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*Journal of Teacher Education* 2002; 53; 190

DOI: 10.1177/0022487102053003002

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# TEACHER PREPARATION RESEARCH

## AN INSIDER'S VIEW FROM THE OUTSIDE

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*The authors were asked by the Office of Educational Research and Improvement and the U.S. Department of Education to conduct a review of high-quality research on five questions concerning teacher preparation. As part of that assignment, they were asked to develop a set of defensible criteria for including research in the review. In this article, they summarize what the research says about the five questions posed by their funders, and they discuss the development of the review criteria. The questions included attention to the subject matter and pedagogical preparation of prospective teachers, to the content and character of high-quality field experiences and alternative routes, and to research on the effects of policies on the enhancement of teacher preparation.*

Commissions and professional societies are issuing an increasing number of recommendations concerning the practices and policies of teacher preparation, and such recommendations are also debated in scholarly circles. Groups as diverse as the National Research Council, the Fordham Foundation, and the American Federation of Teachers have issued reports concerning the future of teacher preparation. Considerable debate has ensued concerning both how much we know and what we should do (e.g., Ballou & Podgursky, 2000; Darling-Hammond, 2000a).

The U.S. Department of Education commissioned us to summarize the existing research—empirical studies, conducted with rigor and critically reviewed—on teacher preparation. We recognize, of course, that research is not the only basis on which decisions are made, especially in matters of schooling where the future of U.S. children is at stake, but we agreed to do this review because, as teacher educators and researchers, we felt that it was a helpful exercise to take a step back—as insiders—and look critically—as

outsiders—at our own field. Here we highlight some of the report's major findings, encouraging readers to examine the full report on the Web site for the Center for the Study of Teaching & Policy, <http://www.ctpweb.org>.

### BACKGROUND

The Department of Education asked for a summary of rigorous empirical research on five key questions asked by policy makers, educators, and the public, questions about the effects of major components of teacher preparation, about the effects of teacher education policies, and about alternative routes to teacher certification (see Table 1).

We identified candidate studies by searching databases, examining reference lists of reviews and reports, reviewing prominent journals and Web sites, and consulting scholars. The domain of our review was empirical research on U.S. teacher education, published in the past two decades, that was directly relevant to the five key questions. With the assistance of our techni-

**TABLE 1 Key Questions About Teacher Preparation**

Number	Question
1	What kind of subject matter preparation, and how much of it, do prospective teachers need? Are there differences by grade level or subject area?
2	What kinds of pedagogical preparation, and how much of it, do prospective teachers need? Are there differences by grade level or subject area?
3	What kinds, timing, and amount of clinical training (student teaching) best equip prospective teachers for classroom practice?
4	What policies and strategies have been used successfully by states, universities, school districts, and other organizations to improve and sustain the quality of preservice teacher education?
5	What are the components and characteristics of high-quality alternative certification programs?

cal advisory group, we decided to focus on peer-reviewed journal articles that met generally accepted standards in a varied set of research traditions, from large-scale correlational analyses to interpretive studies. In short, we searched for research that would conform to what scholars characterize as disciplined inquiry, presentations that describe the methods of investigation and analysis as well as the findings well enough that others can assess their validity. Limitations of time and uneven review processes led us to omit book chapters from our review. We found 57 studies that met all our criteria.

We begin with some cautions. First, although the phrase *teacher preparation* seems familiar to us all, it is falsely so, for *teacher preparation* means many different things across the United States. Second, we focused our review on the role teacher education plays in helping all students meet academic standards, but we acknowledge that teacher education has other goals. Third, we recognize that claims about the effects of teacher preparation must be treated with caution, given the imperfections in measures developed thus far. Fourth, although the key questions we addressed are each important, we recognize that they are also limited. Other topics, such as teacher recruitment, are critical for understanding the forces that affect teacher quality.

## EXISTING RESEARCH ON TEACHER PREPARATION

### *What Are the Effects of Subject Matter Preparation?*

We found no reports meeting our selection criteria that directly assessed prospective teachers' subject matter knowledge and evaluated the relationship between teacher subject matter preparation and student learning. To date, researchers conducting large-scale studies have relied on proxies for subject matter knowledge, such as majors or coursework. The research that does exist is limited, and in some cases, the results are contradictory. The conclusions of the few studies in this area are especially provocative because they undermine the certainty often expressed about the strong link between college study of a subject matter and teacher quality.

Seven studies related to Question 1 met our selection criteria (Darling-Hammond, 2000b; Ferguson & Womack, 1993; Goldhaber & Brewer, 2000; Guyton & Farokhi, 1987; Hawk, Coble, & Swanson, 1985; Monk, 1994; Rowan, Chiang, & Miller, 1997).<sup>1</sup> Of the 7 studies, 4 concerned mathematics and science teachers, 1 concerned secondary teachers without specifying subject matters, 1 concerned elementary and middle school mathematics and reading teachers, and another studied program graduates who had taken subject matter knowledge tests. One study involved 36 teachers; the others had sample sizes ranging from 200 to 3,000 to 65,000 teachers. Measures of teacher subject matter knowledge included self-reports about majoring in a relevant subject matter, counts of courses taken by individuals, and National Teachers Examination scores.

Consistent with common belief, several studies showed a positive connection between teachers' subject matter preparation and both higher student achievement and higher ratings on teacher performance evaluations, particularly in mathematics, science, and reading. In another study, however, researchers found that National Teachers Examination scores and grade point averages (GPAs) in the major

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accounted for only small proportions of the variance in teaching performance of prospective secondary teachers. In contrast, education coursework accounted for 48% and 39% of the variance when performance was rated by education supervisors and subject matter specialists, respectively. In another study, the researcher found that states with a higher proportion of well-qualified teachers (full certification and a major in their field) had higher mathematics and reading test scores in Grades 4 and 8. The same study found a negative relationship between a state's proportion of teachers with less than a minor in the field that they teach and student achievement.

Undermining the view that ideal teacher preparation is a subject matter major, three studies had complex, inconsistent results, with results varying across subject areas and according to whether subject matter study was measured by number of courses or completion of a major. Contrary to the belief that more is better, when it comes to subject matter courses, one study found that subject matter study beyond four to six courses had little effect on student achievement.

Several studies addressed the question of the relative merits of studying subject matter in the context of teaching (e.g., subject matter methods courses) versus studying it as a distinct course (e.g., majoring in a subject matter). Several studies found that education coursework, including subject-specific methods courses, is useful, sometimes having a higher correlation with student achievement than subject matter study. (Our full report presents greater detail on the differences in results across studies, both for this question and for the other key questions.)

In a study that illustrates the complexity of studying prospective teachers' subject matter preparation, Monk (1994) found positive relationships between teachers' subject matter preparation and student achievement. However, there was evidence of a threshold effect; that is, there was minimal additional effect of teachers' study of mathematics beyond five undergraduate mathematics courses on pupil mathematics performance. Having a math major had no bearing on student performance.

The results were different in science. Although there was no impact on student achievement with teacher undergraduate coursework in life sciences, there was a strikingly positive relationship between undergraduate coursework in physical sciences and student achievement. Again, there appeared to be a threshold effect.

Monk (1994) found positive effects of mathematics education courses, with courses in mathematics education contributing more to student achievement gains than undergraduate mathematics courses. There was a similar relationship in science. After exploring a number of interaction effects, the researcher concluded that it is "risky" to make any generalizations about the significance of teacher subject matter knowledge. Although there is no definitive research that helps us understand this confusing finding, several possible explanations bear further investigation, including the possibility that a teacher needs pedagogical content knowledge as well as content knowledge.

In addition to the 7 studies of the effects of subject matter preparation, we found 11 studies concerning the typical subject-specific knowledge of preservice teachers at both the elementary and secondary levels (T. L. Adams, 1998; Ball 1990a, 1990b; Borko et al., 1992; Graeber, Tirosh, & Glover, 1989; McDiarmid & Wilson, 1991; Simon, 1993; Stoddart, Connell, Stofflett, & Peck, 1993; Tirosh & Graeber, 1989; M. Wilson, 1994; S. M. Wilson & Wineburg, 1988). These studies suggest that the subject matter preparation that prospective teachers currently receive is inadequate for teaching toward high subject matter standards, by anyone's definition. It appears that prospective teachers may have mastered basic skills but lack the deeper conceptual understanding necessary when responding to student questions and extending lessons beyond the basics. The limited knowledge of prospective teachers is acquired in coursework across a prospective teacher's K-12 and university experience—in high school, general (liberal) education undergraduate requirements, and university subject matter departments.

A general weakness of the research regarding the subject matter preparation of prospective teachers is important to note: The validity of the

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proxies for subject matter knowledge used in most current research—course or major—is limited by the wide variation in their meanings.

### ***What Are the Effects of Pedagogical Preparation?***

We found no research that directly assesses what teachers learn in their pedagogical preparation and then evaluates the relationship of that pedagogical knowledge to student learning or teacher behavior. Research on pedagogical preparation has remained at a high level of aggregation, giving little information about possible differences across grade level or subject area. At this level, the research suggests some benefit of pedagogical preparation, but the measurements used make it difficult to see clear associations.

Conducting research about pedagogical preparation is complicated. *Pedagogical preparation* means many things: instructional methods, learning theories, educational measurement and testing, educational psychology, sociology, and history. For this report, we focused on research that explores the impact of pedagogical preparation for the program as a whole. Our logic was that even if individual courses vary, studies might find consistent results by looking at students who took a full set of education courses. We found two types of relevant research: research on certification and research on the value added by education coursework.

*Research comparing certified and uncertified teachers.* One way to examine the overall effects of pedagogical preparation is to compare certified teachers with their uncertified colleagues. We found 5 relevant studies: 3 large-scale studies, 1 study of 18 pairs of teachers matched according to their students' "same general ability," and 1 interpretive study (Darling-Hammond, 2000b; Felter, 1999; Goldhaber & Brewer, 2000; Grossman, 1989; Hawk et al., 1985). Sample sizes ranged from 3 to more than 3,000.

One study found that the students of certified mathematics teachers scored higher on standardized mathematics tests than those of uncer-

tified teachers and that certified teachers also scored higher on mathematics and teaching knowledge tests. Likewise, another study found a negative correlation between percentage of teachers with emergency certification and student mathematics achievement. In another study, the researcher found a positive relationship between a state's percentage of fully certified teachers and student achievement in mathematics and reading. The same study found a negative relationship between student achievement and three indicators of a state's less than fully certified teachers: percentage of all less than fully certified teachers, percentage of new entrants to teaching who were uncertified (excluding transfers), and percentage of newly hired uncertified teachers. However, another study found no difference in the achievement of students who had teachers with certification versus those with temporary/emergency credentials. One interpretive study

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**High-quality research . . . requires multiple methods. It also requires deep knowledge of the subject under investigation—in this case, teaching and teacher preparation.**

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found that secondary teachers with no pedagogical preparation had a limited ability to engage high school students in the subject matter and that those teachers taught as they had been taught.

A teaching credential is a crude indicator of professional study, and unfortunately, these studies offer little insight into the specific aspects of pedagogical preparation that are critical. Large-scale research that uses certification status and degrees as indicators of teacher preparation may identify differences between, for example, teachers with emergency certificates and those with regular certification but may not help us understand what aspects of the coursework taken for regular certification matter. This problem is exacerbated by the wide variation in certification practices across states. Future research will need better databases and



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more research (with complementary and sophisticated analytic tools) to clarify these confusing results.

*Research on the value added by teacher education coursework.* Another approach to understanding whether pedagogical preparation has an impact is to examine the value-added of education coursework in teacher preparation programs. We found 1 multiple regression study, 2 correlational studies, and 6 interpretive studies (P. E. Adams & Krockover, 1997; Ferguson & Womack, 1993; Gess-Newsome & Lederman, 1993; Grossman & Richert, 1988; Grossman et al., 2000; Guyton & Farokhi, 1987; Hollingsworth, 1989; Monk, 1994; Valli & Agostinelli, 1993).<sup>2</sup> Sample sizes ranged from 1 to 6 teachers in case studies to more than 1,000. Although the number of studies is limited, in general, the research suggests that there is a value added by teacher preparation. However, the research methods used and the limited sample sizes in the interpretive research make it difficult to determine specifically what prospective teachers learn in education coursework.

In the 2 correlational studies, researchers contended that education coursework was a better predictor of teaching success than subject matter major or GPA prior to entering the teacher education program. In the multiple regression study, the researcher found that undergraduate mathematics education coursework contributed more to student gains than did courses in undergraduate mathematics coursework. A similar result, albeit weaker, was found between graduate science education coursework and student achievement in science. In the interpretive studies, researchers found that teachers attributed their knowledge of a range of instructional strategies, classroom discipline and management, and classroom routines to their education coursework.

In 2 studies, researchers found, however, that the entering beliefs and knowledge of prospective teachers act as powerful predictors of what they learn in education courses. In 3 other studies, researchers found that new teachers reorganized their content knowledge in their subject-

specific education coursework. Consider 1 year-long study of prospective biology teachers (Gess-Newsome & Lederman, 1993). The teachers—all biology majors—reported never having thought about the individual topics of biology or the interrelationships among those topics. They could only list courses they had taken, with little understanding of the field writ large. Over the course of a year's worth of pedagogical preparation and field experiences, the new teachers began to reorganize their knowledge of biology in light of how it should be taught. Although these results are limited, they resonate with research on teachers in other subject areas.

One serious obstacle to large-scale teacher education research is that most research on teacher preparation is not funded by outside agencies. This typically has meant that the research is limited to a single institution where teacher education researchers can use the data generated by their local teacher education efforts. It is difficult to know how representative the graduates of any single institution are of the larger population. Furthermore, without knowledge of what the local pedagogical preparation entailed, it is impossible to replicate the research. Because much of the in-depth research is done locally by teacher educators who have an investment in the enterprise, results are sometimes suspect. Although local teacher educator researchers have valuable knowledge of the phenomenon under investigation, critics have the right to raise questions about the conflict of interest apparent for teacher educators doing research that validates the need for teacher education.

Future research can address these questions in multiple ways. First, teacher educator researchers ought to aim for publishing in the most rigorously reviewed education journals, as well as in journals outside of education related to their disciplinary perspectives (e.g., history, mathematics, economics, psychology, sociology, and the like). Second, research designs should include serious consideration of alternatives to traditional teacher education, as well as collaborations between teacher educator researchers and other researchers.

### **What Are the Effects of Student Teaching?**<sup>3</sup>

Research on student teaching in teacher preparation consists primarily of small interpretive studies. These suggest that clinical experiences vary widely, but many focus on a relatively narrow range of teaching skills and are disconnected from other components of teacher preparation. Studies have focused on attitude shifts rather than on changes in knowledge and skills. Individual studies of clinical training suggest ways clinical experience might have more uniform positive effects.

Learning to teach typically involves spending considerable time in schools participating in field experiences of varying lengths. In fact, field experience is a staple of teacher preparation programs. Study after study shows that experienced and newly certified teachers alike see clinical experiences as a powerful—sometimes the single most powerful—component of teacher preparation. Whether the power field experience enhances the quality of teacher preparation, however, may depend on the particular experience.

What constitutes field experience varies in purpose, timing, structure, and connection to other parts of teacher preparation. Research in this area has explored promising practices, the factors that shape the quality of field experiences, and the impact of traditional student teaching experiences in comparison with the impact of yearlong internships.<sup>4</sup>

*Promising practices in field experiences.* We found 8 interpretive studies, with sample sizes ranging from 5 to 15, that suggest that field experiences and student teaching can be designed to be more educative (Florio-Ruane & Lensmire, 1990; Grisham, Laguardia, & Brink, 2000; Grossman & Richert, 1988; Grossman et al., 2000; Hollingsworth, 1989; Lazar, 1998; Shefelbine & Hollingsworth, 1987; J. D. Wilson, 1996). We also found 2 interpretive studies, with samples of 26 and 37 preservice teachers, in which researchers compared different treatments, or kinds of clinical experiences (Metcalf,

Ronen Hammer, & Kahlich, 1996; Schelske & Deno, 1994). Although the research on field experiences shares the limitations of the research on pedagogical preparation (i.e., local studies, often unique to a particular program at a particular institution), these studies suggest some potentially promising practices and have the potential to inform future research.

In one study, when prospective elementary teachers were given an opportunity to observe and interview students learning to write, their conceptions of the teaching and learning of writing began to change. Another study demonstrated that a carefully designed practicum altered interns' initial stereotypic views about poor inner-city parents and prompted them to realize both that caregivers played a significant role in literacy and that the school was partly to blame for retarding improvements. In a third study, researchers found that new teachers learned most from clinical experiences when they were required to do an action research project designed by university teacher educators. In yet another study, researchers found that student teachers could learn as much from laboratory experiences as from field experiences about how to reflect on teaching, organize instruction, and teach. A theme across several studies is that field experiences lead to more significant learning when activities are focused and well structured.

Cooperating teachers have a powerful influence on the nature of the student teaching experience. One researcher found that pairing a student teacher with a cooperating teacher who had dissimilar ideas led to greater learning from the field experience. However, other researchers have found that student teachers tend not to rock the boat in the classrooms in which they are placed and thus do not always engage in critical conversations about their own teaching or their collaborating teachers' practice.

*Factors that shape student teaching.* Disentangling the impact of coursework, fieldwork, and other factors on learning to teach is complex in part because it is inadequate to rely simply on participants' self-reports to determine where

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and what teachers learn. Furthermore, because prospective teachers often simultaneously take university courses and participate in clinical experiences, it is difficult to identify the effects of separate program components. Across the research we have already described, however, several critical factors emerged.

Student teaching experiences are interpreted in varying ways by prospective teachers, even among those in the same teacher education program. Student teachers' beliefs and knowledge, as well as those of cooperating teachers, play an important role in how they think about and learn from the field. Cooperating teachers also work with novice teachers in a wide variety of ways. Some focus on subject matter and strategy, others assume that novice teachers know the subject matter, and others focus more on maxims of teaching. Some cooperating teachers offer little by way of advice or support. Some interpret the job as socializing student teachers into the status quo of schools or into the cooperating teachers' own practices. Sometimes cooperating teachers see their role as enabling innovation and independence.

In one study, the researcher found that general classroom managerial routines have to be in place before prospective teachers can focus on teaching subject matter. Regardless of their subject matter preparation, prospective teachers who failed to routinize discipline, management, and instruction were often unable to focus on what students were learning. In another study, the researchers documented the myriad factors that shape a prospective teacher's field experiences, including the teacher's subject matter knowledge, the openness of the cooperating teacher to certain kinds of instruction, and the norms and expectations of the school and the school district. In still another study (Grossman & Richert, 1988), researchers found that prospective teachers cited fieldwork more than coursework as a source of knowledge, yet coursework also made important contributions. From field experience, prospective teachers reported acquiring survival skills, learning about students, and recognizing that their stu-

dents' understandings vary, are complex, and differ from the teachers'. Coursework taught prospective teachers about theoretical princi-

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**We are limiting our capacity  
to generate the scholarship we  
need to improve teacher education  
if we are not preparing the next  
generation of teacher education  
researchers to use the full range  
of methods and to conduct large-  
and small-scale studies.**

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ples such as mainstreaming and grouping and also gave them an image of the possible.

*Comparisons of 5-year and 4-year programs.* One final area of research that sheds light on the question of appropriate field experiences concerns differences in the graduates of 4-year and 5-year teacher preparation programs. We found 2 studies that examined this question, 1 large-scale study and 1 small interpretive study (Andrew, 1990; Grisham et al., 2000).

In the large-scale study, the researcher found that teachers who went through a 5-year program that included a yearlong internship (and took the same courses as their peers who went through a 4-year program with a shorter, more traditional student teaching experience) were more satisfied with teaching and with their teacher education program. They also had a higher retention rate and consistently rated their teaching abilities higher. In an interpretive study of 5 preservice teachers who student taught in a professional development school, researchers report that a yearlong experience significantly contributed to the quality of what new teachers learned.

The research on clinical experiences is weak in several ways. Much of the early research focused on cooperating and prospective teachers' attitudes. Although it is important to know how teachers feel about the benefits of field experiences, attitude surveys do not answer



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questions about what prospective teachers actually learn. In addition, the research in this area is interpretive and small scale. Although this research sheds light on the factors that make field experiences complicated, the limited sample sizes and local treatments make it impossible to generalize.

### ***What Policies Improve the Quality of Preservice Teacher Education?***

Little research bears directly on this question. Several strategies, however, have captured the attention of policy makers: requiring program accreditation, strengthening state program

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**We worry that unless we . . .  
produce sound, robust measures  
of impact, others—policy makers  
and critics—will produce other,  
less appropriate measures.**

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approval, mandating additional coursework (especially on reading instruction), setting limits on the number of credits required in education coursework, increasing the amount of teacher testing and holding teacher education programs accountable for results of teacher testing, requiring a subject matter major, changing the duration of teacher preparation from 4 years to 5, and establishing professional development schools. Other policies currently in use may have important implications for teacher preparation, among them changing teacher certification to require passing assessments of teaching performance and creating or mandating induction programs. Although enthusiasm for these policies is high, the research base is thin.

We searched for research on the effectiveness of these policies, either describing the effects of policies on desirable characteristics of teacher preparation programs or describing the effects on students enrolled in those programs. We found only 4 studies, 2 that used large samples to compare the certification test scores of teachers in different policy contexts (Gitomer,

Latham, & Ziomek, 1999; Wenglinsky, 2000), 1 that compared characteristics of teachers from 4-year and 5-year programs (Andrew, 1990), and 1 that looked intensively at the effects of policy initiatives on a single program (Prestine, 1991).

The 2 larger studies, conducted by Educational Testing Service researchers, used scores from a set of tests widely administered for teacher certification as a measure of teacher quality. The researchers compared average certification test scores from different teacher preparation programs to gauge the success of different policies. One study, for example, used data on 300,000 prospective teachers who took the teacher certification tests between 1994 and 1997. For most of those prospective teachers, the researchers also had college entrance examination (SAT or ACT) scores, so they could take account of initial differences among students attending different programs. In a comparison of accredited and nonaccredited preparation programs, the researchers found that in the accredited programs, a higher proportion of teacher certification test takers got scores high enough to meet state requirements. This difference cannot be explained simply by a difference in a program's ability to attract "better" students because the college entrance scores were actually lower in the accredited programs. Interpretation of the result is obscured somewhat by the differences in cut scores states set.

In the other of these 2 large studies, researchers found several other characteristics of institutions that were associated with better performance on the certification tests. These characteristics included having a relatively high proportion of traditional students in the teacher education program and having relatively low institutional emphasis on teacher education, as indicated by a low proportion of education majors/minors at the institution and a low proportion of the institutional budget devoted to teacher education.

Although these results illustrate the questions that large-scale comparisons of teacher education graduates might try to address (e.g., Are teacher tests valid predictors of teaching performance?), more research is needed to

ascertain with confidence the link between certification tests and teaching practice. Moreover, research is needed to shed light on the findings about the effects of the proportions of education majors/minors and of budget allocations at institutions. Does this association reflect differences not fully accounted for by entering students? Does it represent institutional practices common in colleges with small teacher preparation programs but potentially adoptable in colleges with larger programs?

We found no other rigorous studies that focused directly on the relationship between policies and teacher preparation quality. However, provocative evidence offered by one investigation suggests a direction for further investigations and offers one model for doing research (Darling-Hammond, 2000b). With evidence from national databases, this study demonstrated a statistically significant correlation between the percentage of colleges in a state that were National Council for Accreditation of Teacher Education (NCATE) accredited (a function of institutional and sometimes state policies on accreditation) and the percentage of teachers who are well qualified (i.e., have full certification and a major in their field).

This research demonstrates the use of nationally representative data to examine policy effects but also illustrates the limitations of currently available national data. The correlation indicates that some circumstance links the proportion of NCATE-accredited institutions to the proportion of well-qualified teachers. In the absence, however, of more detailed data about teacher preparation programs, the performance of their graduates, and the way preparation influences hiring and retention, research cannot show whether teacher quality is an effect of state policies about program approval, state mechanisms to facilitate hiring, widespread support for improving teacher quality, or some other set of factors. The association between program accreditation and patterns of teacher employment calls for further exploration. If national surveys began to collect more information about teacher preparation, large-scale research might help establish the link between state or

institutional policies and teacher preparation variables.

### ***What Are the Components of High-Quality Alternative Certification Programs?***<sup>5</sup>

The research we reviewed indicates that alternative routes have successfully recruited a more diverse pool of teachers, but they have a mixed record in terms of the quality of teachers recruited and trained. Despite the heightened interest in alternative certification, research about its impact is limited and has produced decidedly mixed findings. This may be in part because programs that are labeled “alternative” vary from 1-year or 2-year preservice models to programs offering a few weeks of training before placement as teacher of record.

We found 14 papers that shed light on issues of alternative certification (Goldhaber & Brewer, 2000; Grossman, 1989; Guyton, Fox, & Sisk, 1991; Houston, Marshall, & McDavid, 1993; Hutton, Lutz, & Williamson, 1990; Jelmsberg, 1996; Lutz & Hutton, 1989; McDiarmid & Wilson, 1991; Miller, McKenna, & McKenna, 1998; Sandlin, Young, & Karge, 1992-1993; Shen, 1997, 1998a, 1998b; Stoddart, 1990). One study was an in-depth analysis of one program; 3 comparative studies involved the evaluation of the alternative routes in Dallas and Houston (sample sizes ranged from 69 to 110). Three papers analyzed a large-scale national survey of more than 14,000 teachers (Shen, 1997, 1998a, 1998b). Four other studies compared graduates of alternate routes to traditionally prepared 1st-year teachers in New Hampshire, Georgia, and California. One interpretive study involved case studies of 3 new teachers who had no prior preparation; another compared alternate route teachers’ knowledge and beliefs with a national sample of graduates from teacher preparation programs.

The research supports several important observations: (a) Alternative routes are attracting a diverse pool of prospective teachers in terms of age and ethnicity, and (b) alternative routes have a mixed record for attracting the

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“best and brightest.” In one analysis involving a national sample of more than 14,000 teachers, 3.3% of the alternatively certified teachers did not have B.A.s. In that same analysis, the researcher found that more alternatively certified teachers were teaching out of field in mathematics and science than traditionally certified teachers. In a case study of the Los Angeles Unified School District, however, prospective teachers in alternate routes had GPAs that met or surpassed national averages of traditionally certified teachers. However, this study also found that alternatively certified teachers’ GPAs were lower than traditional recruits in mathematics and science.

In 2 reports based on the same database, researchers contrasted the knowledge of alternatively certified interns with that of a national sample of teacher candidates. Researchers found that alternate route secondary and elementary teachers suffered from the same weak mathematical knowledge as did traditional teacher candidates. An analysis of English teachers, however, suggested that traditionally prepared English teachers were significantly more knowledgeable about specific instructional strategies for teaching writing. This result resonates with another study, in which the researcher found that 3 English teachers who had no teacher preparation prior to teaching also had no formal understanding of how to represent the subject matter to their students and fell back on instructional strategies that had worked for them as students in high school or college. These strategies were largely idiosyncratic and ill suited for the students they were teaching.

In 2 studies, researchers found that high percentages of alternatively certified teachers were teaching in urban settings or in schools where the majority of the students were from minority populations. In their evaluation of the Dallas alternative route, however, researchers found no significant difference in school socioeconomic status for alternatively certified and traditionally prepared teachers. Although it is heartening that alternate routes might be fulfilling their promise of placing more teachers in high-need, urban settings, the fact that 2 studies

showed that a higher percentage of those teachers were teaching out of subject than their traditionally certified colleagues is worrisome. This raises the possibility that poorly conceptualized or administered alternative routes may simply exacerbate extant inequities. One study did find that alternatively certified interns in one city held high expectations for low-income and minority students and attempted to develop curriculum and instruction responding to the needs of diverse learners.

Evaluations of the performance of alternate route and traditionally prepared teachers produce mixed results. In 2 studies of the same alternative route, researchers found that—when rated by their mentors—alternatively certified teachers got high evaluations as teachers. They also had higher mean passing scores on the statewide certification test. The alternatively certified teachers, we should note, had gone through an extensive program with high entry standards. Of the 691 applicants who took basic skills exams, only 110 interns were admitted to the alternate route program after an evaluation of an entrance essay and a structured interview. They also participated in professional coursework, planned and taught practice lessons, and were closely supervised and mentored. Only 59 were eventually certified after their 1st year in the program; others dropped out or were categorized as “pending” until their files were complete or their performance improved. In another study, the researcher found the opposite: Principals rated teachers from the college-based teacher education programs as being better prepared in teaching methods and educational foundations than alternatively certified teachers. The teachers themselves concurred. In 2 other studies, no difference was found in teaching behaviors or difficulties encountered by new teachers.

We found 1 study that examined the effects of alternative program status on student achievement. This study of a university-based alternate route featuring extensive coursework, intensive supervision, and mentoring found no differences in average student achievement of matched pairs of alternatively and traditionally certified teachers on their students’ perfor-

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mance on the Iowa Test of Basic Skills. A third result from this research suggests that teachers who have come through high-quality alternative routes and teachers traditionally certified show some similarities. Several studies found no significant difference between the two groups on a number of characteristics. For instance, alternatively certified and traditionally certified teachers tend to be more alike than different in terms of socioeconomic status and gender. In several studies, especially after the induction year, observers rated alternatively and traditionally certified teachers' performance similarly, particularly when alternatively certified teachers came from structured alternate routes. And in 2 studies, alternatively certified and traditionally certified teachers' attitude profiles concerning self-efficacy and confidence were similar. However, in others, alternate route teachers were less confident about their knowledge and practice.

Another finding from the alternate route research suggests that successful alternate routes appear to be resource intensive and labor intensive. Many programs have high dropout rates. In a study of the Los Angeles Unified School District's alternative route, one researcher reported that of the 1,100 recruited alternatively certified teachers in a 6-year time frame, 29% had left the district (and may have left teaching) in that same time frame. In the Dallas program, 11 of 110 interns dropped out within the 1st year, and another 24 were recommended to be placed in a "pending" category due to deficiencies in their preparation or materials. The minority alternatively certified teachers in another study indicated they did not plan on staying in teaching. In another study, traditionally prepared teachers were found to be more positive about staying in the profession, and 5 of 23 alternatively certified teachers had dropped out of the program before the end of the year. On the other hand, in one study, researchers found no differences in alternatively and traditionally certified teachers, after 8 months of teaching, in terms of their job satisfaction or their intentions to be teaching in the next 5 years.

These contradictory findings seem puzzling. Clearly, alternative certification varies across contexts (Zumwalt, 1991). To begin with, some states treat all postbaccalaureate programs as alternate, whether they include preservice coursework and student teaching or offer little structured training. Moreover, some alternate routes have high entrance standards, and some require substantial coursework and mentoring. In fact, in some contexts, alternative certifica-

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tion may simply be traditional certification packaged differently. For example, the Dallas Independent School District Alternative Route Program was initially the product of a collaboration between the school district and East Texas State University. Although alternatively certified interns might have gotten more support in the form of supervision than the typical teacher education student, their coursework might otherwise have been very similar to traditional teacher education. The number of credit hours required for courses in the Los Angeles Unified School District's alternate route is comparable to that required in California teacher preparation programs, and analyses of transcripts suggest that course content is similar to college-based teacher preparation. In sum, alternative certification programs in some of these studies may share key characteristics with traditional teacher education programs, but all of them do not. For example, in one study of a district alternative route, the researcher found that attendance was the sole criterion for passing all program requirements. Teacher candidates were not held accountable for learning any of the material offered by the school district in its carefully designed curriculum.

We found one extensive description of the content and character of an alternative route that met the criteria for this review. Because the



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research literature seldom includes descriptions of the content and components of alternative routes, it is difficult to determine whether the variation in the research results is due to differences in program quality.

Given the literature that does exist, however, it appears that several features may be important to high-quality alternative certification, including high entrance standards; extensive mentoring and supervision; extensive pedagogical training in instruction, management, curriculum, and working with diverse students; frequent and substantial evaluation; practice in lesson planning and teaching prior to taking on full responsibility as a teacher; and high exit standards.

The research in this domain suffers from weaknesses similar to those we have already noted, including a reliance on supervisors' ratings and problematic proxies for subject matter knowledge. An additional weakness concerns a problem with the data on which 3 of the studies are based. As one critic suggests, teachers' responses were inaccurate. Specifically, teachers might have been confused about their own certification status (Ballou, 1998). For example, 52% of the teachers who reported that they completed an alternative certification program also said that their undergraduate major was in education. Furthermore, much early research on alternative routes was conducted when those programs were first created. Because the programs themselves were under development, the programs were relatively unstable. Now that more states have programs and many programs are more established, it is time for new research.

## CONCLUSION

As we noted earlier, what we present here is a restricted review of the literature on teacher preparation. Many other relevant questions could be asked, and a broader range of scholarship considered. We undertook this study because we felt strongly that teacher education researchers needed to respond to contemporary criticism by taking stock and examining our own assumptions. Thus, although we are members of the educational establishment, we aimed

to look at the work of our own community from a critical distance. In this conclusion, we comment on what conducting this review taught us rather than reiterating the answers to the five questions posed. Conducting the review and searching for empirical research that met stringent standards gave us a sharper sense of the gaps between claims we, as teacher educators, would like to make and evidence that those outside our field would find persuasive. We came away with the conviction that we, as a field, must make changes that will, in the coming years, give us a better grounding for the practices we believe in or perhaps give us reasons to rethink some practices.

First, more teacher education researchers need to aim for publication in peer-reviewed journals, especially journals that speak to audiences beyond teacher education. The national discourse about teacher preparation demonstrates a broad interest in our field. To have a strong voice in that discourse, our work needs to profit from the careful criticism and higher credibility that comes from the review of peers, including peers outside our immediate circle of colleagues.

Related to this is the need to make public our research practices. Many reports were left out of our review because they did not include a description of research methods with enough detail to judge the validity of the conclusions. When we failed to find such descriptions in papers that had been peer reviewed, we wondered what basis the reviewers had for making judgments. To move our collective understanding forward, and to give those outside our field reasons to accept our claims, our research reports—in journals, reports, or books—need to devote more space to descriptions of research design, as well as data collection and analysis, so that the basis for our conclusions is open to scrutiny.

As we lay open the reasons for our conclusions, we need greater care in selection and use of citations. Reference to previous work is a legitimate basis for justification but carries no more weight than the work it cites. The habit in our field (perhaps more widely in social science) of citing a paper because of a claim it makes

without a judgment about the claim's basis dilutes the value of argument by citation. We found many citations to papers that offered no empirical evidence or that themselves relied heavily on unsupported claims. Other citations were to papers and presentations that were unavailable and hence could not be evaluated. Although new research is often available only in presentation or paper form, it behooves us as a community to be more guarded in our use of such citations. In sum, we were surprised at the lack of attention to the kinds of evidence used to support researchers' arguments.

We were also struck with the dearth of impact measures. We believe teacher education makes a difference. We also believe that, as teachers, we ought to be held accountable for what our students (in this case, prospective teachers) learn. We worry that unless we—as teacher educators and researchers—produce sound, robust measures of impact, others—policy makers and critics—will produce other, less appropriate measures. Rather than view this as a problem, we see it as an opportunity. We would all benefit from the development measures of the knowledge, skill, commitments, and capacities we hope prospective teachers acquire in our company.

Finally, we took to heart the lessons we learned as teachers of future teacher education researchers. A decade or two ago, naturalistic or interpretivist inquiry was too seldom found in journals. Its growth has contributed many insights into education, schooling, and teacher preparation. It seems, however, that the pendulum might have swung too far. We found that most scholarship was limited to small-scale interpretivist research. The large-scale quantitative research included in this review was almost entirely (with the exception of Darling-Hammond's work) done by outsiders to the teacher education community.

This observation caused us to wonder about the implications for the preparation of new researchers. Clearly, there is a need for high-quality, rigorous research in multiple traditions. And we welcome analyses by scholars outside of teacher education. But scholars inside of the

teacher education community have a content knowledge—of teacher preparation and its associated challenges—that is sometimes missing when outsiders conduct research. This content knowledge can enrich large- and small-scale studies, using field and survey methods. And we believe that it is our obligation to help educate future generations of teacher education researchers to both value and conduct such multimethod research.

In conclusion, we would suggest that high-quality research, which will command respect and attention from broad audiences, requires multiple methods. It also requires deep knowledge of the subject under investigation—in this case, teaching and teacher preparation. Finally, it requires peer review and high standards. We would argue that we are limiting our capacity to generate the scholarship we need to improve teacher education if we are not preparing the next generation of teacher education researchers to use the full range of methods and to conduct large- and small-scale studies; if we are not making our methods of design and analysis public; and if we are not submitting our work to critical peer review both within and outside the educational community.

## NOTES

1. To abbreviate the length of this article, we cite the relevant articles at the beginning of each section. For citations of specific articles, please see the full report.
2. We found many more studies that examined teacher learning within a particular course, but given our limited time frame and the difficulties in comparing specific courses across institutions, we did not include those course-specific studies in this review.
3. In this report, we use the terms *field experience*, *clinical training*, and *student teaching* interchangeably.
4. In the full report, we also present research on the typical field experience.
5. In this article, we use *alternative* and *alternate* interchangeably.

## ACKNOWLEDGMENTS

This article is based on a report done for the Center for the Study of Teaching & Policy, with support from the Office of Educational Research and Improvement, U.S. Department of Education (OERI-ED) (PR/Award Number R308B970003). The contents do not necessarily

represent the positions or policies of the Center or OERI-ED. Courtney Bell, Dawn Berk, Marco Meniketti, and Lisa Morgan located and reviewed candidate research reports. Many people provided helpful advice and critique, including Bruce Alberts, Adam Gamoran, Kenji Hakuta, Ellen Condliffe Lagemann, Judith Warren Little, Kenneth Zeichner, Deborah Ball, Linda Darling-Hammond, Sharon Feiman-Nemser, Pamela Grossman, Mary Kennedy, Gary Sykes, and four anonymous reviewers who read the draft and responded with detailed feedback.

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