (Bell, 2002).

In an analysis of successful teacher programs, Darling-Hammond (2006) concluded that teacher preparation programs need to develop “explicit strategies to help students to confront their own deep-seated beliefs and assumptions about learning and students and to learn about the experiences of people different than themselves” (p. 6). Because public schools are funded by the local, state, and federal governments, they are inherently political. This means that education has the power to either perpetuate or eliminate inequalities. This reality makes it even more important for prospective teachers to question their assumptions honestly and thoughtfully so that they can help students obtain a critical understanding of the world around them,
empowering their students to engage in a “deep examination through dialogue with others of the legitimacy of the social order in terms of access to socioeconomic resources and opportunities” (Sleeter et al, 2004).

**Implementation.** Though researchers and educators alike acknowledge that teachers must confront their beliefs, there is little agreement about the best way to accomplish this difficult task. Most teachers participate in a field experience or student teaching and it is conceivable that just spending time in a classroom could be enough to change teachers’ beliefs. However, just being exposed to low income or urban students during field experiences often reinforces or strengthens teachers’ incorrect beliefs rather than getting rid of them (Cross, 2003; Haberman & Post, 1992; Ladson-Billings, 2000). Cross (2003) posits that this occurs because just observing others doesn’t force the teachers to “question or examine themselves, their status, or their positions in society and how their positions relate to racial minority grounds.” Ladson-Billings (2000) believes that field experience deepen stereotype and attitudes because the teachers do not know enough about the cultures and cultural practices of their students to truly understand them.

Because field experiences do not seem to consistently provide the opportunity to challenge assumptions that preservice teachers require, some researchers have looked at the effect of other similar experiences that may have more potential for changing their beliefs. Instead of (or in addition to) field experiences, teachers can engage in service learning, which often consists of tutoring. Rather than observing in the classroom, the teacher becomes an active participant and is explicitly giving back
to the community (Baldwin et al., 2007; Wade, 2000). Because of this, service-learning experiences may be a more promising way to get preservice teachers to question their beliefs (Baldwin et al. 2007) and to develop curricula that reflects a diverse student body and realistic expectations of their students (Wade, 2000).

Another option being explored is the use of ‘real-world’ experiences. Ryan et al. (2009) gave preservice teachers the opportunity to “observe and enact theories of communication, language and learning in real-world contexts and specifically not in classrooms.” Students in this program visited several different sites and helped out in some way at each site. These experiences gave them exposure to a wide range of pedagogical styles and opportunities to observe children’s learning in many different settings. A crucial part of getting teachers to challenge their beliefs was the reflection they did after visiting the sites. This forced the teachers to think critically about the types of learning happening both inside and outside of the classroom and the impact they can have on their students (Ryan et al., 2009). Ryan et al. (2009) found that teacher’s beliefs did change as a result of these experiences; they observed “how different contexts and purposes can call for different pedagogical styles,” which is important for teachers who are going to be teaching a class of diverse learners (Ryan et al., 2009).

Regardless of whether it is coupled with a student teaching or service-learning experience, reflection is a vital component of challenging one’s assumptions. This reflection should involve preservice teachers “critiquing ideologies, examining the influences on their thinking and identities, and considering the kind of teachers they
want to become” (King, 1991, p. 141). This reflection can happen either through writing (Baldwin et al., 2007; Ladson-Billings, 2000) or dialogue (Cook-Sather & Youens, 2007; Sleeter et al., 2004). Writing autobiographies or descriptions of their experiences provides an opportunity for the “critical examination and experience of difference” (Ladson-Billings, 2000). Having discussions with their peers allows teachers to share their experiences in a space where they can question their understandings about and explanations of situations (Sleeter et al., 2004) and discuss the unspoken rules of culture or to teachers’ own racial identity development (Bell, 2002). To achieve the desired results from reflection, the teacher educator has to create a space and provide a conceptual framework (Sleeter et al., 2004).

In addition to these experiences, some research suggests that teachers need to have multicultural coursework that educates them about the challenges that different minority groups face and aspects of students’ culture that can help teachers better understand them. However, a program with a disjointed assortment of courses that includes a few about diversity in the classroom or multicultural education will not be as effective as a program that has a common vision of teaching and learning that addresses the needs of all learners (Darling-Hammond, 2006). All the same, just because teachers have had classes in multicultural education does not mean they will successfully implement such practices in the classroom. Cross (2003) found that teachers who were taught to recognize their students’ diverse backgrounds and experiences, respect the way they speak, and acknowledge the cultural diversity in the classroom thought that they were doing these things effectively when in reality they
were not doing as well as they thought. Teachers must be educated to “really celebrate diversity, not just random holidays, isolated cultural artifacts, or ‘festivals and food’” (King, 1991). However, it is difficult to figure out how to effectively meet the needs of diverse classrooms of students if one has only been shown what not to do, rather than what to do. Ladson-Billings (2000) suggests that teachers should be shown what it looks like to be a teacher who effectively implements these practices in the classroom.

*Evidence linking challenging assumptions to teacher effectiveness.* This is another area of teacher preparation that suffers from a lack of rigorous empirical studies. Few studies have examined how teachers’ assumptions play out in the classroom. As a result, it is not clear which beliefs make teachers most effective. Ladson-Billings (2000) found that expert teachers had higher expectations of their students and promoted both sociopolitical critique and cultural competence in their classrooms. Few studies have looked at how one program, when compared to another, causes teachers to challenge assumptions. As a result, it makes it difficult to ascertain which experiences are most successful at changing these beliefs. Doing this research is difficult; these beliefs are often implicit and unacknowledged, which makes them difficult to measure.

*Reflective Practice.* Reflection is one of the most important skills that can be learned in teacher preparation. It provides a way for teachers to focus on what students are learning rather than what is being taught, providing another way of
verifying that students are actually completing the teachers’ learning goals (Hiebert, Morris, Berk & Jansen, 2007). Successful reflection also allows teachers to analyze and improve their practice and articulate, address, and revise their beliefs (Chitpin, Simon, & Galipeau, 2008). Become a successful reflector requires that teachers examine their practices in ways that account for their experiences, knowledge, and beliefs. However, knowing what questions to ask and when to ask them are difficult skills to develop and should be incorporated into teacher preparation programs so that teachers have the opportunity to hone their reflection skills with the support and guidance of mentors, teacher educators, and peers before being in a situation where they are required to use them on their own.

Reflection is described by researchers in many ways, as “an active and deliberative cognitive process, involving sequences of interconnected ideas which take account of underlying beliefs and knowledge” (Hatton & Smith, 1992) and a “collection of dispositions, knowledge, and reasoning skills that enable developing and testing hypotheses about cause-effect relationships between teaching and learning” (Hiebert et al., 2007). Most definitions of reflection entail evaluating the situation, consulting prior knowledge, and exploring available solutions or actions that would have positive results. Reflection is believed to be one of the most powerful ways to develop excellent teaching practices (Chitpin et al., 2008) and is a central component of many teaching programs.

In many Asian countries, collaborative reflection is an essential component of a teacher’s job. Teachers engage in a practice called “lesson study,” which requires
groups of teachers to establish a common goal and an area of focus. They then work together on creating, implementing, observing, analyzing, and improving lessons (Chokshi & Fernandez, 2005). Though reflection is used in many teacher preparation programs, this seems to be the only widely used system of reflection documented in the literature.

Many researchers have put forth theories to explain how reflective practice should work. Hiebert et al. (2007) believe that the purpose of teaching is to support student learning. As a result, they have articulated four skills or steps they believe teachers need to be effective. The first step is setting learning goals for students. These goals must be specific, stating what students will be able to do at the end of the lesson or unit. Goals such as “student will be able to understand concept of…” are not specific enough because it is difficult to find evidence for understanding a concept. Instead, goals should use active and measurable verbs like explain, analyze, or compare. Without these goals, teachers cannot evaluate what their students have learned.

The second skill is observing the teaching and learning happening in their classrooms. Successfully completing these observations requires that teachers: (i) acknowledge that evidence is essential for understanding how effective the lesson was, (ii) know what counts as evidence that students are achieving goals, and (iii) know how to collect evidence. In this step, it is important that teachers recognize the importance of what students have learned, not what the teacher taught. Teachers must also be able to distinguish between student responses that indicate learning (a correct
answer to a question) and those that don’t (head nodding). To understand what counts
as evidence, teachers must also have a breadth of subject knowledge that allows them
to anticipate students’ responses and understand what those responses indicate about
the students’ thinking. These elements all require that the teacher focus on their
students as learners rather than on themselves as teachers.

For the third step, teachers construct hypotheses about how their teaching did
or did not facilitate learning. By relating principals of teaching and learning to their
observations, teachers come to better understand how a particular instructional event
impacted the learning that was supposed to occur. If the desired learning did not
occur, teachers brainstorm other questions, activities, or explanations that could have
been more effective. With the information gathered from the three previous steps,
teachers can then revise their lesson plans to more effectively promote student
learning. If they have the opportunity, teachers can then implement their revised
lesson plan, ideally resulting in a higher percentage of students meeting the learning
objectives.

While other people’s ideas about reflection are not explained with the same
level of detail as Hiebert et al.’s, most of the research on reflection reveals a similar
trend. For example, Rodgers (2002) articulates a reflection cycle that involves
presence (awareness of what students are learning and how they are learning it and
adjusting one’s actions accordingly), description (describing but not interpreting what
happened during a lesson), analysis (developing explanations for what happened that
can transform into a hypothesis to be tested), and experimentation (intelligent action
based on the analysis). Though goal setting is not explicitly part of her cycle, the latter three steps mirror those of Hiebert et al.’s. Chitpin et al. (2008) describe a similar approach, the objective knowledge growth framework (OKGF), which requires teachers to recognize a problem, develop a theory about how to fix it, implement the theory and then pose another question.

Many of these models were constructed by teacher educators who believe that these skills should be taught during a teacher’s preservice education. It is not entirely clear how such skills should be integrated into a teacher preparation curriculum, however, many teacher education programs that require student teaching also require students to keep a journal in which they reflect on their experiences. Others use video-taped lessons as a way of promoting reflection after the lesson is over. Many researchers also suggest that reflection be done in groups – in this way, teachers can work together to improve all of their abilities (Rodgers, 2002; Arani, Reza, & Fukaya, 2009).

Reflection seems to have many positive effects. In many different Asian countries, lesson study is seen as a successful way of helping teachers design more effective lessons, understand differences in student learning styles, raise student achievement, improve the quality of their teaching, and help students become critical thinkers rather than passive recipients of education (Arani et al., 2009). Reflection gives teachers the skills they need to improve their practice over time (Chitpin et al., 2008; Hiebert et al., 2007) and can lead to more equitable instruction by encouraging teachers to make decisions based on student learning rather then their perceptions or
assumptions (Chitpin et al., 2008; Hiebert et al., 2007). It can also help build a professional knowledge base, alter the professional roles of teachers by making teaching more intellectually demanding and acknowledging how complex it is, and connect policy to practice (Fernandez & Cannon, 2007).

**Evidence linking reflective practice to teacher effectiveness.** The research on reflection typically focuses on how teacher’s abilities to reflect on their own practice change over time (Chitpin et al., 2008; Nagle, 2009). Some of the research looks at how teachers’ learn from their own practice (Jansen, 2009), and others look at how teachers what teachers are thinking about while teaching (Romano, 2006). There is little research that investigates how an improved ability to reflect on one’s work affects student achievement. Though it does seem that developing these skills would lead to enhanced student achievement, research examining how to make reflective practice most beneficial to students would provide empirical support for these ideas. Reflection also needs to be researched in the context of retention; perhaps increasing teachers’ abilities to reflect on their practice, thus making teaching more intellectually demanding and engaging, could also help to increase retention rates.

**Structural Components**

The way a teacher preparation program is structured has significant effects on the development of the aforementioned skills. Mentoring and cohorts are two particularly prominent processes used in the context of teacher training.
**Mentoring.** The majority of teacher education programs require students to student teach, providing a unique opportunity for teachers in training to work alongside experienced professionals who serve as mentors and develop their practice. Though most of the research about mentoring focuses on what happens after teachers have their own classrooms, this research can and should be applied to teacher preparation programs to strengthen the student-teaching experience and help prospective teachers develop.

Mentoring is often touted as an essential and beneficial component of a teacher’s development, especially during her first few years in the classroom. As of 2000, almost two thirds of America’s first year teachers had a mentor, though those mentors varied in level of involvement (T. Smith and Ingersoll, 2004). Given the increased prevalence of mentoring in the last twenty years (Ingersoll & Kralik, 2004), it is likely that an even greater number of novice teachers now have mentors during their first year of teaching. Despite the prevalence of mentors, these mentors fulfill different roles for their mentees and vary widely in their level of effectiveness (Ingersoll & Kralik, 2004).

Schools and universities have adopted many different ways of mentoring novice teachers. In some cases, mentor teachers are relieved of teaching duties for several years to mentor as many as fifteen students at once whereas in others, mentor teachers are assigned a mentee on top of their typical teaching duties (Parker and Feiman-Nemser, 1992). Yet others reduce mentors’ teaching loads, giving them more time to observe and communicate with their mentor teachers (Glazerman et al., 2008).
While some of these differences between school districts or programs are due to the availability of funding, others are due to different visions about what the role of a mentor should be.

**The Role of the Mentor.** Teaching has often been characterized by isolation, despite the fact that teachers work in the same building as dozens of other professionals doing exactly the same thing (Beutel & Spooner-Lane, 2008; Giles, Davis, & McGlamery, 2009; Hobson, Ashby, Malderez, & Tomlinson, 2009). As a result, the first year of teaching has typically been a “sink or swim” experience with new teachers struggling to successfully plan lessons, manage student behavior, establish appropriate rules and procedures, communicate with parents, learn how the administration works, maintain a positive classroom climate, and motivate students.

Mentors can help rectify this situation in a number of ways. Parker and Feiman-Nemser (1992) believe that mentors can serve as local guides, educational companions, or agents of cultural change. Local guides are mentors who help teachers learn about school policies, resolve pressing issues, and share materials with no long-term role. By working with novices to improve their specific teaching situation, educational companions help novices with urgent concerns while simultaneously paying attention to their professional development and focusing on long-term goals such as understanding student thinking. Agents of cultural change work most strongly to combat the typical sense of isolation by creating opportunities and expectations of collaboration and joint learning. In addition to these roles, others have stated that the point of mentoring is to serve as the major link between theory and practice (Sundli,
2007; Feldman & Kent, 2006), to help novice teachers through discussion and reflection (Evertson and Smithey, 2000), and to advance visions of effective teaching (Stanulis & Floden, 2009), particularly those articulated by national curriculum and teaching standards (Wang, Odell, & Schwille, 2008). As a result of these differing ideologies and the realities of district policies where teachers work, some novice teachers have mentor teachers who have the time and desire to talk through lesson plans, observe classes and give feedback, and encourage reflective conversations about lessons whereas others rarely interact with their mentors.

**Components of Effective Mentoring.** Researchers have been working for many years to understand the effects of mentoring on teachers and their students as well as the factors that make some mentors more helpful than others. Despite all of this work, the influence that mentors have on their mentee’s teaching is often assumed, relying on theory and common sense rather than empirical evidence. As a result, little work has been done that looks at the effects of mentoring on student performance, thus making it difficult to draw any robust conclusions (Wang, et al. 2008). Much of the existing research on mentoring focuses on different aspects of mentoring (mentor training, characteristics of the mentor and novice teacher, and the nature and focus of the relationship) and how these aspects affect the success of the mentoring process. The way success is measured or accounted for in this field of research varies greatly, making it difficult to know whether all of these studies are really investigating the same thing.
Many studies have looked at the differences between mentors who have had been trained as a mentor and those who have not. Evertson and Smithey (2000) examined the differences between mentors who had participated in a 4-day workshop focusing on helping them develop a knowledge base of effective mentoring practices. During the workshop, mentors discussed their role as mentors and the needs of new teachers, learned techniques for observing the novice teachers, practiced communication skills, and explored the classroom management strategies the novice teachers had been taught in their workshop. These mentors also attended monthly meetings to share strategies and discuss problems that had arisen. The comparison group received no training. Evertson and Smithy (2000) found that the trained mentors had “more specific strategies for developing discipline plans, appropriate lesson pacing, and changing instruction to more student-centered approaches” (p. 299), were more likely to offer suggestions than emotional support, and exhibited better communication and conferencing skills that recognized novice teachers’ needs to reflect on their own teaching before discussing solutions.

Other research agrees with these ideas, observing that mentors who have a better sense of what teachers are learning are more useful in helping novices connect their ideas to their practice (Parker and Feiman-Nemser, 1992). A report by the National Center for Research on Teacher Learning (NCRTL, 2000) echoed these ideas, stating that mentors need opportunities to learn how to be effective mentors. This means having chances to understand how their role as mentors affects the novice’s learning, to question their beliefs about learning to teach, and to talk through
issues that often emerge while working with novices (NCRTL, 2000). These researchers are all arguing that there is a different knowledge bases teachers need to be effective, there is a different knowledge base required for mentoring that involves knowing about adult learning and how to teach teachers (Achinstein & Athanases, 2005, Wang et al., 2008). Mentors who have acquired this knowledge and the relevant skills will be more effective than those who haven’t.

In addition to training, other researchers have looked at characteristics and skills of mentor and novice teachers that make them most effective. The best mentor teachers have a “disposition towards learning, towards students, and towards the profession of teaching” (Parker-Katz & Bay, 2008, p. 1264). Effective mentors guide rather than evaluate their novice teachers, use active rather than passive listening, and use questions as a way to prompt reflection (Evertson and Smithey, 2000). They also think with the beginning teachers instead of imposing ideas as an authority figure, help novices understand the issues they are having and their causes, and focus the teachers’ attention on ideas they may not have thought of such as the way children think or connections between theory and practice (Wang et al., 2008). While some teachers may be proficient in these skills, many may need to be explicitly taught them in training workshops. These skills are not skills that teachers would have necessarily have developed, thus contributing to the idea that there is a separate knowledge and skill base for mentors than for teachers. Little research has been done looking at what prospective teachers should do to benefit most from mentoring. However, the initial findings suggest that novices who are more open to criticism and have a more
accurate self-evaluation tend to have the most beneficial mentoring experience (Roehrig et al., 2008).

Another factor contributing to the success of mentoring concerns the characteristics of the relationship between the mentor and the mentee and where the focus of mentoring lies. The way the mentor and the prospective teacher initially see their relationship may shape the relationship itself and what the novice is able to learn from it (Wang et al., 2008). Those who go into the experience expecting to learn a lot will most likely have a better learning experience than those who have low expectations. The amount of time mentors have available drastically changes the nature and intensity of the assistance they are capable of providing (Parker and Feiman-Nemser, 1992). This may dictate which of the roles (described above) they end up playing. Mentoring also works better when there is open communication between the mentor and the novice (Sundli, 2007). This allows them to communicate freely about educational philosophies and teaching or working styles that could otherwise cause conflict. Such communication also helps prevent power struggles, which, when present, prevent learning from occurring. Mentor teachers can also help empower beginners by giving them the opportunity to communicate with the parents, principal, and other administrators (Parker-Katz & Bay, 2008) so they are learning through experience. Additionally, prospective teachers’ teaching improves more when mentors are able to focus on student learning (Achinstein & Athanases, 2005), using inquiry and reflection as means to understand the novice’s actions in the
context of the lesson and how the novice teacher was promoting student learning (Parker-Katz & Bay, 2008).

Evidence of linking mentoring to teacher effectiveness. There are several different ways to look at the success of mentoring. Most of the studies described above looked at changes in teachers’ behaviors in the classroom as an indication of success. However, other researchers have looked at the effects of mentoring on student achievement and teacher retention.

The studies looking at the relationship between mentoring and student achievement have all concluded that mentoring has a positive effect on the students (Evertson and Smithey, 2000; Johnson, 2009; Strong, 2006; Villar & Strong, 2007). Beginning teachers who received induction support (with mentoring) for two or more years were more likely to make significant gains (Villar & Strong, 2007) and districts that provided mentors for their second year teachers (in addition to the first year teachers) had better standardized test scores (Strong, 2006). Students of teachers with extensive mentoring became more engaged in their classes (as judged by observation and self-report data) while the engagement of students with mentor-less teachers decreased significantly (Johnson, 2009).

There is also some evidence that mentoring improves teacher retention. Having a mentor in one’s field decreases the risk of teachers leaving after their first year by about 30% (Smith & Ingersoll, 2004). This number increases significantly if teachers are provided with other kinds of induction support as well (Villar & Strong, 2007). Given that such an alarming number of teachers are leaving each year, the fact
that mentoring can have such a huge effect is promising. There has been little research, however, looking at the effects of preservice mentoring on retention.

Another way to measure the effects of mentoring is to look at how teachers’ behavior changes after mentoring. Overall, many studies have found that novices with involved mentors improved more than those without mentors (Stanulis & Floden, 2009). A study done by Johnson (2009) found that teachers who had trained mentors were more likely to differentiate their instruction than teachers who had non-trained mentors. In Evertson and Smithey’s study (2000) described above, beginning teachers with mentors improved on a number of measures significantly more than their non-mentored counterparts. They managed their instruction better (giving clear explanations and pacing lessons well), more successfully established rules and procedures, did a better job tailoring their lessons to the students interests and needs, managed student behavior more effectively, and had a better classroom climate.

If teachers can learn more of these skills during their student teaching time from a mentor, they will be more effective upon graduation. In working with a mentor, they will have learned more about setting up a classroom, navigating the administration, designing and presenting engaging and appropriate lessons, and effectively managing student behavior, which will make them more successful as teachers. Though no research has looked closely at which of the components of mentoring cause the improvement in student achievement, learning these skills before stepping foot into their own classroom will certainly help teachers be more effective when they do.
More research is needed to truly understand the impact that mentoring can have on both preservice and inservice teachers. Research needs to focus on understanding which methods of mentoring are most beneficial to teachers and how those mentors can be taught to carry out those practices. In addition, the impact of both limited and comprehensive mentoring on teachers’ behaviors and practices and on student achievement and behavior needs to be investigated, as there is a lack of rigorous empirical studies in this arena. If mentoring practices are going to be more frequently and diligently integrated with field studies, research will also be needed to determine the differences between what preservice and inservice teachers require from their mentors to develop into effective teachers.

**Cohorts.** The teaching profession has historically been characterized by teachers working independently of one another, isolated from the professionals in the classroom next door. However, recent reform efforts have begun to emphasize the importance of shared responsibility and collaboration within schools (Westheimer, 1999). This emphasis has been paralleled by an increase in popularity of cohorts in teacher education. Cohorts are typically defined as groups of students who begin a program together, take the majority (or all) of their classes together, have a set of shared experiences, and finish the program around the same time (Maher, 2005) rather than being admitted at the same time but proceeding through the program taking different courses and never developing into a coherent group of prospective teachers. The use of cohorts in higher education first gained popularity in the 1980s
and is now a common feature of many traditional and alternative teacher preparation programs (Mather & Hanley, 1999). Cohorts are beneficial because they can help participants build a network of supportive relationships that will continue to exist after graduation, increase intellectual stimulation by giving participants an opportunity to share resources and ideas, and simplify the organizational and administrative aspects of the program because all students move through the program together, taking the same classes at the same time (Seifert & Mandzuk, 2006; Maher, 2005).

The majority of the research related to the effectiveness of the cohort approach uses interviews, observations, and group discussions to explore the evolution of participants’ opinions about the cohort and the development the cohort itself over the course of a program. These studies have found that cohorts can have a number of positive effects on their participants. Cohorts lead to more engaging class discussions in teacher preparation courses (Maher, 2005), encourage participation of all cohort members in these discussions (Beck & Kosnik, 2000), and strengthen peer relationships, resulting in increased learning on the part of the prospective teacher (Dinsmore & Wenger, 2006). They also provide an opportunity to develop a sense of continuity and shared experience (Maher, 2005) that promotes a sense of belonging. Furthermore, cohorts cultivate an awareness of the value of collaboration (Beck & Kosnik, 2000) and an increased sense of peer responsibility (Maher, 2005) and accountability (Mandzuk, Hasinoff, & Seifert, 2005) that makes participants feel as though they can rely on other participants to support them.
However, the effects of cohorts are not uniformly positive. At times, cohorts can take on the characteristics of the strongest members, making it difficult for everyone to participate, or creating expectations that everyone will maintain the same shared beliefs and exhibit the same behaviors. The intensity of the cohort experience can create destructive social dynamics and peer pressure to conform that takes attention away from the experience of learning to be a teacher (Mandzuk et al., 2005, Mather, 1999). Additionally, Seifert and Mandzuk (2006) suggest that while cohorts help participants develop relationships with their peers and some of the skills required for collaboration, they are less successful in helping students develop a sense of individuality. Despite the potential negative effects, the majority of research has found that participants were satisfied with their cohort experience (Dinsmore & Wenger, 2006; Maher, 2005).

One major problem with the existing research related to cohorts is that each program designs its cohort in a completely different way. Some cohorts participate in team building and other social activities to help prospective teachers build relationships with each other outside of an academic context whereas others merely have all of their teachers take all of the same classes. Some programs provide space to address the issues concerning social dynamics that arise while others do not because only some programs have instructors who are attempting to facilitate the development of a community, not just a cohort. In addition, the programs discussed in the literature vary in intellectual rigor. While these differences are reported in the research, the lack of uniformity across cohorts makes it difficult to draw any reliable conclusions about
the effectiveness of cohorts. Additionally, although a few studies compare the experience of students who are in a cohort to those who are not (Mather & Hanley, 1999), the majority of studies look at just one program to see how the cohort is affecting its participants. Some studies look more at the role cohorts play as support groups or intellectual communities (Seifert & Mandzuk, 2006) while others look more closely at how the impact of the cohort on ideas and relationships changes over time (Beck & Kosnik, 2000; Dinsmore & Wenger, 2006; Maher, 2005; Mandzuk, et al., 2005). There is little, if any, research that looks at the effects that a cohort has on outcomes such as teacher retention, teaching practices, teacher collaboration, or a teacher’s later success in the classroom.

To compliment this literature on cohorts within teacher education, there is a growing body of research on “learning communities” within schools. The opportunity to work together, simultaneously developing content knowledge and working to improve the curriculum, provides a way out of the isolation that typically characterizes teaching (Grossman, Wineburg, & Woolworth, 2001). Teachers who have had positive, engaging cohort experiences may be more likely to participate in these types of collaboration, which also help teachers intellectually engaged and inspired to teach (Grossman et al., 2001). More research is needed to understand if such learning communities would be a useful addition to teacher preparation.
Discussion

Though at first glance these components seem loosely connected at best, they are much more cohesive when viewed through the lens of reflective practice. Reflective practice is the most important skill that can be acquired through teacher preparation programs – it must be used to challenge assumptions and to connect theory with practice. Content knowledge provides teachers with the building blocks to build curricula and understand student learning, both of which require reflection to be done well. Mentors and cohorts comprise communities in which reflective practices are practiced and encouraged.

Reflection provides the means through which prospective teachers can challenge their own assumptions. Without reflection, prospective teachers cannot acknowledge or revise their preconceived notions about students and learning. After they are made aware of their own beliefs and have participated in field experiences, pre-service teachers are in a position to learn about different theories of education and how they can be applied in practice. Throughout this process, working with a mentor provides many ways for prospective teachers to develop reflection skills. Mentors can model, encourage, and ask questions that prompt reflection. Cohorts also provide prospective teachers with backstops for the development of individual reflective practice. These components are all required to successfully learn and apply the skills involved in reflection.

What the literature reveals. This body of research has identified several different components of teacher preparation that have the potential to impact
prospective teachers. Though several large-scale studies have found the effects of teacher preparation to be negligible (Lunenberg et al., 2007), this research suggests that though teacher preparation is difficult, teacher educators have devised at least some strategies that are effective. When broken down into different components including mentoring, cohorts, challenging assumptions, content knowledge, theory and practice, and reflective practice, research shows that each of these has the capacity to affect teachers in a different way. However, the mere presence of these components is not enough to effect change. Each area or structure must be carefully constructed to ensure that it is having the desired effect. Much of this research has been successful at breaking down each of the components into the smaller pieces that are influential. Mentoring, for example, is influenced by the amount of time the mentor has available, the relationship between the mentor and prospective teacher, the kind of feedback the mentor gives, how often this feedback is given, and how this information relates back to what the prospective teacher is learning in her preparation courses to name a few. Having a mentor does not necessarily improve a teacher’s practice, but mentors who exhibit specific behaviors, such as active listening skills have more success (Evertson & Smithey, 2000).

**Matching outcomes to goals.** Even though the research presented above uses a variety of approaches to evaluation, these approaches aren’t used systematically, consistently, or in balance. Though as a whole the literature focuses on teacher affect, the research on each component of teacher preparation tends to take a slightly different approach to what it means to be effective. Some of these approaches are
more logical than others given what is being evaluated. Research on challenging assumptions focuses on teachers’ perceptions, attempting to understand what their initial conceptions are and how they change throughout the course of their preparation. Theory and practice, however, also focuses on teachers’ perceptions rather than their ability to engage in theory-guided action.

Each component of teacher preparation serves a different purpose within the context of education. To determine the effectiveness of each component, researchers need to look for outcome measures that reflect its goals. The measures that determine effectiveness may differ across components. For example, if challenging assumptions has the goal of forcing teachers to confront their beliefs, measuring effectiveness of this component needs to look at whether teachers’ beliefs were changed. If the emphasis on bridging theory and practice exists to help teacher enact theory-guided action, researchers need to focus on teachers’ ability to use theory-guided action in the classroom. The challenge here is that these components simultaneously serve a variety of purposes. Cohorts, for example, can have many benefits for prospective teachers, including helping them challenge their assumptions, creating support networks, and fostering intellectual and professional growth. Each of the desired outcomes needs to be assessed independently to determine how effective a programs’ cohort structure is at achieving that particular goal. This becomes infinitely more difficult when the purposes of each component have not been clearly articulated or defined, as is often the case.
Focus on teacher affect. Despite the importance of matching outcome measures to the goals of each component, this literature focuses heavily on teacher affect, looking primarily at teachers’ experiences or feelings and not their behavior or cognition. For areas such as learning to challenge assumptions, it is logical to focus on teacher affect; the point of this component of preparation is to encourage teachers to acknowledge, confront, and revise their beliefs about children and learning. It is surprising, however, that research on cohorts and the integration of theory and practices is so strongly focused on teacher affect. For cohorts, much of the literature tries to understand what the experience of being in a cohort is like and how teachers’ perceptions change over time. This is certainly an important component of cohorts, but it is not the only relevant outcome. If cohorts are really serving as the intellectual communities that many believe they should be, they should also result in changes in teacher and student behavior and cognition. Knowing what the desired effects are and whether they are being achieved is crucial to improving and adapting the cohort model to fit the needs of the teacher and her future students.

A similar gap is seen in the literature on theory and practice. Though training teachers to integrate theory and practice is often cited as one of the biggest challenges of teacher preparation (Korthagen, Loughran, & Russell, 2006), the research tends to focus on teachers’ perceptions of this gap rather than assessing their behavior or what they actually know. To assess a program’s success at helping prospective teachers link theory and practice, prospective teachers’ actions in the classroom must be observed and analyzed, looking to see where and how their practice reflects theory.
Research must also look at whether teachers have the knowledge about how to achieve this integration; it is possible that some teachers understand how to hypothetically link the two but cannot successfully do so in the classroom.

**Lack of attention to behavior and cognition.** Because teacher preparation exists to prepare teachers to succeed in the classroom, teacher educators need to know whether teacher preparation is actually affecting the behaviors teachers exhibit in the classroom or the knowledge they have. There is, however, little literature investigating what teachers know or what they do in the classroom. To help teachers become effective practitioners, teacher educators need to understand the knowledge and skills required of good teachers. Without this understanding (and an understanding of how this knowledge impacts students), it is hard to know what prospective teachers need to know or how to teach them. Predictably, research looking at content knowledge tends to involve what teachers know more than other aspects of research. Most of this research, however, focuses on teachers’ pedagogical content knowledge, not their subject matter knowledge. Interestingly, research on content knowledge often uses proxy variables such as test scores, coursework, or degrees obtained to approximate the knowledge that teachers have (Hill et al., 2005); few studies actually assess what teachers do or do not know. Research needs to investigate how teacher behavior changes with varying levels of knowledge and confidence in one’s knowledge and how to improve teachers’ content knowledge. Many teacher educators have found, for example, that prospective teachers don’t understand or enjoy science, most likely because they have been taught by the same
methods reformers are trying to replace (Stofflett & Stoddard, 1994). This highlights one of the biggest challenges of teacher preparation: teachers who have been taught using traditional methods will have a difficult time using new methods without extensive training, but the methods they were taught with are not effective at promoting conceptual understanding of the material. Research on cognition needs to address this challenge, helping teacher educators find solutions that can be used to overcome it.

Because teacher behavior is the only component that students directly experience (affect and cognition are channeled through behavior), it is arguably the most important outcome of teacher preparation. Teacher educators need understand how their practices are affecting teacher behavior to train teachers effectively. A focus on behavior also ensures that prospective teachers are internalizing the material presented in a way that will allow them to use it later on. If research does not look at teacher behavior, there is no way of knowing what they are actually doing in the classroom. The limited research on teacher behavior tends to be located in the literature on mentors, looking at the influence of different mentoring situations or practices on teacher behavior, both as practices in the classroom and retention. This needs to be expanded to examine the effects of other areas of preparation on teacher behavior, as there are many unanswered questions related to behavior that are essential to determining the effectiveness of teacher preparation and specific practices. How does participating in a cohort impact a teacher’s effort and ability to create a positive classroom community? What does it look like in the classroom when
teachers truly understand how to create theory-guided lessons? How do different stages of cultural competency affect teachers’ abilities to motivate and build relationships with their students? These questions are just a few of the many that are yet to be answered.

**Lack of attention to student outcomes.** Most importantly, the majority of this research focuses on the effects that teacher preparation has on teachers, typically ignoring how teacher preparation affects students. This significant different in distribution of outcomes can be seen in Figure 1.

![Figure 1: Distribution of Research Outcomes](image)

*Figure 1. Distribution of research outcomes used in studies on teacher preparation*

The lack of attention paid to the effect of preparation on students is particularly striking given the fact that once teachers are in the classroom, student achievement is often the sole measure of their effectiveness. Though student cognition is measured occasionally, none of the research considered in this thesis examined student affect. This is even more shocking, given that motivation is the driving force behind learning (National Institute of Child Health and Human
Though student achievement reflects how much students have learned and is certainly an important outcome of education, ultimately students are the ones who decide what work to do and how hard to try. Thus student affect plays a major role in academic success. Measuring student affect, especially in terms of motivation, confidence, enjoyment of learning, and perceived self-efficacy, is crucial to understanding how teachers are affecting their students. Students who are confident in their abilities and believe that they can and will succeed are much more successful than those who do not (NICHD & NCATE, 2006). Students who are motivated put forth more effort than those who aren’t. Students who believe that they are successful because of their hard work rather than their intelligence are more likely to accept challenges (Mueller & Dweck, 1998). Because these factors play such a significant role in mediating academic achievement, research on teacher preparation should factor in effects on student affect when determining effectiveness.

**Limitations.** In general this research does not employ the empirically rigorous methods that are needed to draw solid, reliable conclusions or causal relationships. Studies are often done by teacher educators on their own students, failing to look at other populations of prospective teachers. Teacher preparation programs take a variety of approaches when educating their prospective teachers and these approaches are not always explicitly stated. This makes it difficult to compare results across studies. Such discrepancies are particularly apparent in the research on cohorts; each program structures their cohorts differently, places a different value on community
building, and expects the cohort to serve a different purpose, yet all of these practices fall under cohorts. Despite these limitations, the research on teacher preparation provides some answers for how to develop effective teachers.
Part 3: Best Practices

Though the research on teacher preparation is in no way complete, teacher educators cannot wait until they have all the answers before incorporating the findings into their programs and courses. The reality is that there are too many students who don’t have access to highly qualified, effective teachers, and any changes that can be made in teacher preparation that have been linked to positive outcomes will be a good first step. That is not to say that we should stop looking to understand the relationships between these variables or be satisfied with implementation of a fraction of the currently available research. If education is going to be informed by research, there must be a feedback loop developed through which researchers investigate the factors that improve the effectiveness of preparation, using teacher educator concerns as a starting point to ensure that the research is relevant and useful. Once these techniques have been empirically validated, researchers must disseminate the information to teachers and teacher educators. Teacher educators must then incorporate those findings into their own practice and provide feedback on how the new practices are working. Teacher educators must also be equipped with the skills they need to effectively evaluate their own work. Ensuring that practice is evidence-based requires more flexibility collaboration, and communication than currently exists within the education community, but would greatly improve the quality of teacher preparation.

One major challenge in applying this evidence to practice is that research is often done in fragments that need to be integrated into a coherent hole. Evidence
shows, for example, that pedagogical content knowledge is a significant predictor of student achievement (Ball et al., 2005) and that teachers are not receiving adequate elementary mathematics preparation (Greenberg & Walsh, 2008) and often lack an understanding of the knowledge they will be teaching in science classes (Stofflet & Stoddard, 1994). Other research has shown that having a mentor is one potential way of acquiring both PCK and content knowledge (Appleton, 2008; A. Berry et al., 2009; Goodnough, 2009). All of these findings are important, but taken alone each says little about how to improve teacher preparation. No one study can cover all of the pieces needed to develop a framework for teacher preparation, but taken together they begin to provide solutions that address all facets of the problem.

Given the number of demands required of teachers, there is no way teacher education can reasonably teach prospective teachers everything they need to know during preparation. As a result, the question then becomes which skills they require to be able to continuously develop as an effective practitioner and what teacher education can do to promote these skills. Teacher education courses cannot help teachers figure out how to teach every topic they will cover in any given class, but it can help them understand how people learn and build a comprehensive, replicable, and effective framework that promotes a conceptual understanding of the material around which their lessons can be built. Similarly, few teachers step into their first classroom with a fully defined vision of how they want their classroom to work. However, teacher preparation can teach reflection skills that teachers can use to constantly assess and improve their practice and develop this vision over time.
Helping teachers develop these skills and bridge the gap between theory and practice is no small task; as seen above there is no clear cut, well-researched way to achieve these goals. This section aims to highlight the best practices as presented by the research above, integrating the individual components to form a coherent whole. Because research shows that merely including the aspects of teacher preparation explained above will not develop effective teachers (Cross, 2003; Haberman & Post, 1991; Ladson-Billings, 2000, Mandzuk et al., 2005; Mather & Hanley, 1999), each aspect must be carefully designed, implemented, and evaluated to ensure that it is having the desired effect. This section begins with the structural components of a teacher preparation program and then looks at what skills and knowledge prospective teachers need to acquire and how they can be acquired.

**Structural Components**

Preparation programs create many structures through which content is channeled. These five structures provide a variety of learning opportunities for preservice teachers and are essential to the development of theory-guided practice.

**Field experiences.** Field experiences are integral to learning to teach, as they are the vehicle through which prospective teachers connect theory and practice. These experiences provide the context through which prospective teachers understand the information they are being taught and form their own theories about teaching and learning. The most effective field experiences allow prospective teachers to spend
ample time in the classroom and then discuss and reflect on their experiences (Allsopp, DeMarie, Alvarez-McHatton, & Doone, 2006; Korthagen, 2001; Korthagen & Kessels, 1999; Orland-Barack & Yinon, 2007). The learning within field experiences should be scaffolded, gradually increasing the prospective teachers’ responsibilities from observing to collaborating to working independently.

Field experience must be designed carefully to bring about the desired changes in beliefs and actions; participation alone does not guarantee that these changes occur (Cross, 2003; Haberman & Post, 1991; Ladson-Billings, 2000). The mentor and the school-university relationship are two of the biggest factors that affect the quality of the field experience (both are discussed below). Another major component of these experiences is reflecting on what is taking place in the classroom. Constant, guided, and scaffolded reflection helps teachers develop the necessary knowledge about teaching and explore their deeply held, potentially problematic assumptions. To ensure that prospective teachers’ experiences are challenging their assumptions and not just reinforcing existing stereotypes, field experiences must place students in diverse settings and be accompanied by learning about the cultures and cultural practices of the students if the experience is going to do something other than strengthen existing stereotypes and attitudes (Ladson-Billings, 2000).

**Mentoring.** Mentors have the potential to help prospective teachers make significant progress in linking theory and practice and developing the skills they need to learn from experience, as they are the role models through which practice is
learned. Mentors should be highly qualified, effective teachers and should exemplify the practices and views endorsed by the teacher preparation program. Mentors should be trained in how to be a mentor because, just as there is a specific knowledge base required for teaching, there is a knowledge base required for mentoring that involves knowing about adult learning and how to teach teachers (Achinstein & Athanases, 2005, Wang et al., 2008). Mentors should be taught this knowledge and the relevant skills before becoming a mentor.

During their training, mentors need to be taught specific practices that will make them more helpful to prospective teachers. Learning how to make their practice explicit, guide rather than evaluate their mentees, and ask questions that will facilitate prospective teachers’ growth and prompt reflection are all essential components of mentor preparation, as are exploring how different mentor roles affect prospective teachers’ learning and developing a sense of what their mentees are learning in their university courses. As part of making their practice explicit, mentor training should also focus on how draw prospective teachers’ attention to ideas they may not have though of on their own, such as how children think or explicit connections between theory and practice. This learning must be complemented by an opportunity to practice and hone these skills. In addition, mentors should meet regularly with a liaison from the university to ensure that they know what is going on with their student teachers’ coursework, are continuously pushed to question, reflect on, and improve their own practice, and have a supportive environment to discuss their work as a mentor.
Because the amount of time mentors have available drastically changes the nature and intensity of the assistance they are capable of providing (Parker and Feiman-Nemser, 1992), programs should be structured so that mentors are relieved of some of their teaching duties, freeing up time to work with the prospective teachers. Mentors should observe their mentees often, providing immediate and specific feedback after the lesson is over (Scheeler, 2008). Scheeler (2008) suggests that receiving immediate feedback via an earpiece is the most effective way to improve teaching. Given that this is probably not a practical large-scale solution, mentors should take detailed notes when observing. Mentors and their mentees should debrief as soon as possible after the class, talking through specific instances and how the teacher could have handled them differently while simultaneously referring back to the relevant theories. Having a mentor teacher point out specifics, noting, for example, when the prospective teacher should have walked around the room to ensure all students were on-task, gotten the attention of a specific student who was beginning to disengage from the lesson, or responded to a student comment differently, will help teachers to develop their classroom management skills and improve their practice more quickly than they would on their own. Mentors should focus on student learning (Achinstein & Athanases, 2005), using inquiry and reflection as means to understand the novice’s actions in the context of the lesson and how the novice teacher was promoting student learning (Parker-Katz & Bay, 2008). Mentors should also help teachers learn to navigate aspects of teaching that are outside the classroom by giving
them the opportunity to communicate with the parents, principal, and other administrators (Parker-Katz & Bay, 2008).

**Cohorts.** Prospective teachers should be grouped into cohorts that move through the program together, taking most of the same classes and growing as a community. Cohorts need to be carefully designed to emphasize the importance of the community, giving prospective teachers a place to communicate openly and discuss what is going on with the group. Emphasis must be placed on community-building activities throughout the program, creating a network of supportive colleagues that will continue to exist after graduation.

Through cohorts, prospective teachers should be encouraged to challenge their assumptions and “address issues of race, gender, and class effectively (Daniel, 2009, p. 175).” These assumptions are best addressed when cohorts contain a diverse group of prospective teachers. However, how much prospective teachers learn from these experiences also depends on the instructor’s ability to guide the discussions (Daniel, 2009). Teacher educators must then work on their ability to facilitate these conversations to make them as beneficial as possible.

To be effective, cohorts must also foster intellectual growth and provide a place to exchange ideas, acting as a learning community and not just a support group. One possible way to do this is to use a peer-supported learning model (Korthagen et al., 2006). In this model, prospective teachers are broken into small groups that meet regularly to reflect on their practice. The groups submit meeting reports that are
reviewed by the teacher educator and incorporated into whole-cohort meetings. With this method, prospective teachers learn to collaborate with each other while receiving support and having another outlet for reflection. Another way to foster intellectual growth is to create smaller learning communities within the cohort that engage in learning together. This could happen through reading and discussing a book and then figuring out how that book could be used with students in a classroom (for more information on similar practices with in-service teachers, see Grossman et al., 2001).

**School/University collaboration.** Building school/university partnerships is a crucial way to improve the connection between theory and practice and improve teacher learning. An ideal partnership would ensure that the teachers who work at the school both practice and preach the same ideas that the preservice teachers are being taught. For example, if the teacher preparation program endorses a constructivist approach, prospective teachers would ideally be placed in a classroom with a teacher who also uses constructivist methods rather than didactic ones. One major problem with current preparation is that the prospective teachers who do come out of a preparation program with a clear approach to education often start to change their practice when they begin teaching, most likely because the other teachers in the school maintain a different approach than the prospective teachers had been taught in their preparation program. Reinforcement and modeling of the desired behaviors early in the prospective teacher’s career could be formative, giving them the experience they need to sustain their practices once placed in another school. Given
that most teachers were prepared under the current system of education and therefore tend to teach in the ways they were taught (Stofflett & Stoddard, 1994), schools of education that want to help their students learn to teach with reform-minded methods may also need to develop professional development schools to create a support network for their prospective teachers that will reflect the practices advocated by the school.

A successful school/university partnership also requires a lot communication to ensure that the collaboration is meeting both parties’ needs and addressing everyone’s concerns. The university needs to make sure that mentors know what the prospective teachers are learning in their university classrooms and provide support for the mentors to help them grow in this new role. The universities and schools should also establish consistent expectations for the mentor/mentee relationship and work together to generate schedules that work for everyone involved. Improved school/university relations would also make it easier for prospective teachers to be involved in the work teachers do outside the classroom and for university educators to regularly observe and evaluate their prospective teachers. Some research (Moyer, 2006) also suggests that holding prospective teachers’ classes at the school rather than at the university campus increases the benefits that prospective teachers derive from field experiences. Improved school/university relations would facilitate the coordination of such classes.
Teacher educator knowledge and practice. Though it cannot be discussed at length in this thesis, any conversation about teacher preparation must also discuss characteristics and practices of teacher educators that allow successful preparation of teachers and what can be done to prepare them to better train prospective teachers. Just as teachers have a significant impact on their students, teacher educators have a big effect on their prospective teachers. In short, teacher educators need to be executing all of the best practices for K-12 teachers, only adapted for adult learners.

The teacher educator should, at all times, model effective teacher practices. If teacher educators are advocating teaching through methods other than lectures, teacher educators should present material through these methods. Teacher educators should also think out-loud, guiding prospective teachers through the process they used to decide how to organize the course, present the material, and ensure that students’ are learning. This process would be most helpful if teacher educators could also articulate the challenges they face as a teacher; for example, if prospective teachers are asked to work in groups and they are getting off task, the teacher educator should explain her observations and thought process about how to handle the situation. To help teachers learn to reflect, teacher educators should also verbalize their reflections, including the challenges they face.

Teacher educators need to devise methods of determining their prospective teachers’ initial beliefs about teaching, learning, and students to better prepare them to challenge these belief. For example, D. Smith (2000) describes how she surveys the students (prospective teachers) in her science pedagogy class to learn about their
initial conceptions and ideas about science. Understanding where her students are coming from is crucial to helping them learn to be successful teachers; in this case, many of her teachers have unfavorable opinions of science and lack confidence in their abilities as a scientist or teacher of science. As a teacher, Smith’s approach changes depending on whom her prospective teachers are and what they believe. By figuring out where her students are when the class begins, Smith can easily predict some of the issues that will come up during the semester and knows which areas to focus on during her teaching, thus making her better equipped to help her students achieve the goal of understanding what science can and should be. Smith’s process is an example of how to build pedagogical content knowledge. Explaining this process to the students could help them learn how to create situations within their classrooms where they can acquire more PCK.

Curriculum and Implementation

Central to any successful teacher program is not only what teachers are being taught, but also how the program is implemented. The structural factors and curriculum are important for building a solid foundation, but these components will not create lasting change or effective teachers without intentional, well-planned implementation. Figuring out how to carry out each piece individually and then integrate them into a coherent whole is time consuming and difficult, but crucial to the success of the program.
Because teacher preparation cannot possibly cover everything teachers need to know, teacher preparation should focus on helping prospective teachers develop a set of skills that will help them succeed in the classroom (Korthagen et al., 2006). These skills consist primarily of learning how to learn from experience and engage in effective reflective practice. In addition to these skills, there are many different topics that need to be addressed in teacher preparation. This section does not include all of them, but instead focuses on several that have come out of the literature and suggestions discussed above.

**Reflective Practice.** The most important skill that teachers need to learn during preparation is how to engage in reflection, as this is the skill that allows teachers to learn from their experiences and constantly improve their own practice. Becoming a reflective practitioner requires figuring out not only what questions to ask, but also when to ask them. Reflection should focus on student learning, helping the teacher evaluate student learning in light of stated learning objectives and then examine why and how their instruction impacted the learning (Hiebert et al., 2007). Productive reflection requires engaging with a series of steps that involve setting goals, assessing whether the goals were achieved, forming hypotheses as to why the lesson did or did not work, and using these explanations to revise the lesson (Hiebert et al., 2007).

Reflection skills will be much easier to learn if they are incorporated into all aspects of teacher preparation. Teacher educators should not only regularly model
their own reflection process but also expect prospective teachers to consistently reflect on their knowledge, beliefs, and experiences through writing and discussion. Mentors should engage prospective teachers in conversations that require them to reflect on their own actions. Reflection should be scaffolded, with mentors and teacher educators initially asking guiding questions that help the prospective teachers learn what to ask.

**Cultural competence.** Recognizing that the majority of teachers are white, middle-class women who lack both cultural knowledge and an understanding of how culture impacts teaching and learning (Sleeter, 2001), preparation programs must help their prospective teachers become culturally competent so that they can meet needs of the diverse populations they will be teaching. Creating cultural competence involves addressing prospective teachers’ ethnocentrism and ideas about students who come from different cultural backgrounds. Although multicultural coursework is an important component of developing this knowledge, preservice teachers also need field experiences that expose them to different cultures (Marx & Moss, 2010).

Encouraging reflection is central to developing cultural competence; without reflection, prospective teachers will not become aware of the potentially adverse effects their beliefs could have on their students. Guiding prospective teachers’ reflection and supporting them through the process of examining their own beliefs are a must; challenging one’s assumptions is not an easy process and can easily be abandoned in favor of retaining one’s current beliefs without the necessary
encouragement and guidance. Challenging one’s assumptions to create cultural competence requires that prospective teachers talk about what it means to be a white teacher for a class of predominately students of color and how this should be addressed. Beginning with conversations about race, racism, class, and privilege that force prospective teachers to think about these issues and articulate their opinions, teacher preparation programs can do a lot to help prepare teachers for these experiences. These discussions are the first step on the road to ensuring that teachers have accurate beliefs and expectations of their students.

In addition to reflecting on and discussing their beliefs, prospective teachers need to be placed in situations that force them to critically analyze their beliefs. Research provides many potential options for how to do this including: study abroad experiences (Marx & Moss, 2010), service-learning, and real-world experiences (Baldwin et al, 2007; Ryan et al., 2009; Ryan & Healy, 2009a). Mentoring or tutoring programs give prospective teachers an opportunity to observe children’s learning in a different context and pay more attention to the development of one child, offering a potential way to challenge and change prospective teachers’ assumptions about their students (Baldwin et al., 2007), how learning happens, and the need for pedagogical methods to match the context where learning is happening (Ryan et al., 2009). Prospective teachers who engage in service learning are also given more opportunities to observe how theories studied in the classroom, particularly concerning learning, language, and communication, play out in real life (Ryan et al., 2009). With these types of experiences and guided reflection to go along
with them, prospective teachers will have many opportunities to challenge their assumptions, making them better equipped to teach classes of diverse students.

**Content knowledge.** Continuing to develop teachers’ content knowledge is a crucial component of teacher education. Programs need to have a clear understanding of what prospective teachers need to learn before being certified. These expectations should be reflected in the curriculum, textbooks, and class syllabi and include content beyond that which prospective teachers will be expecting their students to learn (Greeberg & Walsh, 2008). Particularly for science, this content needs to be presented through the methods that prospective teachers are trained to use in their own classrooms.

Preparation programs also need to focus on the development of pedagogical content knowledge (PCK). Because PCK is based in the work of teaching, it requires that prospective teachers have experiences in the classroom before they can acquire this knowledge. This work should be coupled with courses on teaching specific subjects and grade levels that focus on proof, analysis, exploration, communication, and representations (Ball et al., 2005). Prospective teachers can also improve their PCK through observations of and conversations with mentors (Appleton, 2008; A. Berry et al., 2009; Goodnough, 2009). Discussing why a mentor chose a specific example or asked a certain question can help prospective teachers start to grasp the many components of PCK.
**Theory-guided action.** Connecting theory to practice should be a major focus of teacher preparation, providing as many opportunities as possible for prospective teachers to observe, practice, and discuss what it means to do so. Field experiences should occur concurrently with preparation courses, emphasizing how theories discussed in class are applied in the classroom (Korthagen, & Kessels, 1999). Teachers should not start learning theory before experience in a classroom; the theory will be less meaningful if teachers do not have a context within which it can be applied or understood. Within the field experiences, prospective teachers should have a gradual release of responsibility. They should begin by observing their mentor teacher and discussing the practices she is modeling. After increasing amounts of collaboration with the mentor teacher, prospective teachers should undergo guided practice before teaching on their own and applying their knowledge in new situations (Feldman, 2006). Mentors should also guide prospective teachers’ reflection toward recognizing the gaps in their knowledge so that the theories they are learning are seen as relevant and meaningful.

**Day-to-day basics.** In addition to a solid theoretical foundation, effective teacher preparation must address the day-to-day basics without letting these issues become the central components of instruction. Teachers must master these basics before they can focus on curriculum or learning. This includes topics such as how to set up a classroom, create, explain, and implement a behavior management system, interact with aides that come into the classroom, navigate the administration, talk to
students, etc. Though this information could be learned through many different circumstances, the material should be learned in a context that forces prospective teachers to think through the ramifications of their actions concerning each of these topics so that these actions can also be theory-guided. How student desks are arranged, for example, has a significant effect on the atmosphere of the classroom. The way a teacher addresses rules and expectations on the first day of class sets the tone for the entire semester. The words a teacher uses to communicate with his or her students impacts his ability to develop relationships with them. Without an understanding of these day-to-day basics, teachers will have a difficult time making use of the other knowledge they gained during teacher preparation.

**Modeling and Observation.** Every aspect of teacher preparation programs should be seen as an opportunity to model practices for prospective teachers. To create a truly effective program, classes must give students examples of what to do in addition to what not to do. Teachers can only learn so much from watching others do the “wrong” thing. When given an ideal to reach for, teachers may not know how to apply the principle in the classroom if they haven’t seen it demonstrated. For example, Cross (2003) found that even when educated about how to address and incorporate diversity into the classroom, many teachers were not implementing these ideas in a beneficial way. The teachers thought that reading books with characters whose race matched that of their students was good teaching. These teachers believed they were successfully bringing diversity into the classroom, most likely because they
had never observed a teacher who did so successfully and did not know what else to do.

In addition to having good teaching modeled for them in their classes and field experiences, prospective teachers should have the opportunity to watch other effective teachers in practice. Videos of effective teachers may be a good solution to this problem, as they can be watched multiple times, looking for different aspects of teaching during each viewing. For example, to emphasize theory, prospective teachers could look for how teachers’ actions reflect specific theories. When focusing on classroom management, teachers could look for behavioral management strategies the teacher uses and how student behavior changes in response to teacher actions. If, as Elliott & Stemler (2008) argue, that expert teachers have a kind of tacit knowledge that experienced teachers don’t have, perhaps this knowledge could be acquired more quickly if it were made more visible and explicit. If a prospective teacher sees a video of an experienced teacher using effective classroom management strategies and discusses how and why they work, this might make it easier for them to implement the strategies in their own classroom. These are the same types of skills that should be pointed out by the mentor teacher after observation; reinforcing these skills in multiple contexts will help the prospective teachers to build up a repertoire of usable skills.
Part 4: Future Directions for Teacher Education Practice and Research

The current model for teacher education has shown to be, as a whole, ineffective at preparing teachers to be successful in the classroom. Many claim that teacher preparation is irrelevant, failing to give teachers the skills they need to succeed in the classroom or help them develop a coherent set of beliefs and practices that can be maintained and implemented in classrooms post-preparation (Korthagen et al., 2006). The problem with teacher preparation emanates from the gap between theory and practice; teachers are often taught theory through lectures during their preparation courses and then expected to apply this knowledge in their field experiences (Korthagen et al., 2006). Any modification to teacher preparation must therefore take this problem into account.

In addition to the unsolved challenge of how to create practitioners capable of theory-guided action, new visions of education complicate the picture. These new visions of learning have emerged in the last ten years, emphasizing “new learning outcomes, new kinds of learning processes, and new instructional methods both wanted by society and currently stressed in psychological and educational theory,” (As quoted in Lunenberg et al., 2006). In short, these views focus on conceptual understanding rather than memorization of facts, students as creators of knowledge rather than receivers of information, and teachers as facilitators of learning rather than impacters of information (see Lunenberg et al., 2006 for more information).

To adapt to this new vision of education and fix the current problems with teacher preparation, teacher education needs to be reframed if not re-envisioned. This
is particularly true if we expect to reform education as a whole; we cannot expect the people who were brought up under the current system to act any differently as teachers unless they are explicitly instructed to do so and given the opportunity to practice what they have learned, receive feedback on their performance, and try again. In light of these concerns, this section introduces several new ideas that may help eliminate or diminish the current challenges facing teacher preparation.

**New Ideas for Practice**

There are many concepts from psychology that aren’t traditionally applied to education or teacher preparation but that provide a useful lens for viewing these issues and thinking about potential solutions. For example, Mueller & Dweck (1998) found that what a teacher says to a student to indicate that they have done a good job (“You put in great effort” versus “You are really good at that”) changes the child’s view of intelligence and has a significant impact on their motivation. This finding is incredibly valuable, but making use of it in the classroom requires more research and attention paid to how teachers can be taught to filter the feedback they are giving to their students. Findings such as these may also have implications for the way classrooms are structured in terms of incentive systems and recognition for achievement. Adapting such research and figuring out how and where to apply it in the classroom is a crucial piece of the puzzle if the research is to be successfully implemented.
This section presents several perspectives that are not typically included in conversations about teacher preparation, but that provide potential solutions to some of the current shortcomings of teacher education. Some of these ideas are structural, such as increasing the role that psychology plays in teacher preparation; others reframe the way we think about teachers’ acquisition of knowledge.

**Situated learning.** Borko and Mayfield (1995) argue for the concept of situated learning, or the idea that “knowledge is inseparable from the contexts and activities in which it is developed (p. 502).” This means that to learn to teach, particularly in ways that are different from the instruction they received as students, prospective teachers’ experiences must be grounded in the classroom contexts in which their knowledge will be used (Borko and Mayfield, 1995) rather than learning ideas in lecture classes and then attempting to apply them later on in the classroom. This type of learning requires that prospective teachers have the chance to test different strategies in the classroom and receive feedback on their classes (Borko and Mayfield, 1995). Though some teacher preparation research acknowledges that experiences is necessary to integrate theory and practice, rethinking teacher preparation through a situated learning perspective would shift teacher educators’ priorities and force them to reconsider their methods in light of how people actually learn.
Conceptual change. Learning to teach in a way that is different from the way one was taught can be incredibly difficult. This is particularly important because teachers often enter preparation programs with many incorrect assumptions about students, teaching and learning (Ryan et al., 2009, Ryan & Healy, 2009a) that can be difficult to change (Enterline et al., 2008). These assumptions, if left alone, can have detrimental effects on what prospective teachers are able to learn (Tiezzi & Cross, 1997) and how effective they are in the classroom (Baldwin et al., 2007; Enterline et al., 2008). The idea of conceptual change, taken from cognitive psychology, may be helpful in overcoming these obstacles. Conceptual change is “learning that occurs when students’ understandings about specific concepts are restructured in major ways (Stofflett & Stoddard, 1994, p. 33).” There has been some work done looking at the use of conceptual change in science education (Carey, 2000; Stofflett & Stoddard, 1994), but little work has investigated using conceptual change as a framework for guiding teacher preparation as well as teachers’ instruction of their students.

As Carey explains, students hold “alternative conceptual frameworks for understanding the phenomena covered by the theories we are trying to teach (2000, p. 14)” that must be revised if students are to truly understand what they are being taught. To be considered successful, a students’ understanding of certain concepts must be significantly reorganized (Stofflett & Stoddard, 1994). To achieve conceptual change, teachers must first figure out what their students’ initial beliefs are (Carey, 2000) and help the students address and think through these initial ideas (Smith et al., 1997, Stofflett & Stoddard, 1994). The mechanisms through which conceptual change
occurs are not fully understood (Carey, 2000) but some progress has been made in understanding how to bring about it. A study by C. Smith, Maclin, Grosslight, & Davis (1997) found that using a curriculum that was structured around the idea of conceptual change, unearthing and discussing students’ initial views before giving them time to investigate the phenomenon, was more effective at restructuring students’ initial conceptions. In a study looking at the effects of conceptual change learning on prospective teachers’ understanding of science and ability to teach conceptually, Stofflett & Stoddard (1994) devised a five-step plan that was used to promote conceptual change. After acknowledging and discussing the prospective teachers’ initial views, prospective teachers were given an opportunity to explore the concept at hand through guided discovery. They then discussed their results and compared them with their initial conceptions. If they were still unable to articulate why their initial conceptions were not correct, the prospective teachers engaged in further experimentation and discussion. After successful differentiation between their lay theories and the scientific concepts being discussed, the teachers were asked to apply these new concepts to real world examples.

There are two different situations in which conceptual change can be used in teacher preparation: to change teachers’ conceptions about how to teach and to improve their understanding of the content. Research has shown that prospective teachers’ ideas about teaching and learning are not only difficult to change, but often directly opposed to a conceptual change approach (Thorley & Stofflett, 1996). Given this, it is unlikely that merely telling teachers how to use a curriculum grounded in
ideas of conceptual change will result in any change in behavior (Carey, 2000). There are two reasons for this, first, when trying to use a pedagogy they don’t fully understand, teachers struggle and default to didactic methods. Second, even if they are told how to make use of these pedagogies, they process this information in relation to the concepts of teaching and learning they already have. Thus the new methods are incorporated into their existing ideas because they have no experience with the concepts being presented (Stofflett & Stoddard, 1994). Learning to teach for conceptual change requires that teachers themselves undergo conceptual change regarding their conceptions of pedagogy.

Conceptual change can also be used to frame prospective teachers’ instructional strategies and bolster their knowledge. The recent emphasis on teaching for understanding, particularly in math and science, requires that teachers have a solid conceptual understanding of the subject themselves (Stofflett & Stoddard, 1994) and emphasizes the importance of teaching to promote conceptual change (Thorley & Stofflett, 1996). This approach is particularly important in science classes because children often have “lay theories” about how things work that must be corrected by the teacher. As these misconceptions are inevitable, teachers must be taught how to help children develop an accurate understanding (Carey, 2000). If teachers, however, do not have a conceptual understanding of the material, they are prone using didactic teaching methods, relying on textbooks and lectures rather than giving students the opportunity to develop an understanding of the concept through explorative activities (Stofflet & Stoddard, 1994). This is particularly important because many science
teachers have insufficient knowledge about the information they are teaching and hold many of the same misconceptions as their students (Stofflett & Stoddard, 1994). Without a conceptual understanding of the information they are teaching, it is impossible for teachers to teach conceptually.

In a study by Stofflett and Stoddard (1994), prospective teachers enrolled in a class about conceptual change pedagogy either learned science content in a conceptual change framework or through a more traditional method. After learning the content, all of the teachers learned about how to use conceptual change methods in the classroom. The teachers who learned the science content through conceptual change methods developed a more scientific understanding of the content being taught, were more likely to plan to use hands-on teaching methods, and better understood why experimentation is an important component of science classes. Most importantly, they were more successful at implementing the methods in their own classrooms. Thus, merely showing teachers how to use a conceptual change curriculum and modeling this practice for them does not change the way they teach; “teachers must experience the innovative pedagogy first as learners before they can develop intelligibility of methods being taught (Stofflett & Stoddard, 1994, p. 45).” Studies like this one are a good first step, but more research is needed to broaden our understanding of this process and how it can be used in education and teacher preparation.

Though conceptual change is most often applied to science education, it is a useful framework for thinking about other components of teacher education as well.
The process of articulating one’s initial conceptions, having an experience designed to challenge those conceptions, reflecting on the experience and then discussing how one’s observations and new beliefs contradict the old ones is similar some of the methods that have been used to encourage teachers to challenge and revise their assumptions about learners and learning and integrate theory and practice. Programs that use these methods are the ones that have been most successful at achieving their goals, most likely because these methods are grounded in experience and require extensive reflection, reflecting the situated nature of learning. Reframing teacher education as repeated conceptual change, about teaching, learning, students, and specific academic concepts, would require restructuring teacher education programs to ensure that conceptual change is occurring but could make teacher education a much more constructive experience.

Applying psychology to education: focus on cognitive science and human development. One area where there is a huge gap in theory and practice is with the application of psychology to education. Psychology endeavors to understand how people work, explaining everyday phenomenon such as learning, motivation, and social interactions. To be as effective as possible in the classroom, teachers must first understand how people work. There is a wealth of knowledge in psychology that would greatly benefit educators by informing their practice, improving teaching and learning, and giving teachers the tools they need to maximize their students’
ENGAGEMENT AND ACHIEVEMENT (APA Work Group, 1997; NICHD & NCATE, 2006).

To truly reach all students and help them succeed, educators must not only know, but more importantly, be able to apply information from human development and cognitive science (NICHD & NCATE, 2006). However, this work is not often framed in a way that is neither relevant nor easily accessible to educators, as it is not translated into a common language or disseminated beyond psychology journals or conferences. To complicate the matter, teacher education programs provide little preparation that would enable teachers to use this information if it were made available (Comer, 2005). Even when this knowledge is shared, it is not taught in a way that prospective teachers can use to inform their practice because they are not given an opportunity to understand the application of the information to their work.

As a result of this lack of communication, educators and researchers lack a common language to discuss these concepts, further deepening the divide for both human development and cognitive science. What educators call a “cognitive science approach” often does not even begin to reflect the work that cognitive scientists are doing and what researchers call an “application to education” is often designed in a way that is neither useful nor helpful for teachers. Teachers, therefore, are learning theories that have not always been empirically validated. Their teaching approaches do not reflect the current knowledge about learning or development because they have not been exposed to this knowledge. These approaches also fail to do what is best for the whole child because they haven’t been taught to look at education from a developmental perspective. For example, school cultures fail to create environments
conducive to learning because they focus on the problem behaviors (Comer, 2005). In addition, teachers often hold problematic views that are not challenged or addressed. Indeed, despite substantial empirical evidence to the contrary, many prospective teachers believe that intelligence is fixed (Mueller & Dweck, 1998), bad behavior is a reflection of poor parenting (Stipeck et al., 1998), or children learn best from didactic teaching (McDevitt & Ormrod, 2008).

Current preparation in development. The National Institute of Child Health and Human Development and the National Council for Accreditation of Teacher Education recently surveyed almost 300 teacher preparation programs about their prospective teachers’ training in development. They found that 90% of the institutions surveyed required prospective teachers to take at least one child and adolescent development course, either through the college of education or through the psychology department (NICHD & NCATE, 2006). About half of the institutions surveyed believed that their teachers needed additional coursework in adolescent development, but many felt that they did not have sufficient time during the program to require more courses on development. Despite the fact that many respondents believed more coursework was necessary for teachers in the program, others argued that the field would benefit from courses that are better defined, building a consistent and relevant knowledge base that prospective teachers are able to utilize in the classroom. The survey also looked at which textbooks are used in developmental classes. There was very little consensus on which textbooks should be used or were the best authority on the subject, and, when analyzed, the survey showed that the
majority of the texts used contain no application to education. In addition to this lack of application in the textbooks, one quarter of the respondents articulated a lack of consensus among teacher educators about how knowledge of development should be applied to education. These teacher educators were generally unclear about which aspects of development should be included in teacher education (NICHD & NCATE, 2006). If the information being taught in child and adolescent development classes is not presented in a way that is relevant to teachers’ work in the classroom, teachers will not develop a complete understanding of the material that allows them to use it appropriately in the classroom.

*Effects of psychology on teacher practice.* From a developmental perspective, this lack of knowledge is especially problematic because teachers’ behaviors, views of their students, and focus in the classroom change depending on their view of development. In a study investigating the way teachers’ beliefs about learning affected their actions, Stipeck & Byler (1997) found that teachers who come from a behaviorist perspective and hold traditional views of learning endorse the belief that learning happens best through didactic instruction and use such practices in their classes. However, Stipeck et al. (1995, 1998) also found that compared to students with teachers who held constructivist beliefs, students whose teachers take the behaviorist perspective, emphasizing skills and believing that children require input from adults to learn, perceived themselves as less competent (evidenced by the fact that they rated their abilities lower, had lower expectations for success on school-related tasks, were more dependent on adults for permission and approval, and took
less pride in their accomplishments), exhibited less motivation (indicated by their choice to complete a less challenging math problem or maze), and expressed more negative attitudes towards school (shown by the finding that they claimed to worry more about school). However, those with constructivist views implemented more student-centered lessons (Daniels & Shumow, 2003), resulting in increased motivation, less anxiety, and better language and problem-solving skills (Stipeck et al., 1998; Stipeck et al., 1995). A study by M. Smith & Shepard (1998) found that teachers who hold maturationist views, believing that children develop on their own over time, are more likely to suggest remediation than teachers who hold less maturationist views.

The views that a teacher holds walking into a classroom are important because “the choice of pedagogy inevitably communicates a conception of the learner (As quoted in Daniels & Shumow, 2003, p. 506).” Children’s experiences in the classroom mold how they think about themselves and their ability to learn. For example, a teacher’s view of intelligence influences the kind of praise they will give to their students and the type of classroom environment they will create (Daniels & Shumow, 2003). Those who view intelligence as fixed are likely to praise children for their performance whereas those who view intelligence as malleable are more likely to praise children’s hard work. These contrasting types of praise have been shown to have drastically different effects on students’ motivation and behavior; children praised for intelligence chose to complete performance oriented problems and were more interested in learning about how other children did on the problems whereas
those praised for effort chose problems that would allow them to continue learning and were more interested in learning new problem-solving strategies (Mueller & Dweck, 1998). Because teachers’ views can have such a significant effect on their students’ self-concepts, behavior, and achievement, prospective educators need to be forced to question their own beliefs about such concepts and then educated about how different perspectives affect students.

From a cognitive science perspective, this lack of knowledge detracts from a teachers’ ability to truly be effective in the classroom. Knowing little about learning and memory in the brain, teachers fail to structure their lesson plans in ways that will help students retain the crucial points of the lesson (Willingham, 2010). For example, a science teacher may plan a demonstration to help their students engage with the material, thinking that it will help illustrate the concept in a tangible way, yet what students remember about the demonstration is not the scientific principal it represents or how the principal works, but how “cool” or entertaining the demonstration was. To remedy this problem, teachers should choose demonstrations carefully, anticipate student responses to the demonstration, and engineer them so that students are forced to think about the meaning of the material rather than how cool it was.

This lack of knowledge about development may also be contributing to the abysmal teacher retention rates. One of the biggest reasons teachers leave the profession is the feeling that they can’t affect change (Ingersoll, 2002). However, schools like the Comer Schools (explained below) that take a developmental approach to education have found that it improves teachers’ satisfaction and feelings
of efficacy and increases their involvement in decision making (Comer & Emmons, 2006). Thus schools that take this approach have the potential to maintain significantly better retention rates compared to other schools. Even in schools that do not take a developmental approach, it is likely that improving teachers’ knowledge about development would provide them with an additional set of skills to make them more effective in the classroom, thus empowering them to create change and potentially increasing retention (NICHD & NCATE, 2006).

*Why the gap persists.* Issues of valuing, translating, and communicating information all contribute to the development and maintenance of the gap between psychology and education. With the rising emphasis on test scores as the chief measure of teacher quality, the education system seems to put the focus on the teacher’s job as the passing on of information rather than the nurturing of a whole child, making child development less important to the work of educators (NICHD & NCATE, 2006). In addition, knowledge of child development is not included on tests required for teacher certification. As a result, it is not considered an essential component of teacher knowledge and it is traditionally not emphasized strongly in teacher preparation (NICHD & NCATE, 2006). If programs do not focus on the importance of development, teachers themselves will fail to value the information because the will fail to see it as useful to their practice. For example, those that view intelligence as a fixed ability have little use for information about the interplay between development and one’s ability to learn (Comer, 2005) and those with a maturationist view believe that children develop on their own, thus eliminating the
need for knowledge about development (Daniels & Shumow, 2003). A failure to value this information means that teachers will be less likely to retain the information, as people remember information that is meaningful to them (McDevitt & Ormrod, 2008), and that teachers will not use it in the classroom even though a developmental approach to education has been shown to improve student behavior and achievement (Comer & Emmons, 2006).

A second problem that is central to the gap between psychology and education is the translation and dissemination of the information. Psychological findings are not always immediately applicable to education. Figuring out how to apply the findings and then testing the application to make sure it works is an arduous and time-consuming process that is generally not well respected by academia. In addition, “scholarly articles are often difficult for non-scientists to follow and need to be translated into language that pre-service teachers find meaningful, and into a knowledge base that practicing teachers and administrators can put into action (NICHD & NCATE, 2006, p. 27).” There is no way teachers can make use of information that is not accessible, both from a logistical and a comprehension perspective.

The communication of the ideas that do exist has barriers with both teaching and understanding. Many teacher educators don’t understand why developmental psychology or cognitive science is important for teachers, how it can be related to teaching, or how to help teachers make use of this perspective in their classrooms (Daniels & Shumow, 2003, NICHD & NCATE, 2006). As a result, developmental
concepts are often poorly illustrated and not tied to the classroom (McDevitt & Ormrod, 2008). Furthermore, as explained in the previous section on theory and practice, prospective teachers need to be taught how and when to apply the information they are learning, not just learn the information itself. Because the knowledge is often presented in a decontextualized manner, how it could be successfully utilized in the classroom is often unclear (McDevitt & Ormrod, 2008; NICHD & NCATE, 2006). Just learning about development will not change teachers’ beliefs or their practice (McDevitt & Ormrod, 2008) unless they are also shown how to transfer this information to their classroom (NICHD & NCATE, 2006) and have the opportunity to practice doing so. However, McDevitt & Ormrod (2008) argue that merely emphasizing the applications of child development will yield little change in thinking unless teachers simultaneously engage in conversations about how they think about children.

Another possible factor contributing to this gap is preservice teachers’ failure to understand the information they are being taught. They often have unacknowledged biases, looking for confirmation of their preconceived notions, believing that their culture’s standards are everyone’s standards for what is right, or distrusting academic research (McDevitt & Ormrod, 2008). Prospective teachers also have personal epistemologies – views about the nature of learning and knowledge – that have been developed during years of schooling (McDevitt & Ormrod, 2008) and may contradict what they are being taught. The NICHD & NCATE (2006) report suggests that undergraduate students may also lack the life experiences needed to find
meaning in the information they are being taught and understand how the developmental principles apply. Thus even when child development is being taught, prospective teachers are failing to learn and utilize the material to the extent that they could (McDevitt & Ormrod, 2008). McDevitt & Ormrod (2008) argue that this phenomenon occurs because, though they learn new material, prospective teachers fail to change their beliefs to accommodate for the new concepts and suggest that if classes about development were approached as concepts requiring conceptual change to be understood, prospective teachers would develop a more complete and usable understanding of developmental concepts. For example, teachers who have successfully learned developmental concepts and how to apply them in the classroom would be taught to ask and answer questions such as “Given what I know about language development, how can I teach basic literacy skills in a conceptually rich way,” (NICHD & NCATE, 2006).

What do we know that can be applied to education? Far too much is known about psychology that can be applied to education to explain in this thesis. In addition to the examples discussed above about views of intelligence and conceptual change, below are some examples of general psychological principles or ideas that have significant implications for the classroom. Areas such as psycho-emotional, socio-cultural, and cognitive development all contain relevant ideas that could improve the quality of education teachers can provide for their students. In addition, looking at the classroom from a developmental perspective has shown that “the social structure of the classroom affects individual characteristics,” (NICHD & NCATE, 2006, p. 24).
Research has shown that the ability to manage one’s emotions correlates with academic achievement. Students who have a hard time controlling themselves generally do worse in school (NICHD & NCATE, 2006). In terms of socio-cultural development, there are a wide array of factors that affect children’s development in this area including peers, friends, and media influences. Children coming from different cultural backgrounds are brought up endorsing different values. Teachers must not assume that these values, though often different from their own, lead to poor academic achievement. For example, it is often assumed that Latino values do not support academic success. However, research has shown that “what matters in terms of student academic success is not a particular content of beliefs, but the fact that a family has a coherent set of beliefs which they teach their children and which they use to construct an environment for children” (Reese, 1995, p. 78). If they are going to help every individual child succeed, teachers must be able to recognize the backgrounds and needs of their diverse learners (NICHD & NCATE, 2006) instead of assuming that parents do not care about their children’s education or that the values a child is brought up with aren’t conducive to academic success.

Research from other fields of psychology also has important implications for education. For example, researchers know that motivation is the driving factor behind learning (NICHD & NCATE, 2006). Motivation determines what and how much a child learns and is affected by “the individual’s emotional states, beliefs, interests and goals, and habits of thinking” (APA Work Group, 1997, p.4). There is also a difference in the success of students who have mastery versus performance
orientation (Ames & Archer, 1988). A mastery orientation encourages students to master a skill or concept whereas performance motivation orients students to evaluate themselves by comparing their performance with others. Children with a mastery orientation have better peer relationships, higher self-esteem, and more academic success (NICHD & NCATE, 2006). Another significant finding relates to the importance of relationships in children’s development. Children learn from interactions with their caretakers, internalizing the values and attitudes of the role models around them. It is often through these relationships that children are motivated to succeed in school (Comer, 2005). These are just a few of the many findings from psychology that have implications for the classroom.

**The solutions.** To fix these problems, teacher education programs will need to make changes both program wide and within individual courses. The program needs to emphasize development as a key part of a teacher’s job, rather than emphasizing passing on of information (NICHD & NCATE, 2006). This emphasis needs to be a common thread throughout all courses, not just courses on development (NICHD & NCATE, 2006). Throughout their education, prospective teachers need to be presented with a consistent knowledge base that can be applied in classroom situations and forced to challenge their assumptions (NICHD & NCATE, 2006).

Another option is to view learning about development as conceptual change for prospective teachers (McDevitt & Ormrod, 2008). Anticipating common preconceptions, emphasizing concrete ideas, encouraging consistent self-reflection, and creating disequilibrium are all strategies that have been shown to promote
conceptual change in other situations and may be useful in the area of teacher preparation (McDevitt & Ormrod, 2008).

Furthermore, the changes required within individual courses must mirror the changes made in the bigger program as a whole. All classes must emphasize the importance of educating the whole child and provide explicit connections between the theories and the classroom. Students must be given the opportunity to learn how to apply their knowledge in the classroom (Shuell, 1996). This is a crucial component of the successful integration of psychology with education and without it, the problems will persist.

**Example of a successful developmental approach to education.** The application of psychology to education is one of the few areas of education research that has substantial evidence linking it to improved student achievement, behavior, and attitudes about school. James Comer has developed a school reform effort that takes a developmental approach to education, creating schools with school cultures that support development along the six essential pathways: (i) physical, (ii) social/interactive, (iii) psycho-emotional, (iv) ethical, (v) linguistic, and (vi) cognitive/intellectual. His model has nine crucial elements. Three teams are created: a School Planning and Management Team (SPMT), a Student and Staff Support Team, and a Parent Team. The SPMT is made up of adult stakeholders and has three main responsibilities: creating and overseeing a comprehensive school plan, staff development, and assessment. In addition, he developed three essential guidelines: no fault problem solving, consensus decision-making, and collaboration (for more
This model was first tested on two schools in the New Haven Public School system that, after implementation, moved from near the bottom of New Haven schools to close to the top for student achievement, had the best attendance out of any school in the city, and experienced no behavior problems (Comer, 2005). This model has since been implemented in over 1,000 schools across the country and both internal and external evaluations have shown that these schools consistently have students who achieve more, have better attitudes towards education, and improved behavior (Comer, 2006). Schools that do a more thorough job implementing the Comer model have better results (Comer, 2005; Comer & Emmons, 2006), providing a natural way to look at just how much a developmental approach can affect education.

The case of the Asheville school system illustrates just how much of an impact this approach can have. Before this method was implemented, 42% of the students at a particular elementary school were at or above reading level on both math and reading. However, by the end of the second year with the Comer method, 78.6% of the students were proficient and by the end of the 5th year, 98% of the students were at or above grade level on both reading and math (Comer, 2005). The program was then implemented throughout the whole district and, as a result, the gap between White and Black test scores essentially disappeared for both math and reading. In 1998, approximately half of the Black students were proficient on math and half were proficient on reading whereas approximately 90% of the White students were proficient on math or reading. By 2004, approximately 90% of both Black and White
students scored as proficient for math and reading and the scores of both populations had improved, essentially eliminating the achievement gap (Comer & Emmons, 2006). The Comer schools are still working on improving their program, integrating the latest research from psychology and neuroscience and improving the training for their teachers and administrators (Comer & Emmons, 2006).

Evidence linking a developmental approach to effective teaching. Compared to other areas of teacher education discussed in Part 2, the evaluations in this area of teacher education generally incorporate a wide variety of methods. Rather than the typical focus on how teachers feel about some aspect of their preparation, these studies actually link teacher behavior or views to student affect, behavior and cognition. However, if development is going to be more thoroughly integrated with teacher education, researchers will need to find ways to measure how teachers’ beliefs about development change over time and how these changes affect their behavior in the classroom. This research must continue to tie increased developmental knowledge to students’ attitudes, behavior, and achievement, as the evaluations of the Comer schools have done.

Much research is required if psychology is every going to be truly integrated into teacher preparation. Research needs to focus on finding evidence that the capacity to learn is developmental (Comer, 2005) and on how work in cognitive science and developmental psychology can be successfully applied in the classroom. There is little research looking at changes in preservice teachers’ attitudes and behaviors after learning about development (Daniels & Shumow, 2003) and even less
work looking at how such changes affect children’s learning (Daniels & Shumow, 2003, NICHD & NCATE, 2006). This research must be complemented by collaboration between educators, researchers, and teacher educators to develop a common language and means through which psychological discoveries can be disseminated and discussed if this knowledge is ever going to be successfully applied in the classroom.

**Future Research Directions**

There remains much research to be done about teacher preparation, as there are a large number of unknowns concerning teacher education. This research is critical to the successful development of effective teachers.

First, research needs to look at the connections between different outcomes and at the interplay between different components of teacher education and how these differ across grade levels and subjects. This work needs to focus on understanding how specific behaviors affect student confidence, motivation, dropout, achievement, and understanding of the underlying concepts. It also needs to examine how program structure or curriculum is supported or undermined by mentors, cohorts and field experiences. All of these findings need to be broken down by grade level and subject matter. The best practices in teacher education or the knowledge required to be effective may differ among teachers; while elementary, middle and high school teachers and English, mathematics, science, and social studies teachers all are
responsible for educating a room full of children, they encounter different challenges along the way. While elementary school teachers need to be well versed in how to teach children to read, high school English teachers need to be capable of teaching students how to critically analyze a text. These require different skill sets that must be addressed and evaluated during teacher preparation.

Second, research needs to focus on many different levels. For example, with mentoring, it is important to understand the specific practices that mentors must engage in that help their prospective teachers learn most effectively, which parts of teaching can be learned through explicit instruction and which must be learned through experience, how to teach people to become effective mentors, how mentoring affects the mentors’ practice, and how mentoring on a school, programmatic, and national level is influencing teachers’ attitudes, behavior, and cognition to name a few. While research on a small scale can illuminate specific practices that benefit prospective teachers, research on a large scale, looking at how mentoring affects retention nationwide, explains the current trends and larger relationships but cannot possibly take into consideration all of the nuances of the mentor-prospective teacher relationship. Thus research needs to be looking at specific practices within each component, why those practices work, and how they can be implemented in other programs. As new practices are being implemented, large-scale studies are needed to evaluate the benefits of these practices from a broader perspective. Every element of this research is required to fully understand what the best practices are and how to enact them successfully.
Third, research on practices within teacher preparation needs to be linked to outcomes once teachers have their own classrooms. As critics argue, if teacher preparation has no longstanding effects, it is not useful. If certain practices or beliefs ebb as teachers remain in the school system, research needs to concentrate on understanding why. Factors such as a failure to truly understand the concepts initially and lack of reinforcement from colleagues must be addressed and rectified within teacher preparation and the schools. One of the most important components of this research is concentrating on how practices within teacher preparation affect students, particularly after teachers graduate. Teachers exist to educate students. Teacher preparation exists to educate teachers. Thus if the effects teacher preparation are not impacting students, teacher education needs to be redesigned to guarantee that it is.

This highlights a fourth area of needed research: understanding why certain practices work and how to implement them. The purpose of understanding effective teacher preparation practices is to ensure that they can be employed in programs across the country. If, however, researchers know that a certain practice works but don’t understand why, subtle changes in implementation may reverse the effects. Recognizing why certain techniques are effective simultaneously explains which components of that technique must be retained when attempting to implement new ideas. Additional research is also needed to expand on how to successfully incorporate psychological concepts into education and teacher preparation. For example, Mueller & Dweck (1998) found that what a teacher says to a student to indicate that they have done a good job (“You put in great effort” versus “You are
really good at that”) changes the child’s view of intelligence and has a significant impact on their motivation. This finding is incredibly valuable, but making use of it in the classroom requires more research and attention paid to how teachers can be taught to filter the feedback they are giving to their students. Research also needs to investigate the implications findings like these may have for classroom structures.

The last major area for future research includes developing methods of measurement that are based in practice. As Ball et al. (2005) have done in creating their instrument to measure teachers’ pedagogical content knowledge for mathematics, measurement needs to be based on “close examination of the actual work of teaching” (p. 17). Metrics that are not based in practice most likely fail to reflect the authentic work of educators, diminishing both the relevance and the usefulness of the measure. This type of work is tedious and time consuming, but when done well results in measurement tools that can simultaneously evaluate teachers’ knowledge and serve as a starting point for future learning.
Conclusion

Developing effective teachers is no easy task. Given the innumerable definitions of what it means to be an effective teacher, the substantial number of demands required of teachers, and the variety of outcomes affected by teacher preparation, it is nearly impossible to delineate which components of teachers’ preservice training are responsible for their classroom practices. Additionally, prioritization of outcomes is dependent on each person’s perception of the purpose of education. It is therefore difficult to reach consensus on which concrete outcomes we should focus on when attempting to improve teacher preparation.

Although there is a substantial body of literature on teacher preparation, there are an appalling number of gaping holes waiting to be filled. Research consistently fails to examine the impact of teacher education on students despite the fact that education exists primarily to educate students. The little existing research on student outcomes ignores the impact of teacher preparation on student motivation, neglecting the fact that motivation is driving force behind learning (NICHD & NCATE, 2006). The research also focuses heavily on teacher affect, often overlooking the effects of teacher preparation on behavior and cognition disregarding the fact that preparation exists primarily to teach prospective educators how to perform well in the classroom. Continuing to follow these trends will result in a lopsided education system in which practices that make teachers feel good are emphasized, though they may not have any impact on their students or their practices in the classroom.
Despite these gaps, the research seems to agree that the most important skill teacher preparation programs can impart to prospective teachers is that of reflective practice. If teachers are taught how to reflect – what to analyze, how to analyze it, what questions to ask, and most importantly, when to ask them – they will have the skills required to learn from experience and will continue to develop as professionals throughout their careers. A teacher who reflects honestly and critically will be able to challenge her own assumptions and continually develop pedagogical content knowledge, even after graduating from her preparation program.

No matter how well a teacher is prepared in advance, learning and support from outside sources must continue once she steps into the classroom. Novice teachers need to be provided with support from a mentor for at least their first two years, as well as relevant, helpful, teacher-directed professional development on a regular basis. They need to be regularly evaluated – not to determine if they should be allowed to remain in the profession, but to help them improve. Schools need to be transformed into collaborative environments where teachers work together to achieve a common goal rather than remain isolated in their classrooms, disconnected and detached from the adults one office over. Teacher preparation alone cannot fix the problems in education; school staff must work in conjunction with preparation programs to ensure that all children have access to highly effective teachers.

Research shows that teacher preparation has the potential to significantly impact the development of effective teachers. Though we have some idea of how to successfully prepare teachers, we do not know enough, and what we do know is not
being applied efficiently. If we want to change schooling – the quality of education, the skills our children are learning, the methods we use to teach, the approach we take to education, the inequitable distribution of teachers and resources – this change must begin in teacher preparation. Teachers are, after all, the ones who interact with our nation’s children, each and every day. If they are not prepared to do things differently, little will change. We certainly have our work cut out for us.
References


doi:10.1016/j.tate.2009.05.001


doi:10.1080/13598660902804303

doi:10.1016/j.tate.2008.11.010


Schmerler, G., Mhatre, N., Stacy, J., Patrizio, K., Winkler, J. E., Groves, J.,


development in learning to teach. *The Teachers College Record, 105*(8),
1399–1436.

Understanding: A Study of Students' Preinstruction Theories of Matter and a
Comparison of the Effectiveness of Two Approaches to Teaching about

Smith, D. C. (2000). Content and pedagogical content knowledge for elementary
science teacher educators: Knowing our students. *Journal of science teacher
education, 11*(1), 27–46.

qualitative study of teachers' beliefs and practices. *American Educational

Smith, T. M., & Ingersoll, R. M. (2004). What Are the Effects of Induction and
Mentoring on Beginning Teacher Turnover? *American Educational Research
Journal, 41*.

Solomon, J. (2009). The Boston Teacher Residency: District-Based Teacher

doi: [10.1177/0022487109349915](https://doi.org/10.1177/0022487109349915)

Spear-Swerling, L., & Sternberg, R. J. (2001). What science offers teachers of


