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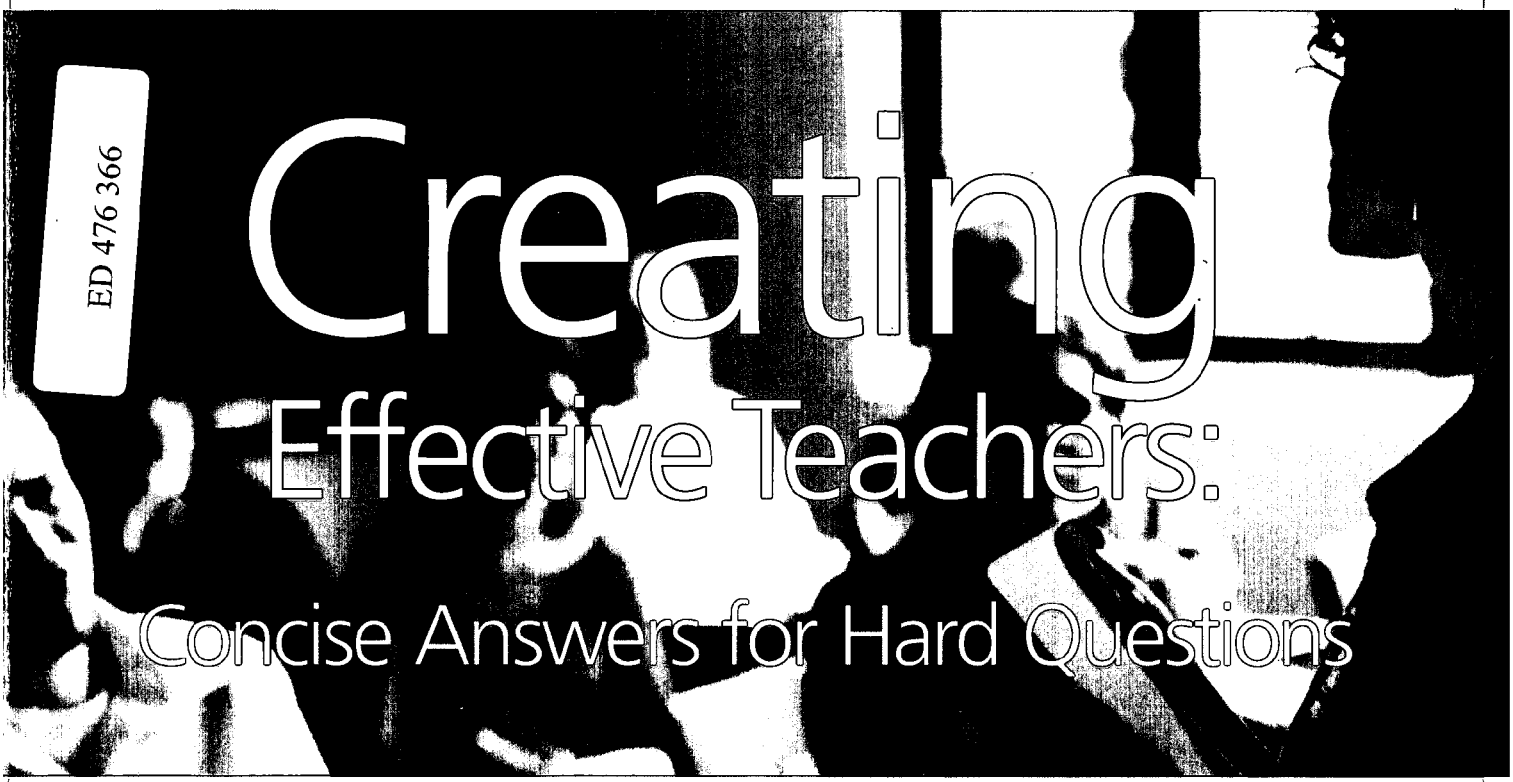
ABSTRACT

This addendum addresses questions of interest to state education policy makers, also elaborating on questions posed in the original work. Issues examined include: the extent to which subject knowledge contributes to teacher effectiveness; the extent to which knowledge of pedagogical theory, learning theory, or child development contribute significantly to teacher effectiveness; the extent to which high-quality, field-based experience prior to certification significantly contributes to teacher effectiveness; whether the accreditation of teacher preparation programs contributes significantly to the likelihood that graduates will be effective and remain in the classroom; and whether there are alternate route programs that graduate high percentages of effective teachers. It also offers summary statements on such issues as: new teacher characteristics that contribute to teacher effectiveness; the impact of 5-year versus 4-year teacher education programs on teacher effectiveness and retention; whether requiring state certification for new teachers contributes significantly to teacher effectiveness; and whether institutional warranties for new teachers contribute to the likelihood of graduates being effective teachers. Two appendixes present summaries of research not included in the addendum and nominated literature not included in the review. (SM)

An Addendum to the Report *Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations*



Creating Effective Teachers:

Concise Answers for Hard Questions

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With an introduction by
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Introduction

by Mary E. Dilworth, ERIC Clearinghouse on Teaching and Teacher Education

Those who follow research on teaching, teacher education, and professional development have likely observed a growing number of consensus panels and reports. These efforts, sponsored by various public and private organizations, are designed to state clearly what is known about the impact that good teaching and teacher education have on PK-12 student learning. The work is of interest to a wide range of stakeholders—including education faculty, students, teachers, administrators, policy makers, and the general public.

The consensus report for which this addendum was written, *Teacher Preparation Research: Current Knowledge, Gaps and Recommendations* (Wilson, Floden, & Ferrini-Mundy, 2001), was commissioned by the U.S. Department of Education's Office of Educational Research and Improvement and released in February 2001. As the authors state, this report was developed within a short time line (4 months) and focused on five basic questions that are of key interest to policy makers and teacher educators:

- What kinds of subject matter preparation, and how much of it, do prospective teachers need?
- What kinds of pedagogical preparation, and how much of it, do prospective teachers need?
- What kinds, timing, and amount of clinical training ("student teaching") best equip prospective teachers for classroom practice?
- What policies have been used successfully to improve and sustain the quality of preservice teacher education?
- What are the components and characteristics of high-quality alternative certification programs?

The teaching and teacher education research community's response to this report was tremendous. The criteria used for selection of work to be considered in the piece (e.g., using only peer-reviewed journals) prompted more discussion than the actual findings on the critical questions. While the research community found some interest in a compendium of its own work, the notion that considerable attention was now being given to the methods and venues for research offered the community a new set of challenges. The succession of consensus panels and similar study panels that evolved was inevitable, and most have used or referenced the original work in their development. Each of these efforts promises to expand the knowledge and understanding of teaching and teacher education using research as a guide.

The ERIC Clearinghouse on Teaching and Teacher Education and the American Association of Colleges for Teacher Education are pleased to add to this growing body of literature with the publication of this addendum to the 2001 report. Commissioned by the Education Commission of the States, the addendum aims to address questions that are of particular interest to state education policy makers and elaborates on a number of questions posed in the original work.

- To what extent does subject knowledge contribute to the effectiveness of a teacher? Is there a significant advantage to having an advanced degree in the subject taught as opposed to a subject major? To having a subject major as opposed to a minor?
- To what extent does knowledge of pedagogical theory, learning theory, or child development contribute significantly to a teacher's effectiveness? What pedagogical knowledge is most important?
- To what extent does high-quality field-based experience prior to certification contribute significantly to a teacher's effectiveness? What are the characteristics of high-quality field-based experience? Do professional development schools exhibit these characteristics?
- Does the accreditation of teacher preparation programs by the National Council for Accreditation of Teacher Education, the Teacher Education Accreditation Council, or a state accrediting agency contribute significantly to the likelihood their graduates will be effective and will remain in the classroom? What accreditation measures are likely to be most effective?
- Are there "alternative route" programs i.e., programs that give teachers classroom assignments after 3 months or less of teaching-specific preparation that graduate high per-

centages of effective new teachers with average or higher-than-average rates of teacher retention? What are the important characteristics of these programs?

In addition, the addendum offers summary statements on several questions that were not posed in the original report:

- What characteristics of new teachers contribute the most to teaching effectiveness?
- Is greater teacher effectiveness and retention in the profession more likely to be provided by 5-year teacher preparation programs than by 4-year programs? In general, is teacher attrition influenced by program model?
- Does requiring state certification for new teachers contribute significantly to the likelihood that they will be effective? What kinds of certification vehicles can provide the greatest assurance?
- Do institutional warranties for new teachers contribute to the likelihood that new graduates of those institutions will be effective? Do teachers given remediation under those warranties demonstrate increased classroom effectiveness?
- Are there any teacher preparation strategies that are likely to increase the effectiveness of new teachers in hard-to-staff or low-performing schools? What about in urban or remote rural schools?
- Is setting more stringent entrance requirements for teacher preparation programs or more selective prescreening of preparation program candidates likely to ensure they will be more effective?

Resources closely related to this work include the following:

- The original report, *Teacher Preparation Research: Current Knowledge, Gaps and Recommendations* (Wilson, Floden, & Ferrini-Mundy, 2001), available from the Center for the Study of Teaching and Policy in Seattle, WA (www.ctpweb.org)
- *A Secondary Analysis of a Review of Teacher Preparation Research* (Lauer, 2001), prepared for the Education Commission of the States (ECS) in Denver, CO
- *Eight Questions on Teacher Preparation: What Does the Research Say?,* the upcoming ECS report that syntheses the information in this report for the explicit use of policy makers, available from ECS (www.ecs.org)
- An on-line searchable index of research studies examined in this volume on the web site of the ERIC Clearinghouse on Teaching and Teacher Education (www.ericsp.org)

Creating Effective Teachers: Concise Answers for Hard Questions

In January of 2002, we were asked by the Education Commission of the States (ECS) to complete an addendum to our original report, *Teacher Preparation Research* (Wilson, Floden, & Ferrini-Mundy, 2001). We were directed to use the same criteria we had developed for that report, except that we were asked to include book chapters, unpublished work that had nonetheless gone through some form of peer review, published meta-analyses, and the most frequently nominated books reporting on research on teacher preparation. We were also asked to consider additional questions concerning teacher preparation. The addendum was not intended as a stand-alone piece but as a companion to the original report.

We begin this addendum by introducing the new set of questions proposed by ECS. We then move to a brief description of the process that we used for reviewing new literature. The majority of this addendum focuses on summaries of the additional literature we reviewed. We conclude the report by revisiting the conclusions and recommendations of the original report and reflecting on how this addendum informs those conclusions and recommendations.

An Elaborated Framework for Synthesizing Research on Teacher Preparation

In the original review, we were charged with considering five questions posed by the U.S. Department of Education and the Office of Educational Research and Improvement. ECS posed its own set of questions, many of which overlapped with those original five questions. The new questions were as follows:

Question 1. What characteristics of new teachers contribute the most to teaching effectiveness?

Question 2. To what extent does subject knowledge contribute to the effectiveness of a teacher? Is there a significant advantage to having an advanced degree in the subject taught as opposed to a subject major? To having a subject major as opposed to a minor?

Question 3. To what extent does knowledge of pedagogical theory, learning theory, or child development contribute significantly to a teacher's effectiveness? What pedagogical knowledge is most important?

Question 4. To what extent does high-quality field-based experience prior to certification contribute significantly to a teacher's effectiveness? What are the characteristics of high-quality field-based experience? Do professional development schools exhibit these characteristics?

Question 5. Is greater teacher effectiveness and retention in the profession more likely to be provided by 5-year teacher preparation programs than by 4-year programs? In general, is teacher attrition influenced by program model?

Question 6. Are there "alternative route" programs (i.e., programs that give teachers classroom assignments after 3 months or less of teaching-specific preparation) that graduate high percentages of effective new teachers with average or higher-than-average rates of teacher retention? What are the important characteristics of these programs?

Question 7. Does requiring state certification for new teachers contribute significantly to the likelihood that they will be effective? What kinds of certification vehicles can provide the greatest assurance?

Question 8. Does the accreditation of teacher preparation programs by the National Council for Accreditation of Teacher Education, the Teacher Education Accreditation Council, or a state accrediting agency contribute significantly to the likelihood their graduates will be effective and will remain in the classroom? What accreditation measures are likely to be most effective?

Question 9. Do institutional warranties for new teachers contribute to the likelihood that new graduates of those institutions will be effective? Do teachers given remediation under those warranties demonstrate increased classroom effectiveness?

Question 10. Are there any teacher preparation strategies that are likely to increase the effectiveness of new teachers in

hard-to-staff or low-performing schools? What about in urban or remote rural schools?

Question 11. Is setting more stringent entrance requirements for teacher preparation programs or more selective prescreening of preparation program candidates likely to ensure they will be more effective?

As a first step in conceptualizing this addendum, ECS commissioned a secondary analysis of our 2001 report in which the author thoroughly and thoughtfully considered how the literature in our initial review addressed these questions (Lauer, 2001). In this addendum, we do not reiterate that secondary analysis. Instead, we focus only on summarizing the additional nominated literature we reviewed that meets reasonable standards for quality.

Methods Used for This Report

The process used in identifying research to be included in this addendum differed from that of the original report. In the original report, we conducted library searches to locate all relevant published research. We aimed to be as comprehensive as possible. For this report, ECS solicited nominations from experts, educators, researchers, state department officials, and policy makers. This addendum is not intended to be a comprehensive analysis of all relevant unpublished material.

ECS asked that the research reviewed in this addendum meet the following criteria:

- Be directly relevant to the 11 questions posed.
- Be focused on teacher preparation in the United States. Differences in how undergraduate education and teacher preparation are structured across continents makes it difficult to synthesize research across international studies for this review.
- Be empirical. A wide array of research traditions was included. However, authors had to offer evidence in support of conclusions, rather than only opinion or theory.
- Be original research. Literature reviews were not included, given the uneven quality and monitoring of research included in those reviews. The exception to the "no literature review" criterion was meta-analyses, since these include tested methods for accounting for research rigor.
- Be rigorous, generally meeting accepted standards for research traditions (see Appendix A of the original report for the specific standards that were used). We continued to use the standards that we had developed for the original report, although our thinking was further shaped by the publication of the National Research Council's *Scientific Research in Education* (Shavelson & Towne, 2002), which, while arguing for a range of disciplinary perspectives in education research, proposed six principles of scientific inquiry that are consistent with our original criteria:
  - Pose significant questions that can be investigated empirically;
  - Link research to relevant theory;
  - Use methods that permit direct investigation of the question;
  - Provide a coherent and explicit chain of reasoning;
  - Replicate and generalize across studies;
  - Disclose research to encourage professional scrutiny and critique.

In sum, the criteria for inclusion largely remained the same in terms of issues of quality and rigor.[1] However, we did include in this addendum books, book chapters, and unpublished manuscripts if there was evidence that the work had gone through some form of peer review. Dissertations were not included, our logic being that good dissertation research is typically published. Conference papers were not included unless there was evidence of peer review. As with the original report, we did not include research that was published by organizations that have a vested interest in either supporting or eliminating teacher preparation.

Once nominations were received, ECS staff located the literature and did a preliminary review in an attempt to discard any literature that did not meet these criteria. They then sent us the literature to review. In addition, we completed ERIC searches for several new questions, which generated longer lists of candidate articles that were then reviewed using the same criteria. We received or located 193 additional manuscripts, articles, book chapters, and books to consider. Despite the preliminary review process conducted by ECS, we nevertheless discarded 129 nominations for one of three reasons: (a) the research did not meet the standards for research; (b) the writing was not a research report, but rather a program description, advocacy piece, etc.; or (c) the writing did not directly address the 11 ECS questions.

[1] Thus, while one reviewer urged us to reconsider using any studies with small sample sizes (for example, three or six teachers), we continued to include comparative case studies, field studies, ethnographies, and the like if the authors provided enough information in their description of methodology to enable another researcher to replicate the study and to test the conclusions against the evidence provided.

Sixty-four reports of research (in the form of unpublished manuscripts, evaluations, books, or published articles) are included in this addendum.[2] Specifics concerning the studies included in this review can be found in Appendix A. A list of the nominations not included can be found in Appendix B.

Once the addendum was drafted, three anonymous reviewers were asked to comment on the contents of a draft report. Using their critical commentary as well as that of ECS, we revised the report.

Reflections on the Qualities of the Research Reviewed

Although all of the research we summarize here met our initial standards for inclusion, not all of the reviewed research was of equal quality. Some of the pieces have been published in high-quality and rigorous peer-reviewed journals (*Journal of Political Economy, Harvard Journal of Legislation, Education Evaluation and Policy Analysis*), while others are reports that have not necessarily gone through a comparable review process. This variety resulted in an unevenness in quality, some of which is related to methodological sophistication: Some analyses are more thoroughly done and/or explained than others. The unevenness might also be due to a less than thorough peer-review process.

But unevenness is not the only source of variation; researchers use radically different designs and methods — from single case studies to national surveys, from grounded theory to hierarchical linear modeling — which leads to considerable variation as well. Although journals across many disciplines have increasingly published more research that uses qualitative data — interviews, observations, document analyses, and the like — the standards for what and how one reports such scholarship are still less proceduralized and widely understood. Thus, there was a considerable variability in what and how people reported their research designs, data collection, data analysis, and checks for reliability and validity.

Because the research results we report are so confusing — the studies are all so different, their results often conflicting, and the answers to almost all of the ECS questions inconclusive — we chose not to confuse readers more by addressing the methodological character and quality of each piece of research included in this review. Instead, we offer a handful of observations here about some of the methodological complications and flaws of this report and of the research that it reviews.

Let us begin by considering the issue of sample size. We did not exclude research that involved small samples, because we presume that rigorous studies involving the in-depth study of a few subjects have much to offer the field of education. Nonetheless, studies with small samples need to be treated with care, for several reasons. For example, few of the researchers provided sufficient evidence that their sample — however small — was representative of a population related to their research questions. In the future, when reporting research, authors ought to be required to explain how their sample was selected and how representative the sample might be.

Researchers were more careful about another problem inherent in research with small samples — generalizability — and typically did not make claims that went beyond the scope of the study. While research with small samples might help us generalize to theory (cf. Campbell, 1975), these studies cannot be used to generalize to practice. Throughout the review, when summarizing the results of research of this sort, we aim to use appropriate and qualified language ("the results suggest that a high-quality field experience might be one that . . . "). Even in some of the studies that had larger sample sizes (say 30 to 100 teachers), the fact that much of the research focused on one program or one kind of field experience means that this research is also of limited or unclear generalizability.

A third problem with this review and with the research we synthesize is the lack of attention to context. Teaching and teacher preparation are situated in a large social, political, and economic context that shapes and is shaped by what happens in schools and universities. The contexts that might matter include broader economic conditions (which influence labor markets), current curricular or pedagogical reforms (which influence the content of teacher preparation), and the schools in which teachers are learning to teach (the challenges of teaching in urban, suburban, and rural school settings vary). Because there is so little research available to address any one of the ECS questions and because there were 11 questions to address, we do not include con-

[2] As readers will note from Appendix B, a number of interesting and potentially relevant reports were submitted. Among the kinds of materials submitted were program descriptions by directors (but not the products of research), writing about relevant topics/issues but from outside of teacher preparation (e.g., mentoring in industry or higher education), position papers, and research reviews. We do not mean to imply that these varied forms of writing cannot or ought not inform discussions of teacher preparation, only that they do not qualify for inclusion in this review of research given the criteria for relevant, high- quality research that we used.

text as a significant variable in our analysis. This is a flaw of the original review and of this addendum. Future research analysts would do well to focus on research around one or two of these questions and carefully consider the role of context in explaining the research results.

A fourth problem concerns how complicated it is to tease apart confounded variables or factors. Consider, for example, the issue of selection. Universities, both discipline-based departments and teacher education programs, have selection criteria for admission. Any research that investigates the impact of teacher preparation or an undergraduate or graduate program needs to attend to selection effects, for any results finding a significant relationship (or the lack thereof) might be due to selection effects alone. In much of the research reviewed here (both large and small scale), the authors seldom address issues of selection — how they were accounted for in their analyses, or how they limit their results. This complexity holds true across other variables as well. It is, for instance, quite difficult to tease apart teacher preparation from teacher certification, or the pedagogical education undergraduates receive in their discipline-based courses versus the pedagogical preparation they receive in their teacher preparation coursework.

There are other problems with the research we synthesize — for instance, that interaction effects and nonlinearities are seldom explored with any degree of conceptual or technical sophistication. Throughout the review, we note when a particular problem plagued the research in general, and in our conclusions we recommend that future research be designed to specifically remedy these weaknesses in the current knowledge base.

Additional Research on Teacher Preparation

Question 1. What characteristics of new teachers contribute the most to teaching effectiveness?

We found 23 studies related to Question 1 that met our selection criteria. Most of these studies included experienced teachers as well as new teachers, so the findings are based on teachers with a wide range of years of experience, rather than being based exclusively on data from new teachers. Thus, these studies were not designed specifically to address the question of new-teacher effectiveness, but rather teacher effectiveness more generally. One study involved 3 teachers (Bullough, Knowles, & Crow, 1989); the others had sample sizes ranging from 22 schools (Farkas, Grobe, Sheehan, & Shuan, 1990) to 150,000 teachers (Ferguson, 1991). Teacher variables included years of experience, certification level, highest degree earned, ability (as measured by tests of verbal ability, general academic aptitude, and NTE scores), and race/ethnicity.

Seven studies used data gathered on teachers as part of large national surveys, including the Prospects Study of Elementary Schools (Borman & Rachuba, 1999; Rowan, Correnti, & Miller, 2002), High School and Beyond (Ehrenberg & Brewer, 1994; Harnisch, 1987), Coleman's 1966 Equality of Educational Opportunity study (Ehrenberg & Brewer, 1995), the National Educational Longitudinal Study of 1988 (Ehrenberg, Goldhaber, & Brewer, 1995; Goldhaber & Brewer, 1997), and the National Assessment of Educational Progress (Hawkins, Stancavage, & Dossey, 1998). Four used data from state systems, with two using Texas data (Ferguson, 1991; Hanushek, Kain, & Rivkin, 1998), one using Alabama data (Ferguson & Ladd, 1996), and one using data from North Carolina (Strauss & Sawyer, 1986). Three used data from a city (Hanushek, 1992, using data from the Gary Income Maintenance Experiment; Alexander, Entwisle, & Thompson, 1987, using data from Baltimore City) or school district (Farkas, Grobe, Sheehan, & Shuan, 1990). Three studies reported on job analysis studies conducted by the Educational Testing Service (Reynolds, Tannenbaum, & Rosenfeld, 1992; Rosenfeld, Reynolds, & Bukatko, 1992; Rosenfeld & Tannenbaum, 1991). One used a locally devel-

oped observation form and questionnaire (Hansen & Feldhusen, 1994). One was an interpretive case study (Bullough, Knowles, & Crow, 1989). Four were meta-analyses, published as two sets of a paper and a response. The first pair both looked at the same set of 187 production-function equations (i.e., equations used to model the relationship between educational inputs and outputs) drawn from 38 articles and books (Hanushek, 1989; Hedges, Laine, & Greenwald, 1994). The second pair looked at another set of production-function equations (Greenwald, Hedges, & Laine, 1996; Hanushek, 1996).

Our original report did not address the general question about the connection between general teacher characteristics and teaching effectiveness. While we did look at effects of characteristics (e.g., getting a master's degree or having a high test score), we only did so in the specific context of teacher subject matter preparation or pedagogical preparation. We found inconclusive results. The research reviewed for this addendum also demonstrates that researchers who have investigated characteristics of teacher effectiveness have yet to find consistent results in this arena.

While researchers are interested in many different teacher characteristics (ranging from identity and self-confidence to experience), the research we reviewed clustered around four general areas: teachers' level of education; teachers' experience; the race, gender, and ethnicity of teachers and their students; and teachers' knowledge and skill. We summarize the findings in these four domains.

Findings

✔ The results on the question of the impact of teachers' level of education on student achievement are inconsistent, and there is no clear relationship (negative or positive) between the two. (Varying outcome measures, including the Stanford Achievement Test and the Texas Educational Assessment of Minimum Skills, were used to measure student achievement. See Appendix A for information on the particular measures used in each study.) Fourteen studies (including four meta-analyses) examined the impact of teachers' level of education (e.g., proportion of teachers in a school having a master's degree). The meta-analyses found that the effect of teachers' level of education on student outcomes is inconsistent (Greenwald, Hedges, & Laine, 1996; Hanushek, 1989) or close to zero (Hanushek, 1996; Hedges, Laine, & Greenwald, 1994). Two studies found positive effects: One found having teachers with master's degrees produced higher achievement in Grades 1-7 (Ferguson, 1991); the other found a small positive effect on mathematics achievement (Ferguson & Ladd, 1996). Ehrenberg and Brewer (1994, 1995) conducted secondary analyses of two data sources, finding differential effects, depending on the race of teachers and students. Both secondary analyses found that having more teachers with an MA had a positive effect on Black students' gain scores and a negative effect for White students. Rowan, Correnti, and Miller (2002) found mixed effects: in reading, neither teachers' degree status nor certification status was related to student achievement; in mathematics, there was no effect of teacher certification on student achievement, and there was a negative relationship of teachers' advanced degrees in mathematics. The remainder of the studies found no effect on student achievement (Borman & Rachuba, 1999; Ehrenberg & Brewer, 1995; Goldhaber & Brewer, 1997; Hanushek, 1992; Harnish, 1987; Hanushek, Kain, & Rivkin, 1998) or on use of reformed teaching methods (Borman & Rachuba, 1999).

✔ The relationship between teacher experience and student achievement is also inconsistent, although more studies find positive relationships. Twelve studies looked at this issue. Seven found a positive association with regard to student achievement (Ferguson, 1991; Goldhaber & Brewer, 1997; Greenwald, Hedges, & Laine, 1996; Hanushek, 1992, 1996; Hawkins, Stancavage, & Dossey, 1998; Hanushek, Kain, & Rivkin, 1998; Rowan, Correnti, & Miller, 2002); two found no effect (Ferguson & Ladd, 1996; Hansen & Feldhusen, 1994). Some studies suggest that the benefits of teacher experience extend only to 2 years (Hanushek, Kain, & Rivkin, 1998) or 5 years (Ferguson, 1991). One study found mixed results in a reanalysis of the Coleman data (Ehrenberg & Brewer, 1995), where overall teachers' experience was positively associated with student gains, but within elementary schools, additional years of White teacher experience helped only White students; higher Black teacher experience had no effect for either group. One study found no effect of differences in experience on use of reformed teaching methods (Borman & Rachuba, 1999). These results are further expanded in our discussion of Question 2.

✔ Researchers who attempted to find relationships between teachers' general or verbal ability and student achievement have also found inconsistent results. Five studies addressed the effects of tests of teachers' verbal ability or general academic ability (e.g., as measured on college entrance examinations). Three studies found a positive association with student achievement (Ehrenberg & Brewer, 1994; Ferguson, 1991; Ferguson & Ladd, 1996); the other two found mixed results. In one study, teachers' higher word-test scores led to higher student achievement in reading but not in vocabulary

(Hanushek, 1992). In a reanalysis of the Coleman data (Ehrenberg & Brewer, 1995), effects depended on race and grade level. In elementary schools, higher verbal scores for Black teachers had a positive affect for all students, but higher verbal scores for White teachers benefited only White students. For secondary schools, higher teacher verbal aptitude (across all teachers) led to higher gain scores for White students but not for Black. In the secondary school analyses that are broken down by race of teacher, White teachers' verbal aptitude helps both groups; Black teachers' verbal aptitude helps neither.

In another study, the researchers looked at the effects of a school district's mean teacher composite National Teacher Exam (NTE) score, finding it associated with lower failure rates on a junior-year high school competency examination in North Carolina and also with higher student achievement on a state norm-referenced test, also taken by high school juniors (Strauss & Sawyer, 1986). When per capita income for those living in the district is added to the estimation equations, effects of teacher NTE scores are reduced but remain positive.

In addition to NTE scores, the measures of ability included a verbal aptitude scale used in the Coleman study (Ehrenberg & Brewer, 1995) and the selectivity of the undergraduate program the teacher attended (Ehrenberg & Brewer, 1994). One study found that teachers' scores on a basic literacy examination (the Texas Examination of Current Administrators and Teachers — TECAT), especially knowledge and skill with language, were associated with higher student achievement in both reading and math on the Texas Educational Assessment of Minimum Skills (Ferguson, 1991).

A meta-analysis found a positive association between measures of teacher quality and student achievement but did not indicate the specific measures of teacher quality that were included in the analysis (Greenwald, Hedges, & Laine, 1996).

✔ Research that investigates the effect of the racial composition of the student population and of the teaching force on student achievement has found inconsistent results as well; we found six studies that informed this issue. One found that Black teachers have lower student test scores (Goldhaber & Brewer, 1997). One found that at the high school level, the proportion of teachers in a school who are Black is positively associated with Black student gains and negatively associated with White student gains (Ehrenberg & Brewer, 1995). Another found that, on a large sample of Black students, lower student achievement was associated with having a White teacher (Hanushek, 1992). In yet another study, Ehrenberg, Goldhaber, & Brewer (1995) found that, in general, teachers' race, gender, and ethnicity did not have an effect on student gain scores. However, the researchers did find a small set of statistically significant relationships: When compared to White male teachers, Black male teachers were associated with higher history gain scores for Black and White male students as well as White female students; but they were also associated with lower reading scores for Hispanic male students. Black female science teachers were associated with higher science scores for Hispanic female and White female science students; and White female teachers were associated with lower reading and history scores for Hispanic male students but higher science scores for Hispanic female students.

A study of middle schools that looked at outcome measures other than student achievement test scores found no significant relationship between teacher ethnicity and course grades, but it found that absenteeism decreases markedly when African American students have an African American teacher and that, according to teacher reports, African American students have better work habits when they have an African American teacher (Farkas, Grobe, Sheehan, & Shuan, 1990). In another study, the researchers found a consistently negative correlation between teachers' socioeconomic status (SES) and student race. For teachers with a low-SES background, student race appeared to be irrelevant. For teachers with a high-SES background, Black or White, Black students were associated with lower judgments of school climate and lower evaluations and assessments of students along dimensions of maturity, teacher expectations, and student end-of-the-year marks and standardized test scores (Alexander, Entwisle, & Thompson, 1987).

✔ Other research has attempted to discover what knowledge and skills are particularly important for new teachers. There appears to be widespread agreement among educators about the necessary knowledge and skill, but these analyses are not tied to measures of impact (e.g., student achievement) or empirical results. The three ETS job analysis studies (Reynolds, Tannenbaum, & Rosenfeld, 1992; Rosenfeld, Reynolds, & Bukatko, 1992; Reynolds, Tannenbaum, & Rosenfeld, 1992) used literature reviews and expert ratings of assessment items to identify what areas of professional knowledge were most important for teaching. Ratings led to a narrowing of the pool of statements that would be used in the further development of a test of professional teaching knowledge. The investigators found broad agreement across the subgroups of experts (gender, experience, race/ethnicity,

school level, job category, and geographic region). In one study, experts weighted management of the learning process highest, followed by human development and the learning process, curriculum planning and design, assessment and the learning process, and professional issues related to teaching and learning. In another study (Rosenfeld, Reynolds, & Bukatko, 1992), the experts and survey respondents listed issues related to classroom management, planning instruction, and evaluating student learning and instructional effectiveness as the most important skills of the new teacher. (These findings are also included in Question 3.)

✔ An interpretive study of three beginning junior- and senior-high school teachers (Bullough, Knowles, & Crow, 1989) found that, in the researchers' judgment, the teachers had adequate theoretical knowledge about teaching and exposure to and practice of appropriate teaching skills but, when they first began to teach, lacked useful understandings of the contexts in which they would work and consistent, grounded, and accurate understandings of themselves as teachers.

We remind the reader that this addendum and the original literature review focus exclusively on what we know about teacher preparation. In large part, this was because reviewing the literature on teacher effectiveness more generally is a task in and of itself, one that deserves a separate literature review. The research we reviewed here represents only a small proportion of the research that investigates the question of teacher effectiveness more generally. Before any general conclusions can be drawn about teacher effectiveness, a more thorough review of the literature would need to be conducted.[3]

So are there any significant relationships between measures of teacher characteristics and teaching effectiveness?

Although the results are inconsistent, there appears to be a trend in the research on teacher experience and teacher effectiveness. Teachers with more experience appear to be more effective, with the important caveat that there may be a ceiling effect after 2 to 5 years of experience.

While it remains unclear how race and ethnicity factor into teacher effectiveness, there are some provocative findings that suggest that, in addition to arguing for a more diverse teaching force on moral grounds, a more diverse teaching force might also lead to higher student achievement, especially for Black students. It also appears that there might be a relationship between some measure of teacher general or verbal ability and student achievement. On the matter of teachers' level of education, the results are too mixed to hypothesize a trend.

On the issue of teacher knowledge and skill, the research we reviewed consisted solely of job analyses that were conducted with teachers, administrators, and teacher educators — all of whom have a vested interest in claiming that there is specialized knowledge that teachers need. An additional review of the literature would need to be done before we could confidently assess the status of research on teacher knowledge and skill.

Finally, it is also clear that the research suffers from at least two flaws: insufficient exploration of potentially significant interactions among teachers' and students' race, ethnicity, and socioeconomic status, as well as teachers' verbal ability; and an inconsistent use of insufficient measures of teachers' verbal ability and student achievement. There is a third problem with aggregation — the studies draw on very different data. In some cases, researchers can link individual teachers to their students (either in terms of class performance or individual student performance). Other data sets aggregate this information, and researchers work with aggregate measures of teacher characteristics and teaching effectiveness. Clearly, research that uses aggregate measures cannot be as fine-grained as research that can examine individual cases. Future research will entail the development of highly sophisticated data sets that allow for such fine-grained analyses.

Question 2. To what extent does subject knowledge contribute to the effectiveness of a teacher? Is there a significant advantage to having an advanced degree in the subject taught as opposed to a subject major? To having a subject major as opposed to a minor?

In the materials we reviewed, we found an additional 14 articles, books, and reports that spoke to this issue. Three involved analyses of data from the National Educational Longitudinal Study of 1988 (NELS: 88) (Chaney, 1995; Darling-Hammond, Berry, & Thoreson, 2001; Rowan, Chiang, & Miller, 1997). Another survey involved the

[3] Readers interested in the issue of research on teacher effectiveness might begin by examining Richardson (2001).

National Assessment of Educational Progress (NAEP; Hawkins, Stancavage, & Dossey, 1998); another the Longitudinal Study of American Youth (Monk & King, 1994); and another used the Prospects Study of Elementary Schools (Rowan, Correnti, & Miller, 2002). One involved a smaller survey locally developed (Denton & Lacina, 1984), another a national survey and interview study conducted by the National Center for Research on Teacher Education (Kennedy, 1998); and one was a meta-analysis based on 65 studies of K-12 science teachers (Druva & Anderson, 1983). In addition, several studies reported on job analysis studies conducted by the Educational Testing Service (Reynolds, 1995; Reynolds, Tannenbaum, & Rosenfeld, 1992; Rosenfeld & Tannenbaum, 1991). One interpretive study shed light on this issue (Grossman, 1990) as well as one replication study that involved a regression analysis (Eisenberg, 1977).

The Coleman study included over 570,000 students and their teachers. The sample sizes for the other surveys ranged from 30,000 students and their teachers to over 3,600 students and over 200 mathematics teachers to 82 secondary teachers. One interpretive study involved six new teachers; another focused on one 5th-year teacher education program. The job analyses involved surveys of teachers and other education professionals with sample sizes ranging from 734 to over 2,700 respondents.

The findings of our original report concerning this question were complicated and conflicting, with some studies suggesting that subject knowledge matters and others suggesting that it does not, or that it needs to be combined with pedagogical knowledge. The new research we reviewed does little to resolve this complexity.

Findings

On the matter of the relationship between undergraduate or graduate degrees and coursework, research findings vary.

✔ Some researchers found a positive relationship between teacher subject matter preparation and their effectiveness in teaching or student achievement. In their job analyses of teaching, ETS researchers found high agreement among teachers, teacher educators, and state policy makers that elementary teachers needed knowledge of reading/language arts and mathematics (Reynolds, 1995; Rosenfeld & Tannenbaum, 1991). Chaney (1995) found that students' mathematics achievement was higher for those students who had a teacher who had majored in mathematics as an undergraduate or a graduate student. Students whose teachers had taken both mathematics and mathematics education courses had higher achievement. Student achievement was also higher for students whose teachers had higher GPAs. After controlling for teacher assignment, coursework in advanced mathematics predicted student mathematics achievement, but GPA and mathematics education did not.

Using the same NELS: 88 survey data, Rowan, Chiang, and Miller (1997) found a small but statistically significant relationship between teachers' ability to answer a math item correctly and students' mathematics achievement. They found a similar relationship between students who had a teacher with a degree in mathematics and student mathematics achievement. In their analysis of the NAEP 1996 data, Hawkins, Stancavage, and Dossey (1998) found that eighth-grade students whose teachers had a college major in mathematics outperformed eighth graders whose teachers had a college major in education and students whose teachers had degrees in something other than education, mathematics education, or mathematics. In another study of teacher preparation and students' mathematics achievement, Monk and King (1994) found a small positive effect of mathematics teachers' subject matter preparation during the sophomore year for students who had scored high on a pretest. They also found a positive effect of teacher mathematics preparation on sophomore students who had low pretest scores. Finally, the researchers found a positive effect of sophomore- and junior-year mathematics teachers' subject preparation for the entire sample on 2-year gains in student mathematics achievement.

✔ But these results were not uniform. Eisenberg (1977) found no significant relationship between teachers' coursework in postcalculus mathematics courses, college mathematics courses, GPA, or scores on an algebra test and student mathematics achievement. Rowan, Correnti, and Miller (2002) found that in reading, there was no relationship between teachers' degree status and student achievement. In mathematics, they found no effects of teachers' mathematics certification on growth in student achievement, and they found that students who were taught by teachers with advanced degrees in mathematics did worse than students who were taught by teachers not having a mathematics degree. In their analyses of the NAEP 1996 data, Hawkins, Stancavage, and Dossey (1998) found that fourth graders who had a teacher with a college major in mathematics or mathematics education outperformed students whose teachers had other non-mathematics-related degrees. However, the achievement of fourth graders whose teachers had

degrees in mathematics was not significantly different than fourth graders whose teachers had education degrees.

✔ Important differences emerge as one looks across content areas. Chaney (1995) found that science students who had a teacher who had majored in science as a graduate student also had higher achievement. Chaney (1995) also found that student achievement was higher when students' teachers had taken more courses in earth and physical sciences. Druva and Anderson (1983), in a meta-analysis of research on science teachers, found that student achievement was positively related to the number of biology courses taken (for biology teachers), the number of science courses taken in general, and attendance at academic institutes. They also found that the relationship between students' cognitive outcomes and teacher education in science increases with the level of the science course. Monk and King's (1994) results were mixed. For life sciences, teachers' subject matter preparation had no significant effect on student performance, but there was a positive relationship between the subject matter preparation of physical sciences teachers in the sophomore year for students who had high pretest scores. There was a negative effect of subject matter preparation of physical sciences junior-year teachers on student achievement in science.

✔ As was the case in our original report, there is evidence to suggest that subject-specific preparation is also an important variable in teacher preparation. Grossman (1990), whose analyses were included in our original report, found that English teachers who had no teacher preparation presumed that subject matter knowledge was all one needed to plan lessons: Since they knew Shakespeare, that was sufficient for teaching Shakespeare. English majors who participated in a teacher preparation program had more success planning lessons that could reach their students and were more able to learn from their experience. Grossman's findings suggest that subject matter knowledge is a necessary but not sufficient condition for effective teaching.

Does subject knowledge matter? In the case of mathematics, there appears to be a trend: teachers with mathematics or mathematics education degrees have students who demonstrate higher levels of achievement. As was the case with teacher experience, there might also be a threshold at which more mathematics knowledge does not help teachers.

Overall, however, the relationship between content knowledge and teaching effectiveness is neither consistent nor clear. The research suggests that grade level and the specific content in question are important variables in understanding this relationship.

The gaps and weaknesses that we noted in our original report remain the same. Perhaps most notably, there are few satisfying measures of teacher subject knowledge. Researchers depend on proxies ranging from GPA to undergraduate or graduate degree majors and minors. None of these measures adequately represents teachers' subject matter preparation or subject-specific pedagogical preparation. What constitutes a major or minor in mathematics or English or biology or mathematics education or English education varies considerably across institutions. Furthermore, degree status is not equivalent to actual knowledge. Future research and development should involve heavy investment in the development of stable and reliable measures of teacher content knowledge. And, as was the case with the research on teacher characteristics, researchers need to more thoroughly investigate potentially relevant nonlinearities and interactions, including those related to specific content and grade level.

Question 3. To what extent do knowledge of pedagogical theory, learning theory, or child development contribute significantly to a teacher's effectiveness? What pedagogical knowledge is most important?

In the materials we reviewed, we found 13 articles, books, and reports that spoke to this issue. Two used data from NELS: 88 (Chaney, 1995; Darling-Hammond, Berry, & Thoreson, 2001). One used data from state teacher assessments in Georgia, Louisiana, and North Carolina and from the NTE (Cornett, 1984). Three involved a smaller survey locally developed (Denton & Lacina, 1984; McGinnis & Parker, 1999; Skipper & Quantz, 1987), another a national survey and interview study conducted by the National Center for Research on Teacher Education (Kennedy, 1998); and one was a meta-analysis based on 65 studies of K-12 science teachers (Druva & Anderson, 1983). Three studies reported on job analysis studies conducted by the Educational Testing Service (Reynolds, Tannenbaum, & Rosenfeld, 1992; Rosenfeld, Reynolds, & Bukatko, 1992; Rosenfeld & Tannenbaum, 1991). Two were interpretive case studies (Grossman, 1990; Howey & Zimpher, 1989).

The NELS: 88 database has data from 24,599 eighth-grade students and their teachers. Sample sizes from other surveys ranged from 75 to 703. One of the interpretive case studies examined six programs (Howey & Zimpher, 1989); one looked at six first-year English teachers (Grossman, 1990).

Findings

✔ When asked what knowledge and skill new teachers need to possess, there appears to be uniform agreement among educators. Two of the ETS job analysis studies (Reynolds, Tannenbaum, & Rosenfeld, 1992; Rosenfeld, & Tannenbaum, 1991) used literature reviews and expert ratings of assessment items to identify what areas of professional knowledge were most important for teaching. Ratings led to a narrowing of the pool of statements that would be used in the further development of a test of professional teaching knowledge. The investigators found broad agreement across the subgroups of experts (gender, experience, race/ethnicity, school level, job category, and geographic region). The educators weighted management of the learning process highest, followed by human development and the learning process, curriculum planning and design, assessment and the learning process, and professional issues related to teaching and learning. In another ETS study that used an identical process, experts and survey respondents agreed that knowledge and skills related to managing classrooms, planning for instruction, and evaluating student learning and instructional effectiveness were most important for the newly licensed teacher (Rosenfeld, Reynolds, & Bukatko, 1992).

✔ There are inconsistent results concerning the relationship between teacher preparation and student achievement. Two studies and a meta-analysis looked at this relationship directly. The meta-analysis (Druva & Anderson, 1983) and one study (Darling-Hammond, Berry, & Thoreson, 2001) reported a positive effect of coursework, with the latter referring specifically to differences in education training among secondary school teachers with temporary or emergency certification. The other study (Chaney, 1995) found that, once differences in teaching assignments were taken into account, there was no significant effect of teachers taking coursework in mathematics education or science education and eighth-grade student achievement in the respective fields.

✔ These inconsistent results are also found in research that investigates the relationship between teacher preparation and teacher instructional practice or competence; three publications looked at this issue. The indicator of having taken education coursework was either being an education major (as opposed to some other major) or being regularly certified (as opposed to having only temporary or provisional certification). Cornett (1984) used the NTE Common Exam, NTE specialized elementary education test, and a North Carolina state performance evaluation; Denton and Lacina (1984) used a locally developed measure. In a study of secondary-school teachers, Grossman (1990) interviewed and observed three teachers who had participated in a 5th-year teacher preparation program and three teachers who had no formal teacher preparation.

In Louisiana and North Carolina, teachers with education coursework scored lower on the NTE Weighted Common Exam, but in Louisiana they scored higher on the specialized elementary education area test (Cornett, 1984). In North Carolina, they scored higher on the performance evaluation. On the locally developed measure of instructional competency, differences between education majors and other majors were small. Denton and Lacina (1984) compared secondary education majors to other majors and found no significant difference in ratings by university supervisors of student teachers' planning effectiveness.

Grossman (1990), however, found several specific differences in how well secondary school teachers were prepared. For example, the three teachers with no formal teacher preparation felt little need to plan for teaching Shakespeare. These teachers equated subject matter preparation with planning to teach. In contrast, the three with formal teacher preparation saw planning as preparing to translate subject matter knowledge for students, a necessary step in the process of teaching. They did not presume that students would find English inherently interesting, and they focused on how to make English interesting to their students.

✔ Other researchers examined the changes in prospective teachers who enroll in teacher preparation programs more generally. It appears that teacher education students may learn to think differently about the subject matters that they teach as a result of participating in teacher education programs. Four studies examine this effect. In a study of 75 students from a dozen different programs, Kennedy (1998) found that programs differed in their substantive orientation toward writing and the teaching of writing, with some programs focused on traditional topics (e.g., classroom management) and others introducing reform ideas such as the process of writing. Based on her analysis of interviews with students at the beginning and end of these programs, Kennedy concluded that a program's substantive orientation had an impact on teachers' beliefs about writing and teach-

ing writing. Teacher education students changed their orientations in the direction of their program. Parallel results were found in a study focused on preparation for mathematics teaching (McGinnis & Parker, 1999) and in a study of general progressive attitudes toward education (Skipper & Quantz, 1987). The latter study found that education majors entered college as significantly less progressive than the arts and sciences students, but at the end of college the two groups were no longer significantly different. Among the faculty groups, education faculty were significantly more progressive than the arts and sciences faculty and cooperating teachers. Grossman (1990) found that English teachers with formal teacher preparation drew more heavily on subject-specific pedagogy, favored a process approach to writing instruction, and believed that they needed to help students make connections between their own experiences and the literature they encountered in school.

Kennedy (1998) also found that the substantive orientation of a teacher preparation program affected which students entered the program, so that the beliefs of teachers on entering the program were associated with the program's orientation. Recruitment effect is another possible explanation of the orientation differences Grossman (1990) found between teachers with and without formal teacher preparation.

✔ One interpretive study of multiple programs (Howey & Zimpher, 1989) gave general descriptions of the programs and found that program graduates generally rated the programs highly. The case study did not present data about the effectiveness of the program graduates. It did, however, present portraits of how program faculty construct teacher education programs, providing readers with concrete details about the differences in teacher preparation as a "treatment."

We concluded our original report by noting that the research on the impact of pedagogical knowledge or preparation was spotty and inconclusive. The research that we reviewed for this addendum has not led us to change that assessment. There are, however, several observations that bear noting.

First, the research reviewed here and in the original report focuses on the impact of teacher education *programs*, rather than the impact of particular teacher education *courses* or *experiences*. To thoroughly answer this question, we would need to conduct other literature reviews that searched for research on the impact of courses in child development, educational psychology, learning theory, pedagogical theory, etc. Teacher education is not a monolith: It is very different both across and within programs. It seems reasonable to then assume that the impact of teacher preparation on teacher effectiveness (measured in retention or student achievement or teacher instructional practice or knowledge) might also vary within and across programs. Further literature reviews would be in order prior to drawing conclusions about the impact of teacher preparation.[4]

Second, we suspect that even if we had had time to review all of the relevant literature on the impact of teacher preparation, the results would have remained inconclusive for at least three reasons. For one, there is little agreement on what counts as measures of "impact" or "effectiveness" for teacher preparation. Among the candidate variables are teacher retention/attrition, teacher behavior and instructional practice, teacher knowledge and skill, and student achievement. This leads to another problem: Researchers have not yet found satisfying measures for these outcomes. Much more development work is necessary to build databases that contain reliable and valid proxies for these variables.

Of particular concern is the fact that research on teacher education must tackle the issue of selection effects: What teachers learn while in a teacher education program or field experience (to be discussed in the next section) might be due entirely to program entry requirements. Without large-scale comparative studies designed to tease apart the differential effects of selection and program treatments, we are far from making any reasonable claims about the power of teacher preparation.

Finally, research on teacher preparation has not been a high national priority, and thus most research has been done locally, limiting sample sizes, as well as access to powerful instruments and methods. The research we reviewed that was published in journals dedicated to teacher education suffered several significant weaknesses. Studies were often designed to investigate one program, which seriously compromises the generalizability of any results. The meth-

[4] There are four relevant activities to note here. Currently, there are two national efforts to comprehensively review what we know about teacher preparation, one sponsored by the National Academy of Education (co-led by Linda Darling-Hammond and John Bransford, the other sponsored by the American Educational Research Association (led by Marilyn Cochran-Smith and Kenneth Zeichner). These efforts promise to add insights into the question posed here. Of special note is the fact that the AERA effort began by asking the authors of individual literature reviews to examine the criteria that we used for selecting research for the original Wilson, Floden, and Ferrini-Mundy (2001) report. The other efforts worth noting are two research efforts that are about to begin, one involving the Delta Program led by the Carnegie Foundation for the Advancement of Teaching, the other the Teachers for a New Era led by the Carnegie Corporation of New York.

ods used were often not explained thoroughly, and when quantitative measures or analyses were used, they tended to be simple descriptive statistics. While these are helpful, the field needs more comparative work that uses sophisticated analyses to tease apart issues of selection and recruitment, liberal arts and sciences impact, and program effect.

Question 4. To what extent does high-quality field-based experience prior to certification contribute significantly to a teacher's effectiveness? What are the characteristics of high-quality field-based experience? Do professional development schools exhibit these characteristics?

We begin with the question of field experience. In our original report, we found the research on field-based experience "sobering," for most of what we read focused on the typical field experience, which can be disconnected from teacher education coursework, incoherent, and reinforcing of the status quo. In the pool of nominated articles and books, we found three that spoke to the issue of field experience. Two of these studies were interpretive. One interpretive study contrasted single- versus partnership-placements in a single teacher education program (Bullough, Young, Erickson, Birrell, Clark, Egan, Berrie, Hales, & Smith, 2002); and another examined what preservice teachers learned from a service learning field experience (Malone, Jones, & Stallings, 2002). Sample sizes in those studies ranged from 21 preservice teachers to 108. One study involved a survey and comparative population study (Skipper & Quantz, 1987).

Findings

In our original review, we mainly found literature that described and critiqued traditional field experiences. The interpretive studies here help us begin to document a potential list of features of high-quality field experience.

✔ High-quality field experiences may depend on authentic, respectful relationships between K-12 and university faculty. Developing these relationships takes time, in part because university faculty and cooperating teachers might have different educational perspectives. In one study, researchers found that education faculty were significantly more progressive than either their arts and sciences colleagues or cooperating teachers (Skipper & Quantz, 1987).

✔ For some teachers and prospective teachers, working in partnership field experiences (where two student teachers work with one experienced teacher) might be more effective than single-placement teaching (Bullough, Young, Erickson, Birrell, Clark, Egan, Berrie, Hales, & Smith, 2002).

✔ Prospective teachers might benefit from participating in service-learning activities, such as school-based tutoring, as part of their field experiences (Malone, Jones, & Stallings, 2002).

There is simply not a sufficient body of literature to make claims that we know anything about the features of a high-quality field experience. While these studies might help future researchers design thoughtful research to compare the effects of various field experiences, they do not offer any definitive answers to the question of how to create and offer prospective teachers field experiences that will make them better teachers. The studies are too small, too local, and too unsophisticated in their designs or analyses to allow for any definitive claims about the characteristics of high-quality field experiences.

We also looked for research on whether professional development schools offered high-quality field experiences. Professional development schools (PDSs) were originally conceptualized by the Holmes Group (1990) — a consortium of colleges and schools of teacher education — to be schools strategically designed to support the learning of new and experienced teachers. Across the U.S., colleges and schools of education began partnerships with local schools in attempts to create these institutions. There is considerable variability as to what currently constitutes a PDS across the country, and almost all of the research on PDSs has been local and conducted by insiders.

We found nine studies that investigated questions associated with professional development schools and the impact of field experiences; four of these studies were interpretive (Brink, Grisham, Laguardia, Granby, & Peck, 2001; Bullough, Kauchak, Crow, Hobbs, & Stokes, 1997; Grisham, Laguardia, & Brink, 2000; Rock & Levin, 2002), and five involved surveys and/or comparative population studies (Cobb, 2000; Knight, Wiseman, & Cooner, 2000; Mantle-Bromley, Gould, McWhorter, & Whaley, 2000; Reynolds, Ross, & Rakow, 2002; Yerian & Grossman, 1997). Sample sizes ranged from 5 teachers more than 70.

Again, the research here is too thin to nominate patterns. However, the results might help researchers conceptualize more extensive research.

✔ Three studies found no substantial differences between graduates of different kinds of teacher preparation. In one study, no significant differences were found in a comparison with traditional teacher education graduates, graduates from a postbaccalaureate program, and graduates from a traditional program that included a semester field experience in a PDS along dimensions of employment, job satisfaction, or lesson planning and preparation (Mantle-Bromley, Gould, McWhorter, & Whaley, 2000). In another study, graduates of a PDS and non-PDS program at the same university were compared. No differences were found in retention, and principals rated the PDS graduates as higher along only two dimensions of effectiveness: sensitivity to ethnic and cultural differences and balancing the various demands of teaching. Overall, it appeared that differences in teaching effectiveness were more likely due to individual differences than to program differences (Reynolds, Ross, & Rakow, 2002). However, a significantly higher proportion of the PDS graduates reported higher satisfaction with their teacher preparation program. In a similar study, the researchers found no significant differences in how graduates of a PDS and non-PDS program felt about their own teaching effectiveness or their teacher preparation program (Sandholtz & Wasserman, 2001). However, the graduates of the PDS program did report significantly higher confidence in their own teaching ability and impact.

✔ In one interpretive study of five prospective teachers who all worked in one PDS, the researchers nominated eight factors that might contribute to a quality field experience for prospective teachers: yearlong experience in one school; clustering student teachers as a support system; offering on-site literacy methods courses; the presence of teacher study groups and action research projects in the school; enhanced supervision of student teachers by university supervisors who played multiple roles (collaborating with the steering committee, working closely with the principal, assisting teachers with the formulation of their action research project questions, and participating in the school's teacher study groups); the creation of a steering committee; providing each prospective teacher with a second field experience; and ensuring that the student teachers were treated as having equal status with their collaborating and mentor teachers (Grisham, Laguardia, & Brink, 2000).

✔ Other research suggests that PDSs might be beneficial to both prospective and practicing teachers. In one study, researchers found that preservice teachers were able to clarify their teaching theories as well as gain greater awareness of their students and greater appreciation for inquiry and reflection as the result of working in a PDS (Rock & Levin, 2002). Researchers in two studies found that practicing teachers reported an increase in the time they spent planning and reflecting, an increase in students' opportunities to engage in individualized instruction, and an improvement in the overall school collegiality (Brink, Grisham, Laguardia, Granby, & Peck, 2001; Sandholtz & Wasserman, 2001). In another study, the researcher found that PDS graduates felt more knowledgeable about middle school teaching, more knowledgeable about special education students, and more confident that they could effect student achievement, and they had more positive perceptions of their university supervisors (Yerian & Grossman, 1997). In yet another study, practicing teachers felt that prospective teachers were better prepared through their PDS experiences (Cobb, 2000).

✔ Not all informants considered PDSs a uniformly positive development. In one study, the researchers found that PDS teachers did not display changed ideas about the value of teacher education: Theory was something "done" at the university, practical experience is more important than theory, and teachers are born, not made (Bullough, Kauchak, Crow, Hobbs, & Stokes, 1997). In another study, teachers felt that their obligations to supervise prospective teachers compromised their capacity to attend to their elementary and middle school students (Brink, Grisham, Laguardia, Granby, & Peck, 2001). In that same study, some teachers worried that the prospective teachers did not cover the curriculum as well.

✔ We found only one study that investigated the impact of prospective teachers' PDS involvement on student achievement. In two investigations conducted by PDS staff at one small elementary school, the researchers found that elementary students increased their achievement in both writing and mathematics problem solving after participating in two programs that were designed by university and school faculty under the auspices of the PDS work, and implemented by the prospective teachers who worked in that school (Knight, Wiseman, & Cooner, 2000).

The sample sizes in all of these studies are limited, the results thin and inconclusive. Since little research is grounded in information about student achievement or documented

increases in teacher knowledge and skill, it is difficult to make claims about the qualities of a good field experience, or whether PDSs provide those kinds of experiences.[5]

In our original report, we concluded that there is little research-based knowledge on high-quality field experiences. This conclusion, based on reviewing the nominated research, still appears to hold. A growing number of field experiences are described in programs nominated as effective, and these are rated highly by graduates and the school administrators who hire them. The descriptions are helpful, but — as is the case with the research on teacher content knowledge and teacher preparation — we lack reliable and valid measures of impact as well as insights into what specific features of field experience are more or less effective.

Additionally, much of the research is small in scale and reported in articles that do not thoroughly explain the methods used in gathering the empirical evidence. Every study was local; no study compared field experiences across the wide array of institutions that offer teacher preparation programs. This phenomenon makes generalizing impossible at this point. Most of the research was conducted by teacher educators who are evaluating or attempting to improve their teacher preparation programs. While teacher educators have necessary knowledge of the program content — and they ought to be inquiring into the effectiveness of their own work — we must also take care to control for a conflict of interest in such cases. It was not always clear in the research how researchers controlled for this. Future research would benefit, we believe, by teacher educators establishing relationships with other researchers who might build larger-scale comparative studies.

The limitations mentioned earlier about the variability in what counts as "teacher education" apply here as well. Professional development schools are not all created equally, nor are field experiences similar nationwide. This variety poses several problems for researchers. First, researchers need to document and describe the nature of the "treatment" as they construct explicit chains of causal reasoning in explaining why a certain kind of field experience or a particular PDS experience had an impact on teacher knowledge, skill, or student achievement. Second, because field experiences and PDSs are so variable, it is difficult to imagine the development of comparative studies that use the field or PDS as the independent variable so that we might learn more about differential effects of these treatments.

Question 5. Is greater teacher effectiveness and retention in the profession more likely to be provided by 5-year teacher preparation programs than by 4-year programs? In general, is teacher attrition influenced by program model?

There is greater variety among teacher education programs than the question suggests, for there are 4-year undergraduate programs, 5-year programs that build upon or extend 4-year undergraduate programs, and there are stand-alone 5th-year postbaccalaureate programs, as well as graduate programs like the Master of Arts of Teaching (MAT). We looked for research that compared any and all of these alternatives.

Among the nominated reports was only one additional study that addressed this question. In the original review, there was one other study that addressed this question. In that study, Andrew (1990) found that graduates of 5-year programs had higher entry and retention rates than graduates of 4-year programs. Graduates of the 5-year program were more satisfied with teaching and had significantly more positive attitudes toward the program. This study, based on a comparison of two programs within one institution, is limited.

Another study involved a survey and comparative population study (Andrew & Schwab, 1995). The survey involved 1,390 graduates of 11 universities and colleges, seven of which had 5-year programs, as well as 481 principals of schools who employed these graduates.

Findings

✔ In the comparative population study, graduates of 5-year programs were significantly more likely to enter and stay in teaching and to take on professional leadership roles. No significant differences were found between graduates of 4- and 5-year programs in principals' rating of teacher effectiveness (Andrew & Schwab, 1995).

Clearly, the research base concerning the strengths or limitations of 5-year teacher preparation programs is thin, and no patterns can be discerned from one study (or two if we include the earlier study reviewed). Comparing the relative

[5] It is important to note that we did not do an extensive search for research on professional development schools (PDSs were not included in the original questions posed by the U. S. Department of Education and OERI), but we did examine 20 citations that were found in an ERIC search and that appeared to involve empirical work. Most of the work we found on PDSs either did not meet our standards for inclusion in the review or did not focus on the question: "Do PDSs provide prospective teachers with high-quality field experiences?"

merits of 5-year versus 4-year programs is an area ripe for research. Researchers would want to document program character and content, what prospective teachers learn in those programs, and what the costs and benefits are in terms of capacity and financial resources of such programs. If there are significant differences in the effectiveness of graduates of 5-year programs, researchers would need to pinpoint the causes or correlates of that impact; K-12 research has already clearly shown that more time does not necessarily lead to improved education. Because there might be substantially different populations enrolled in programs with different structures (for example, more career changers and therefore older students in stand-alone postbaccalaureate programs), future research would need to be designed to tease apart the influence of program, populations, and selection biases.

Question 6. Are there "alternative route" programs (i.e., programs that give teachers classroom assignments after 3 months or less of teaching-specific preparation) that graduate high percentages of effective new teachers with average or higher-than-average rates of teacher retention? What are the important characteristics of these programs?

In our original report, we found 13 papers based on 11 studies that addressed the question of the characteristics of high-quality alternative certification routes. In this review, we found 9 additional studies to inform this question.[6] Four involved surveys and/or comparative population analyses (Darling-Hammond, Hudson, & Kirby, 1989; Karge, Young, & Sandlin, 1992; Mantle-Bromley, Gould, McWhorter, & Whaley, 2000; Raymond, Fletcher, & Luque, 2001); one involved a two-group comparison (Hawk & Schmidt, 1989); two involved evaluations of two different alternative certification programs (Goebel, Ronacher, & Sanchez, 1989; Kane, Parsons, & Associates, 1999). One article reported on three linked studies that included a cost-benefit analysis, a follow-up study of program graduates, and a principal survey (Paccione, McWhorter, & Richburg, 2000). Sample sizes ranged from surveys of anywhere from 16 to 482 participants in a teacher preparation program to a telephone survey of coordinators of 11 programs.[7]

In our original report, we found that alternate routes had been successful in recruiting a more diverse pool of potential teachers, but that they had a mixed record for attracting the "best and the brightest." Research also suggested that important characteristics of high-quality alternative preparation programs include high standards for entry, substantial pedagogical training, high-quality mentoring, and strong evaluation components. It was unclear whether there were any significant differences between high-quality alternative and traditional teacher preparation programs.

The additional studies support those conclusions, with the exception of the claim that all alternate routes help diversify the teaching force, for which the results are more mixed in these additional reports.

Findings

✔ Alternative routes attract a more diverse group of teachers. Darling-Hammond, Hudson and Kirby (1989) found students in alternative programs were older and more likely to be a member of a minority group. She also found that they were more likely to be male than the overall teaching population, except in mathematics and science, where they were more likely to be female than the mathematics and science teaching force. Goebel, Ronacher, and Sanchez (1989) found that interns in an alternative certification program (ACP) were comparable to matched samples of experienced teachers and first-year certified teachers (FYC) on gender and ethnic/racial characteristics, except that the FYC tended to have fewer Blacks and the ACP group had more males. Hawk and Schmidt (1989) found that the NTE scores of students in an alternative preparation program were comparable to those of students in a traditional teacher preparation program at the same university. In a study that compared Teach for America (TFA) teachers with other teachers in Houston, Raymond, Fletcher, and Luque (2001) found that TFA teachers were more likely to have at least a B.A. and less likely to be a member of a minority group.

[6] We also found one recently published literature review (Zeichner & Schulte, 2001). Although the authors included several articles in their review that did not meet our criteria for quality, the conclusions the authors draw are similar to our original conclusions about the lack of much research in this area.

[7] Grossman's (1990) book was also recommended to us and we did review it for this addendum. However, because Grossman (1989) was also careful to publish her analyses in peer-reviewed journals, the analyses in her book were already integrated into our initial review.

✔ Alternative routes share much in common with traditional teacher preparation. Darling-Hammond, Hudson and Kirby (1989) found that entry into teaching and retention rates were comparable to those in the overall teaching force. Program duration, intensity, and content varied tremendously.

✔ High-quality alternative routes include high standards for entry, substantial pedagogical training, high-quality mentoring, and strong evaluation components. Darling-Hammond, Hudson and Kirby (1989) found that students in programs that had more pedagogical preparation rated their programs higher.

In addition, three studies included information on student achievement or other measures of teacher effectiveness.

✔ Findings vary as to whether graduates of alternative programs are as effective as graduates of traditional programs. One study found no difference. Goebel, Ronacher, & Sanchez (1989) found that students assigned to experienced teachers or to ACP interns with experience had slightly higher achievement than students assigned to first-year teachers and to ACP interns with little or no experience. The researchers conclude that students of ACP interns perform as well on achievement tests as do students of teachers who graduated from traditional teacher education programs. In a study in which Teach for America teachers were compared with other Houston teachers (Raymond, Fletcher, & Luque, 2001), differences in student achievement favored TFA teachers but were generally not statistically significant. However, variability in average student achievement scores was smaller for the TFA teachers than for other teachers.

However, two studies found that graduates of traditional programs were rated higher than graduates of alternative programs on classroom behaviors. Hawk and Schmidt (1989) found that prospective teachers in a traditional teacher preparation program had higher percentages of teachers rated "above standard" on four of five classroom behaviors assessed by an observation instrument than prospective teachers in an alternative teacher certification program. The four dimensions included management of time, management of students, instructional presentation, and instructional feedback. Karge, Young, and Sandlin (1992) found that ratings for graduates of traditional teacher preparation were rated higher in classroom observations than teachers who were participating in an alternative certification route.

In another set of studies, Paccione, McWhorter, & Richburg (2000) found that 87% of the graduates of an exclusive 10-month postbaccalaureate alternative program — Project Promise (PP) — got jobs, compared to 60% of an undergraduate sample and 40% of a postbaccalaureate program sample. In addition, more graduates of the alternative route completed the teacher education program, and more remained in teaching than graduates of a traditional undergraduate teacher preparation program. PP graduates' ratings were significantly higher than graduates of a postbaccalaureate program or a traditional teacher education program when asked to report of their satisfaction with how well prepared they were for classroom management, teaching diverse students, teaching strategies, and using technology (Mantle-Bromley, Gould, McWhorter, & Whaley, 2000). The only dimension along which there were no significant differences was in terms of how prepared they felt to plan lessons. Principals of PP completers rated them higher than average teachers on the same set of dimensions. In another study of PP graduates, Mantle-Bromley and her colleagues (2000) found that Project Promise graduates did better than traditional teacher education graduates or graduates of a traditional program that included PDS experience on employment variables (percent working in schools, for example).

In a 1999 evaluation of TFA corps members that involved telephone and written surveys with their principals (Kane, Parsons, & Associates, 1999), TFA corps members were valued for their motivation, enthusiasm, and education. Principals believed that TFA corps members have a strongly advantageous (63%) or moderately advantageous (33%) impact on their schools and students. The reasons for that positive impact include teaching abilities (well prepared, professional, related well to students, good teachers) and motivation (energetic, enthusiastic, dedicated). Ninety percent of principals felt that TFA corps members had positive effects on students overall and on their academic achievement. Eighty-four percent of the principals believe that by the end of the school year, TFA corps members will have led to average academic gains of at least one grade level. Over three quarters of the principals reported that corps members were thought to be "much above average" (44%) or somewhat above average (33%) when compared to other beginning teachers. Sixty-four percent of the principals felt that TFA graduates outperformed the overall teaching force in their schools.

In sum, the findings of our original report appear to remain accurate in terms of describing the research literature on alternative certification. Very little research exists

that measures the difference in effectiveness between graduates of alternative certification and traditional teacher education. That which does exist is contradictory and inconclusive, with some research suggesting that secondary teachers who have gone through traditional teacher education are better prepared, while other research suggests no significant differences between secondary teachers who went through alternative paths and their peers who went through traditional paths. And there is also some research suggesting that alternatively certified teachers are more effective.

Three serious factors contribute to our lack of knowledge. First, because alternative routes have a wide range of recruitment and selection policies, we do not know to what extent any research on their impact is due to recruitment or selection. Second, we know next to nothing about what teacher candidates actually learn in these routes, which also seriously limits our understanding of the merits and limitations of such programs. Third, there is such wide variability in what constitutes an alternative route (what the participants are taught, how long the program lasts, how much support and mentoring they receive, etc.) that it is impossible to make any generalizations about alternative programs writ large.

Question 7. Does requiring state certification for new teachers contribute significantly to the likelihood that they will be effective? What kinds of certification vehicles can provide the greatest assurance?

In the materials we reviewed, we found four studies that shed some light on this question (Ayers & Qualls, 1979; Goodlad, 1990; Hawkins, Stancavage, & Dossey, 1998; Murnane, Singer, Willett, Kemple & Olsen, 1991). We also found a recent descriptive report (Mitchell, Robinson, Plake, & Knowles, 2001) that gives current information about what state certification policies and teacher education program approval policies are currently in place but does not provide empirical evidence on their likely effectiveness that meets our criteria for inclusion in this report.

Of the four studies, one draws on a national survey data set, the 1996 National Assessment of Educational Progress (NAEP) (Hawkins, Stancavage, & Dossey, 1998). One used scores on the National Teacher Examinations Weighted Common Examinations (NTE WCE) (Ayers & Qualls, 1979). One used instruments developed for use in California (Ayers & Qualls, 1979).

One study is an interpretive study of teacher education programs, published as a book (Goodlad, 1990). In the fieldwork for the study, Goodlad and his team made visits to 29 teacher education institutions during 1987-88, spending 10-14 researcher-days per site. They used surveys for faculty and students, interviews with students, faculty, and administrators, and review of documents. The book presents results as a narrative, without any systematic attempt to present specific results from surveys or observations.

The NAEP data set is based on large samples of schools in 39 states and jurisdictions. The other survey studies report sample sizes of 200 and up.

In our original report, this question was not asked as such. We did include data from some studies that compared certified to uncertified teachers because we saw a connection to the question of the need for pedagogical preparation. Most of the studies in that report found a positive association between regular certification and student achievement, though one study (Goldhaber & Brewer, 1997) found no difference between the achievement of students who had teachers with certification and students whose teachers had temporary emergency credentials.

Findings

✔ We found one study (Murnane, Singer, Willett, Kemple, & Olsen, 1991) in which the investigators were able to take advantage of changing certification requirements to draw conclusions about the effects of differing certification requirements, in particular, the effect of requiring a minimum score on the NTE. In North Carolina, removal of the licensure requirement for a minimum NTE test score increased the number of college graduates who applied for a teaching license. Reinstatement of the requirement reduced the number of applicants. The effect was more pronounced for Blacks than for Whites. During the period in which the NTE requirement was eliminated, those licensees who nevertheless took the NTE examination (even though it was not required) were more likely to enter teaching in North Carolina within 3 years than those who did not take the exam. Among the licensees who took the NTE during the period when it was not required, those with higher scores were less likely than those with lower scores to enter teaching in North Carolina within 3 years of licensure.

✔ One way to look at the effect of certification is to examine the association between scores on tests used for certification and outcome measures. The study that looked at the association between the NTE Weighted Common Examination Total (WCET) and student achievement (Ayers & Qualls, 1979) found no significant relationship between WCET score and classroom observational data or pupil evaluations when looking across all grade levels; WCET scores were also unrelated to principals' ratings. On the positive side, the scores were linked to principals' ratings of secondary school teachers' subject matter competency. In addition, students of teachers (looking across all grades) with higher WCET scores were more responsible, confident, and alert.

✔ The results from one study found that eighth-grade students whose teachers had a teaching certificate in mathematics performed better than other eighth graders (Hawkins, Stancavage, & Dossey, 1998).

✔ In his interpretive study of teacher education programs, Goodlad (1990) believed that state attempts to dictate the curriculum of teacher education eroded curricular autonomy and lowered program quality. He did, however, see setting licensing requirements as a legitimate part of the state role. What he found "disquieting" was that states were continuing to regulate programs while increasing teacher testing.

There is no discernable pattern in the limited research we reviewed that addresses this question. In part, this is because researchers use quite different dependent measures to examine the impact of state certification. Some research finds that certification restricts the pool of candidates who choose to enter teaching; other research suggests that state certification requirements tend to lower program quality. Other research uses student achievement. Another problem that plagues this research domain is that state certification takes very different forms across states. In some contexts, it consists of a labor-intensive, high-stakes assessment. In others, state certification is a nonissue. Yet another complication is the fact that it is so difficult to disentangle teacher preparation effect from teacher certification effect.

Future research should identify a small set of proxies for impact of state certification (no single one will be sufficient) and use those systematically across studies that explore state certification in depth (we need research that clarifies the differences in the content and character of state certification) and on a large scale (we need systemic research on impact variables and on the relative impact of preparation vs. certification).

Question 8. Does the accreditation of teacher preparation programs by the National Council for Accreditation of Teacher Education (NCATE), the Teacher Education Accreditation Council (TEAC), or a state or regional accrediting agency contribute significantly to the likelihood their graduates will be effective and will remain in the classroom? What accreditation measures are likely to be most effective?

We found one study related to Question 8 that met our selection criteria. The study is an interpretive study of teacher education programs, published as a book (Goodlad, 1990). In the fieldwork for the study, Goodlad and his team made visits to 29 teacher education institutions during 1987-88, spending 10 to 14 researcher-days per site. They used surveys for faculty and students, interviews with students, faculty, and administrators, and review of documents. The book presents results as a narrative, without any systematic attempt to present specific results from surveys or observations.

Our original report included accreditation as one of the policies and strategies that might be used to improve and sustain the quality of preservice teacher education. We reported there on a large-scale survey that found a positive association between teachers' certification test scores and NCATE accreditation and gave a sketch of the results from Goodlad's study in a footnote. We did not include Goodlad's study in the main body of that report because, for that report, we were not including books. What we say here is consistent with that earlier footnote.

Findings

✔ Goodlad reported that, in higher education, teacher education is the most affected by outside forces, especially state agencies. In his view, this situation has eroded curricular autonomy of teacher preparation programs. Heads of teacher education commonly square their curricula with the most recent list of state requirements, more or less resigned to circumstances beyond their control.

✔ The current system of state dictates of teacher education curriculum has a "stultifying impact . . . on program renewal." State focus on regulation tends to lower program quality.

✔ NCATE is seen as important by regional institutions, less so for flagship and major public, major private, and liberal-arts private institutions.

Lauer (2001) notes that there were two studies in the original report that pertain to this question: Gitomer, Latham, and Ziomek (1999)[8] as well as Darling-Hammond (2000). These two reports, combined with the Goodlad study, suggest that accreditation processes might very well improve teacher preparation programs. However, the research on this issue remains thin, especially in comparing the impact of various accreditation processes (NCATE, TEAC, or state), and more research is needed before we can begin to answer this question.

Question 9. Do institutional warranties for new teachers contribute to the likelihood that new graduates of those institutions will be effective? Do teachers given remediation under those warranties demonstrate increased classroom effectiveness?

We found no research in the nominated pool on this question.

Question 10. Are there any teacher preparation strategies that are likely to increase the effectiveness of new teachers in hard-to-staff or low-performing schools? What about in urban or remote rural schools?

Among the nominated reports we were sent, we did not find any that addressed this question and met our criteria. We identified an additional pool of studies to examine by consulting preliminary lists of references identified in projects reviewing related literature. One preliminary reference list came from the work of the AERA Consensus Panel on Teacher Education, which intends to address the question, "What within-program factors influence the preparation of candidates for teaching traditionally underserved populations in various settings?" A second preliminary reference list came from the work of a project in the Center for Research on Education, Diversity, and Excellence (CREDE) that is synthesizing research related to education of diverse learners; we looked at the preliminary reference list for studies of preservice teacher education. When these two projects are completed, they may include additional studies that are relevant to this question. We found additional possibilities in the reference lists of these papers and the reference lists in review chapters, plus nominations from reviewers of our first draft of this addendum.

For this addendum, we identified 12 publications whose titles or place of publication (e.g., in *Urban Education*) suggested that they might address this question and meet our criteria; three warrant inclusion.

Of the three additional studies we reviewed, one used a survey to compare the perceptions of new teachers on the effects of four different student teaching sites within a program (Cook & Cleaf, 2000), one used classroom observations and teacher interviews to evaluate a school-university program based in an urban Houston school (Stallings, Bossung, & Martin, 1990), and the third used interviews with program participants and examination participants' reflective essays in an interpretive study of the Chicago-based Urban Education Program (UEP) (Sconzert, Iazzetto, & Purkey, 2000). The survey study had 41 respondents, the evaluation study compared 44 program participants to 25 student teachers in nonurban schools, and the interpretive study looked at 12 program participants over the course of a year.

In each of the studies, preservice students' field experiences were located in urban schools. Other than that commonality, the program features considered important varied across studies, as portrayed in the relatively brief program descriptions in these publications. The investigators in the survey study had expected a school's participation in the Comer Program to be an important factor, but the Comer schools did not differ from the other urban schools in mean responses to the three questions asked. The Houston program stressed seminars that involved both school staff and university faculty and emphasized use of structured observations as a basis for learning to teach. The Chicago program emphasized participation in the activities of a range of communities in Chicago. Thus these three studies, with modest sample sizes, are suggestive of the effects of a small set of approaches to preparing teachers for urban schools, some of which are low performing. None focuses on preparation of teachers for hard-to-staff schools or rural schools.

[8] In our original report, we failed to list all of the authors of this report. We apologize to Robert Ziomek.

Findings

✔ In all three studies, program field placements in urban schools were associated with teachers gaining knowledge, skills, or beliefs that were seen as appropriate for those urban schools. In the survey study (Cook & Cleaf, 2000), beginning teachers who had done their student teaching in an urban school reported a higher contribution of student teaching to their understanding of the sociocultural needs of students and to their preparation for working with parents from a variety of racial, ethnic, and socioeconomic backgrounds. In the evaluation of the Houston Teaching Academy (Stallings, Bossung, & Martin, 1990), the experimental program group, based in an urban school, changed on all behavioral variables measured in the observation system (reported to be based on research on effective teaching), while the nonurban control group changed on only one of the variables. The urban-based teachers had more problems with classroom management at the beginning of their student teaching (as might be expected in an urban school) but improved substantially; the nonurban group had fewer initial difficulties and showed little improvement. In the study of the Chicago-based UEP (Sconzert, Iazzetto, & Purkey, 2000), the investigators reported that students in the program changed in how they adapted instruction to fit student needs, in the value they saw in learning about their students, and in their awareness of race/ethnicity and social class as important in relationships with students.

✔ The Teaching Academy evaluation attributes its success in changing student teachers' behaviors to its emphasis on learning how to reflect on teaching practice, making use of structured observations.

One could look to other bodies of literature for ideas about what might be helpful in preparing teachers for hard-to-staff, low-performing, urban, or rural schools. One possibility is that the preparation needed for at least some of these schools is preparation built to address obstacles created by cultural or linguistic differences between teachers and students. Many articles discuss the importance of teacher education for cultural or linguistic diversity, for culturally relevant pedagogy, or for multiculturalism. Such orientations might be appropriate for hard-to-staff, low-performing, urban, or rural schools, but the connections are not often made explicit. Indeed, the discussions of teaching for diversity often argue that such preparation is appropriate for most, if not all, teaching settings. Perhaps preparation for teaching in urban schools, for example, should be the same as preparation for other schools; perhaps the best teaching practices will be applicable to those settings as well as to other settings. Better answers to the question for this section might be produced if the presumed links between preparation for diversity and preparation for these school contexts were made explicit, then investigated empirically.

Question 11. Is setting more stringent entrance requirements for teacher preparation programs or more selective prescreening of preparation program candidates likely to ensure they will be more effective?

In our original report, two studies addressed this question (Gitomer, Latham, & Ziomek, 1999; Guyton & Farokhi, 1987). Both reports suggest that raising entrance requirements (in terms of GPAs or college admissions tests) might be problematic. For example, Gitomer and his colleagues found that teacher candidates who were seeking licenses in academic areas had higher SAT and ACT scores than teachers seeking licenses in fields like elementary education. Unlike other research, which has suggested that teachers' academic ability is inferior to that of other college students, the researchers found that prospective teachers who were in academic areas had academic skills that were higher than or equal to those of other college students who did not plan to be teachers. The effects of teacher testing had a positive influence on SAT or ACT scores; that is, those who passed the PRAXIS I had higher college admissions scores than those who failed the test. When the investigators examined what would happen if admissions standards were raised based on these results, they found that, while the academic quality of prospective teachers would increase, the percentage who passed would be greatly reduced, and this would occur more so for minority test-takers. Raising admissions standards would improve the academic quality of prospective teachers but would also exacerbate already existing problems with teacher supply and minority representation in the teaching force.

We found no additional research that addressed this issue among the nominated articles and books. It is obvious — given the limited research in this field — that much more research needs to be done before policy makers can safely assume that we know how admissions standards are related to ensuring higher quality in the teaching force.

Conclusions and Recommendations Revisited

The additional research included in this addendum does not change our initial assertions about "current knowledge, gaps, and recommendations." There exists little research that persuasively answers the 11 questions posed by ECS, although there are a few discernable trends: teacher experience might matter (albeit with a threshold), and a teacher's background in mathematics (either through a mathematics degree or a mathematics education degree) might matter in terms of teaching effectiveness. Alternative routes attract a more diverse teaching pool. Other than those trends, the research is so conflicted and/or thin that we cannot confidently answer the questions.

In her secondary analysis of the original report, Lauer (2001) concludes with the following recommendations of topics for further research:

- The definition of teaching effectiveness
- The influence of K-12 standards on teacher preparation
- The effects of variations in field-based experiences
- The influence of PDSs on teaching outcomes
- The ramifications for teacher supply of 4- versus 5-year programs
- The retention of alternatively prepared teachers
- The links between certification and teaching performance
- The components of accreditation that influence teaching outcomes
- The effects of institutional warranties

She also notes that, given the current context of standards-based reform and accountability, researchers would be well advised to situate studies of teacher preparation within that context. The additional literature reviewed here does not appear to change the validity of those recommendations.

Finally, in our original report, we note the lack of consensus about measures of effectiveness and impact of teacher education. This research supports that initial assertion, and one of the obstacles to synthesizing the literature is that the measures used are significantly different. The variation can be understood along at least two dimensions:

- Impact and effectiveness are variously operationally defined as rates of teacher attrition or retention; diversity of the teaching force; changes in teacher disposition, stance, beliefs, knowledge, or skill; teacher instructional practice; and student achievement.
- The technology for measuring these variables is weak and uneven. Researchers use proxies ranging from reported college major or degree on national surveys to locally developed measures of teacher knowledge, verbal ability, or instructional effectiveness.

Thus, we would argue that, in addition to researching the topics nominated by Lauer (2001), future research activity include the following:

- A conception of impact or effectiveness of teacher preparation that includes multiple indicators. Some of the research reviewed in this addendum and in the original report indicates that teacher effectiveness might be associated with issues of race/ethnicity, academic ability, years of experience, and the like. This scenario suggests that no one indicator will be sufficient for assessing the impact of teacher preparation.
- A significant investment in the technology of research, including the development of reliable and valid measures.
- Research teams that are multidisciplinary, including both disciplinary expertise in method and theory (in economics, psychology, sociology, history, and the like), as well as practical expertise concerning the content and pedagogy of teacher preparation. We do not argue that research on teacher preparation should only be conducted by scholars who know teacher preparation intimately. However, if we believe teachers ought to know the subjects they teach, then it also seems reasonable to argue that researchers ought to know the subjects (teacher preparation, teaching) that they research.
- National investment in research in teacher preparation that would include cross-institutional studies.
- Multimethod, multisite research designs that would include both in-depth and large-scale, as well as qualitative and quantitative methodologies. These teams need to design research that systematically attends to issues of selection effects, confounded variables, context (economic, intellectual, curricular, political, socioeconomic, social), nonlinearities and interaction effects, and generalizability.

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Appendix A
Summaries of Research Included in This Addendum

Question 1. What characteristics of new teachers contribute the most to teaching effectiveness?

Alexander, Entwisle, & Thompson (1987)

School performance, status relations, and the structure of sentiment: Bringing the teacher back in

American Sociological Review, 52, 665-682

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey study

Regression analysis

The data for the study came from the Beginning School Study (BSS), a longitudinal study of first graders in Baltimore City elementary schools in the fall of 1982. Twenty schools were selected at random within strata defined by racial composition and status background. The final sample had 825 first graders in it (28 of them were repeaters and all analyses were identical when those cases were excluded from the analyses). In addition, 800 parents (most often the mother) were interviewed in the fall of 1982; 600 were re-interviewed in the summer after first grade, and first-grade teachers were asked to respond to three questionnaires. Fifty of the 56 first-grade teachers provided some information. School marks and California Achievement Test (CAT) scores were obtained from school records.

Measures included: student race (White or Black, 7 Asian-American and American Indian students were counted as White), sex, parental education (less than high school, high school, beyond high school); student marks and CAT scores; teacher race (White or Black), socioeconomic status (SES) (father's occupation when growing up); classroom climate (survey responses); student maturity (survey responses from both teachers and parents); and teacher expectations.

FINDINGS

Teachers' social origins and pupils' racial background have the most bearing on teachers' affective responses to their teaching situation and their perceptions of students. High SES teachers rated the school climate higher for White students than Black. In addition, for Black students and low SES students, high SES teachers' perceptions of those students were substantially lower than parents' evaluations. The high SES teachers also rated Black and lowest SES students lower on maturity, and hold lower expectations for their performance. Thus, using only the descriptive statistics, it appears that student race and student SES level weigh upon teachers' attitudes and evaluations, and high- and low-SES teachers react quite differently. High-SES teachers react strongly to student characteristics. Teachers' race does not appear to interact with pupil background in structuring teachers' attitudes and evaluations.

The regression predicting teachers' attitudes and evaluations showed a clear influence related to teachers' SES origin and student race. Among low SES teachers, both Black and White, there was only one significant relation: for climate responses among low SES Black teachers, there were more positive climate levels when teaching Black students. Among high SES teachers, both Black and White, 8 of the 10 coefficients involving student race were significant, and all favored Whites over Blacks. Student social background exercised little independent influence on any measure for any teacher. The researchers conclude that "pupil race strongly conditions the attitudes and evaluations of teachers from advantaged social origins, with Black students evoking more negative attitudes and performance evaluations and possibly being judged less mature than their White peers" (p. 674). Among low-SES teachers, pupil race appears to be irrelevant. When examining students' achievement in terms of marks and CAT scores, it appears that Black student performance falls short of White students' performance only in high SES teachers' classrooms. Across reading, mathematics and conduct marks, there were statistically significant differences, all negative, for student race-high teacher SES. CAT scores showed a similar trend.

Borman & Rachuba (1999)

Qualifications and professional growth of teachers in high- and low-poverty elementary schools

Journal of Negro Education, 68(3), 366-381

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey study

Data from the Congressionally mandated Prospects study

Standardized achievement scores for a national sample of 1st, 3rd, and 7th graders over 4 years, beginning in 1991.

Prospects Classroom Teacher Questionnaire (PCTQ)

N=722 teachers

Teacher qualification variables included: highest academic degree attained, years of teaching experience, certification status

Growth opportunity variables included staff collegiality, support for

innovation, teacher policy influence, and supportive inservice

Outcome measures included reformed instruction and teacher efficacy.

MANOVAs were used to examine differences among schools at different poverty levels

ANCOVAs used to examine impact of teacher qualification measures and growth opportunities

FINDINGS

Teacher qualifications — years of experience, certification, and highest degree earned — did not statistically differ by poverty level.

No main effect was found for teacher qualifications in a two by two ANCOVA for reformed instruction. No main effect was found for teacher qualifications in a two by two ANCOVA for teacher efficacy.

The authors found no differences between teachers with above- and below-average qualifications in terms of their instructional efficacy and their use of reformed instructional methods.

Bullough, Knowles, & Crow (1989)

Teacher self-concept and student culture in the first year of teaching

Teachers College Record, 91(2), 209-233

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study (interviews, observations)

Sample is three 1st-year teachers participating in a yearlong seminar.

FINDINGS

In the researchers' judgment, the teachers had adequate theoretical knowledge about teaching, exposure to and practice of appropriate teaching skills, but initially lacked useful understandings of the contexts in which they would work and consistent, grounded, and accurate understandings of themselves as teachers.

Ehrenberg & Brewer (1994)

Do school and teacher characteristics matter? Evidence from *High School and Beyond*

Economics of Education Review, 13(1), 1-17

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (regression analysis)

High School and Beyond (HSB) longitudinal study

Over 30,000 students from over 1,100 secondary schools, initially interviewed in 1980

Student outcome data includes test scores (as sophomores and 2 years later) in mathematics, vocabulary, and reading; dropping out; and family background.

Teacher variables, measured at the school level, include degree level, experience, and selectivity of undergraduate institution.

Unit of analysis is school.

FINDINGS

Having more teachers with an MA has positive effect on Black students' gain scores and a negative effect for White students.

Having teachers from more selective undergraduate programs (hence with higher aptitude) leads to higher gain scores, especially for Black students.

Ehrenberg & Brewer (1995)

Did teachers' verbal ability and race matter in the 1960s? Coleman revisited

Economics of Education Review, 14(1), 1-21

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research

Data from Coleman's 1966 Equality of Educational Opportunity study

Original study included over 570,000 students and 60,000 teachers. This reanalysis uses data from 969 elementary schools and 256 high schools.

Teacher variables include verbal aptitude, race, experience, and highest degree.

Student variables included family background and a "synthetic" gain score for achievement, computed by computing the difference between scores of students at different grade levels within a school.

Unit of analysis is school.

FINDINGS

Findings for elementary schools:

Overall, schools with higher verbal scores for teachers have higher student gains, teachers' experience is positively associated with student gains, and teacher degree level is unrelated to student gains.

The connections are more complicated when broken down by race of students and teachers. The percentage of Black teachers in a school is negatively associated with achievement gains for White students. Teacher experience affects gains only for White students. Advanced degrees have a positive effect for Black students, but a negative effect for White students. Higher verbal scores for Black teachers have a positive affect for all students; higher verbal scores for White teachers benefit only White students. Higher White teacher experience helps only White students; higher Black teacher experience has no effect for either group. Higher degree level for Black teachers raises Black gain scores; higher degree level for White teachers lowers White gain scores.

Findings for secondary schools:

Higher teacher verbal aptitude leads to higher gain scores for White students, but not for Black. White teacher verbal aptitude helps both groups; Black teachers' verbal aptitude helps neither.

Higher degree levels for Black teachers helps both groups; higher degree levels for White teachers lowers gains for White students.

The proportion of teachers in a school that are Black is positively associated with Black student gains and negatively associated with White student gains.

Ehrenberg, Goldhaber, & Brewer (1995)

Do teachers' race, gender, and ethnicity matter? Evidence from the National Educational Longitudinal Study of 1988

Industrial and Labor Relations Review, 48(3), 547-561

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey study

The initial wave of NELS: 88 included responses from 24,599 eighth graders, 22,651 parents, and 5,193 teachers at 1,035 schools.

In 1990, the second wave of data involved 18,221 tenth graders, 15,908 teachers, and 1,291 school administrators (parents were not surveyed).

Cognitive tests were administered to the students each time.

The researchers restricted their analysis to White, Black, and Hispanic students who were enrolled in public schools in both the 8th and 10th grades, who took the same subject matter area tests in both years, and for whom there was data available on teacher characteristics, school variables, and parent responses. Therefore, the final samples for this study included estimated gain score equations to ascertain whether teachers' race, gender, or ethnicity influenced student achievement for:

1,776 students who took history

2,848 students who took reading

3,029 students who took mathematics

2,445 students who took science

FINDINGS

Teacher race, gender, and ethnicity did not play an important role in how much students learned in this sample. There were some notable exceptions:

1. In comparison to White male teachers, Black male teachers are associated with higher history gain scores for Black male, White male, and White female students, but with lower reading scores for Hispanic male students

2. Back female science teachers are associated with higher science scores for Hispanic female and White female science students

3. White female teachers are associated with lower reading and history scores for Hispanic male students, but higher scores for Hispanic female students

The researchers also found that the match of teacher and student race or ethnicity was often associated with higher subjective evaluations of 10th graders by their teachers

Farkas, Grobe, Sheehan, & Shuan (1990)

Cultural resources and school success: Gender, ethnicity, and poverty groups within an urban school district

American Sociological Review, 55, 127-142

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Used school district records and a questionnaire that was sent to 7th- and 8th-grade teachers of social studies courses

Stratified random sample (according to racial composition) of 486 students in 22 middle schools.

Student background variables included gender, ethnicity, and poverty. Teacher characteristics included gender, race, and years of total teaching experience. Basic skills were measured by the Iowa Tests of Basic Skills. Coursework mastery was measured with a district-prepared curriculum referenced test (CRT). Student habits and styles were measured by absenteeism and with a Student Work Ethic Characteristics Questionnaire that was distributed to the teachers.

Regression analyses were conducted.

FINDINGS

Absenteeism decreases markedly when African American students have an African American teacher. African American students are also reported to have better work habits when they have an African American teacher.

Female teachers and more experienced teachers were associated with higher coursework mastery in their students. However, this finding disappears when specifications are changed and interactions among student characteristics and main effects of teacher characteristics are included in the analysis. Thus, the finding is not robust.

There is no significant relationship between teacher gender and ethnicity, student/teacher ethnicity interactions, and course grades.

Ferguson (1991)

Paying for public education: New evidence on how and why money matters

Harvard Journal on Legislation, 28, 465-498

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Regression analyses

Data on between 838 to 890 Texas school districts, including 2.4 million students and 150,000 teachers.

Measures include the Texas Examination of Current Administrators and Teachers (TECAT), which tests basic literacy skills. Other measures included teacher experience, number of teachers with masters' degrees, and average SAT scores for students in regional teacher education institutions. Other measures included Texas Educational Assessment of Minimum Skills (TEAMS), which was given in 1st, 3rd, 5th, 7th, 9th, and 11th grades.

FINDINGS

TECAT scores, students per teacher, experience, and masters degrees all had significant effects on student achievement. Teachers' knowledge and skill with language was the most important variable for student test scores in both reading and math. After 1st grade, teachers' TECAT scores accounted for approximately one fifth to one fourth of the variation in students' average TEAMS scores. TECAT also predicts students' average TEAMS scores over time.

Primary school teachers' TECAT passing rates have 3 times the impact on student achievement than 11th-grade teachers' TECAT passing rates.

Second most important was teacher experience. Teachers with more experience have students with higher test scores, lower dropout rates,

and higher rates of taking the SAT. Once primary school teachers have about 5 years of experience, additional years do not appear to add to their effectiveness. However, high school teachers with 9 or more years of experience produce better student test scores than their less experienced colleagues.

Masters degrees produce moderately higher scores in grades one through seven, accounting for about 5% of the variation.

Ferguson & Ladd (1996)

How and why money matters: An analysis of Alabama schools

In H. F. Ladd (Ed.), *Holding schools accountable: Performance-based reform in education* (pp. 265-298). Washington, DC: Brookings Institute

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (regression analysis)

1990-91 State data from Alabama

29,544 fourth graders in 690 schools

Teacher variables: experience, degree level, and college-admission ACT scores (available for 25% of teachers in the sample)

Student variables: reading and mathematics achievement on Stanford Achievement Test, prior-year scores on Basic Competency Test, family background

School is unit for some analyses; district for other analyses.

FINDINGS

Average teacher ACT score is positively related to student achievement, especially in reading.

Proportion of teachers with master's degrees has a small positive effect on mathematics achievement.

Proportion of teachers with at least 5 years experience had no association with student achievement.

Goldhaber & Brewer (1997)

Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity

Journal of Human Resources, 32(3), 505-23

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Gain score production function study

Data from the fist two waves of National Educational Longitudinal Study of 1988 (NELS)

24,000 eighth graders in spring 1988

18,000 of these students were surveyed again in 10th grade (spring 1990). At each survey, students took one or more content knowledge tests in mathematics, science, writing and history. The researchers focus on students who took the mathematics test in 8th and 10th grades.

Teacher variables include: gender, race/ethnicity, degree level, experience, certification.

5,149 tenth-grade students who came from 638 schools and 2,245 mathematics teachers.

FINDINGS

Individual and family background variables explain three quarters of the variation in students' 10th-grade math scores.

Findings concerning teacher characteristic variables: Students of more experienced teachers have higher scores. Female teachers have higher student test scores; Black teachers have lower student test scores.

Teachers with a BA in math or an MA in math have statistically significant impact on student achievement; teachers with a non-math BA or MA have a negative impact on student achievement. Similar results were found with teacher certification. Teachers who are certified in mathematics have higher student test scores.

Student achievement models using teacher degree (BA or MA) without specifying the subject matter of the degree shows teacher's degree as statistically insignificant. This was also true of teacher certification.

Findings concerned teacher behavior variables: Teachers who have little or no control over their teaching strategies have students with significantly lower test scores. Teaching in small groups and emphasizing problem solving appear to lower student test scores on traditional tests.

Greenwald, Hedges, & Laine (1996)

The effect of school resources on student achievement

Review of Educational Research, 66(3), 361-396

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Looks at production function studies of educational inputs and outputs.

Teacher variables examined are teacher ability (no description given of the variety of variables so classified), teacher education (possession of a master's degree and sometimes possession of course credits past a master's), and teacher experience (number of years).

Outcome variables are student achievement scores in varying subject areas.

Several different analyses, with different numbers of coefficients, were done for each outcome variable. For teacher ability, the number of coefficients ranged from 9 to 24; for teacher education from 24 to 46; for teacher experience from 20 to 68.

FINDINGS

For teacher ability and teacher experience, the results showed a statistically significant positive relationship to student outcomes.

For teacher education (i.e., possession of a master's degree and perhaps additional coursework), the results were mixed, with some analyses showing a positive relationship, some showing a negative relationship, and some showing a mix of positive and negative results.

Hansen & Feldhusen (1994)

Comparison of trained and untrained teachers of gifted students

Gifted Child Quarterly, 38(3), 115-121

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Comparative study

82 teachers (54 trained in gifted education (GTT), 28 untrained (GTU))

Teacher Observation Form

Class Activities Questionnaire

Participant Information Questionnaire

365 randomly selected students (270 from GTT rosters and 95 from GTU rosters)

MANOVA of student t tests for trained and untrained teachers.

ANOVA of grade level and training interaction effects

Pearson product moment correlations between background variables and TOF and CAQ.

FINDINGS

GTT teachers scored significantly higher than GTU teachers on TOF; elementary teachers scored significantly higher than secondary teachers.

Students rated GTT teachers significantly higher than GTU teachers on the CAQ. GTT teachers lectured less, emphasized higher order thinking more, led more discussions, and placed less emphasis on grades than GTU teachers.

There were no significant correlations between teaching skill and age, GPA, teaching experience, teaching satisfaction, or years teaching gifted students. Females scored slightly higher than males; elementary teachers scored higher than secondary teachers.

Teachers in cluster, pull out, or self-contained programs had significantly higher scores than those teaching honors courses. Teachers with more coursework and training in gifted education scored significantly higher on the TOF.

Trained teachers demonstrated greater teaching skills and developed more positive class climates.

Hanushek (1989)

The impact of differential expenditures on school performance

Educational Researcher, 18(4), 45-51,62

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Looks at production function studies of educational inputs and outputs.

The teacher variable examined is level of education.

The author found 113 production functions that estimated a coefficient for teachers' level of education.

FINDINGS

In most cases (100 out of 113), the estimated coefficients for teachers' level of education are statistically insignificant.

The statistically significant coefficients are split between positive and negative relationships, as are entire set of coefficients.

The overall conclusion is that teachers' level of education was not found to be systematically related to student educational outcomes.

Hanushek (1992)

The trade-off between child quantity and quality

Journal of Political Economy, 100(1), 84-117

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Production function analysis

Data from the 4-year Gary Income Maintenance Experiment (1971-1975)

Iowa Reading Comprehension and Vocabulary tests

1,920 students, grades 2 to 6

FINDINGS

Teachers produce similar growth across reading and vocabulary.

Teacher experience is positively related to student achievement. Degree level was not. White teachers have a significant negative impact on student achievement (the sampled students were all Black).

Teachers with a higher word test score had higher student achievement in reading, but not in vocabulary.

Hanushek (1996)

A more complete picture of school resource policies

Review of Educational Research, 66(3), 397-409

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Critique of meta-analysis reported in Greenwald, Hedges, and Laine (1996)

Teacher variables discussed are teacher education (possession of a master's degree and sometimes possession of course credits past a master's) and teacher experience (number of years).

Outcome variables are student achievement scores in varying subject areas.

Number of coefficients included in analysis is 171 for teacher education and 207 for teacher experience.

FINDINGS

Overall argument is that the Greenwald, Hedges, and Laine analysis overestimates the effects of resource variables, including the teacher variables.

A table reports, for each resource variable, the percentage of coefficients that were significantly positive, significantly negative, and statistically insignificant.

For teacher education, significant results were mixed (9% positive; 5% negative), with 86% insignificant.

For teacher experience, the significant results were predominantly positive (29% of total results significantly positive; 5% negative), with 66% insignificant.

Hanushek, Kain & Rivkin (1998)

Teachers, schools and academic achievement

(Working paper No. 6691). Cambridge, MA: National Bureau of Economic Research

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Education production analysis

Demographic information on students and teachers from Public Education Information Management System (PEIMS), the Texas Education Agency's statewide educational data base.

Texas Assessment of Academic Skills (TAAS) scores

939 schools, examination of school average achievement gains in mathematics across cohorts in 5th and 6th grade for students who attend the same school in both grades

FINDINGS

Teacher quality is an important determinant of student achievement.

Teacher turnover is strongly related to divergence in achievement patterns

New teachers' (less than 2 years experience) average student gains are significantly lower than those of more experienced teachers. There is little evidence that there is improvement in student achievement gains after the first 2 years of experience.

There is little or no evidence that a master's degree raises the quality of teaching

Harnisch (1987)

Characteristics associated with effective public high schools

Journal of Educational Research, 80(4), 233-241

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (multiple regression)

High School and Beyond (HSB)

Teacher variable: percent of teachers in a school with higher degrees

Student variables: composite achievement from verbal, mathematics, and science scores, family background.

FINDINGS

After controlling for student background and prior achievement, percent of teachers with higher degrees had no effect on student achievement.

Hawkins, Stancavage, & Dossey (1998)

School policies and practices affecting instruction in mathematics: Findings from the National Assessment of Educational Progress

(NCES 98-495). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey

National Assessment of Educational Progress, 1996

39 states and jurisdictions participated in the 1996 NAEP.

FINDINGS

Eighty-three percent of teachers of fourth-grade students have college majors in education rather than in mathematics or mathematics education. Thirteen percent of fourth-grade students were taught mathematics by a teacher with a college major in mathematics (9%) or mathematics education (4%). However, nearly one third of fourth graders were being taught mathematics by a teacher who had a mathematics teaching certificate.

Sixty-two percent of eighth-grade students had teachers with college majors in mathematics or mathematics education. Eighty-one percent were taught by teachers who had a mathematics teaching certificate.

Fourth-grade students whose teacher had a college major in mathematics education or education outperformed students whose teachers had a major in a field other than education, mathematics education, or mathematics. Fourth graders who were taught by teachers with degrees in mathematics did not outperform students taught by teachers with degrees in education.

The type of teaching certificate (mathematics, education, or other) held by the teachers of fourth graders was not related to fourth graders' scores on 1996 NAEP math assessment.

Eighth-grade students with teachers who had a college major in mathematics (average NAEP scale score of 276) outperformed students whose teachers had a college major in education (average NAEP scale score of 265) or a field other than education, mathematics education, or mathematics (average scale score of 248) on the 1996 NAEP mathematics assessment.

Eighth-grade students whose teachers had a teaching certificate in mathematics performed better than other eighth graders.

Fourth and eighth graders taught by teachers with more than 5 years of teaching experience outperformed students whose teachers had less than 5 years experience.

Teachers of eighth-grade students reported having more knowledge of the NCTM standards than teachers of fourth graders. The more knowledgeable an eighth-grade teacher reported of NCT standards, the higher their students' performance on NAEP mathematics assessment.

However, family variables explain most of the variance across state scores and gains from 1992 to 1996. State educational systems can account for some score difference across the states for students from similar families. Other things being equal, higher per-pupil expenditure, lower teacher-per-pupil ratio in lower grades, higher reported adequacy of teacher-reported resources, lower teacher turnover, and higher participation levels in public prekindergarten all show positive, statistically significant effects on NAEP achievement.

Hedges, Laine, & Greenwald (1994)

Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes

Educational Researcher, 94(3), 5-14

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Reanalysis of the studies summarized by Hanushek in his 1989 publication

This meta-analysis did a combined significance test, rather than the counting of coefficients in the original Hanushek analysis.

Teacher variable: level of education

FINDINGS

The combined test of significance indicated that some of the coefficients for teacher education were positive.

The combined test of significance indicated, but less conclusively, that some of the coefficients for teacher education were negative.

Across the studies, the estimated effect size for teachers' level of education was slightly less than zero.

Reynolds, Tannenbaum, & Rosenfeld (1992)

Beginning teacher knowledge of general principles of teaching and learning: A national survey

(RR. 92-60, ERIC Document 385 570). Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Job analysis study to document the content validity of Praxis II

Literature reviews

External Review Panel of teachers, administrators, teacher educators, and state department officials

Advisory Development Committee

Survey: Job Analysis Inventory

64 items in five domains: human development and the learning process, curriculum planning and design, management of the learning process, assessment and the learning process, and professional issues related to teaching and learning. (N=734)

FINDINGS

Sixteen of the 64 statements were rated below the cut point of 2.50 by one or more subgroups of respondents.

All of the correlations in ratings were in the .90s, suggesting that there is relative agreement about the ratings across subgroups (gender, experience, race/ethnicity, school level, job category, and geographic region).

Respondents weighted management of the learning process highest (27.52 mean percent weight, SD= 9.38), followed by human development and the learning process (20.90 mean percent weight, SD= 8.97), curriculum planning and design (20.35, SD= 7.25), assessment and the learning process (19.41, 6.50), and professional issues related to teaching and learning (11.95, 5.86).

Rosenfeld, Reynolds, & Bukatko (1992)

The professional functions of elementary school teachers

(RR. 92-53) The Praxis Series: Professional Assessments for Beginning Teachers. Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three job analyses were conducted in order to provide evidence for the content validity of new performance assessments (The Praxis Series: Professional Assessments for Beginning Teachers) to be developed by the Educational Testing Service.

Each study had two parts: expert panels who established an inventory of tasks, and a national survey to solicit the judgments of professionals concerning those tasks.

The sample for the survey included 3,602 teachers, 125 administrators, and 232 teacher educators.

FINDINGS

The expert panels generated a list of over 80 tasks, that were then clustered along six dimensions: planning and preparing for instruction, managing the classroom, implementing instruction, evaluating student learning and effectiveness, administrative responsibilities, and additional responsibilities. Then a survey was sent to various education professionals, asking them to rate the tasks in terms of importance for their own work and for the newly licensed teacher.

Findings for the elementary study: Fifty percent or more of the respondents judged all tasks to be performed by the newly licensed teacher. There was high agreement among the judges, with most correlations between groups to be in the .90s. Fifty-three of the 85 tasks met the 3.50 eligibility standard. The most important tasks were to be found in planning and preparing for instruction, managing the classroom, implementing instruction, and evaluating student learning and instructional effectiveness. The 10 highest rated tasks included establishing classroom rules and procedures, monitoring student in-class behavior, monitoring and adjusting classroom activities, managing classroom time effectively, encouraging desired student outcomes, discouraging undesirable student behavior, using motivational techniques and activities, facilitating student learning and encouraging effort, providing opportunities to apply learning, and enhancing student confidence and self-esteem.

Findings for the middle and secondary school job analyses (not summarized in this report) were very similar. Forty-four of the 77 tasks presented to the respondents in the middle school survey met the 3.50 standard. Fifty-seven of the 87 tasks in the secondary school survey met the same standard.

Rosenfeld & Tannenbaum (1991)

Identification of a core of important enabling skills for the NTE Successor Stage I examination

(ERIC Document 384 661). Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Job analysis study

Literature reviews

Interviews with relevant informants

Committees of content experts

Survey to practicing teachers (N=2,269); state officials (N=289); and a supplemental group of Black and Hispanic teachers (N=236)

FINDINGS

A total of 134 enabling skills statements were developed, reviewed, and pilot tested. The statements clustered in six dimensions: reading, writing, mathematics, listening, speaking, and interactive communication.

Twenty-one of the 134 enabling statements were judged to be of little or no importance. All three respondent groups and all teachers (regardless of gender, school setting or level, subject taught, or geographic region) agreed on the relative importance of the enabling skills. One hundred thirteen enabling skills were judged as important or very important.

Rowan, Correnti, & Miller (2002)

What large-scale survey research tells us about teacher effects on student achievement: Insights from the Prospects Study of Elementary Schools

Teachers College Record

(RR.051) Philadelphia, PA: CPRE Publications

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three-level, cross-classified, random effects model was used to analyze data on two cohorts of students in the Prospects data

Presage variables: special certification in reading or mathematics, BA in English or mathematics, and teacher experience

In mathematics, for the cohort beginning in first grade, N=5,454 in 1,422 classrooms across 3 years in 138 schools. For the cohort beginning in third grade, N=5,926 students in 1,378 classrooms in 164 schools.

In reading, for the cohort beginning in first grade, N=6,053 students in 2,033 classrooms in 152 schools. For the cohort beginning in third grade, N=6,153 students in 1,713 classrooms in 166 schools.

FINDINGS

Only 6% of the teachers in the sample had either special certification or BAs in English or mathematics.

The researchers used a three-level linear hierarchical model of students' growth in academic achievement. In reading, neither teachers' degree status or teachers' certification status had significant effects on student achievement growth, but teacher experience did (d=.07 at early grades, d=.15 in later grades). In mathematics, teacher certification had no effect, and there was a positive effect of teachers' experience status on student achievement growth in mathematics, but only for the later grades (d=.18). Students taught by a teacher with an advanced degree in mathematics did worse than students who were taught by a teacher not having a mathematics degree (d=-.25).

Strauss & Sawyer (1986)

Some new evidence on teacher and student competencies

Economics of Education Review, 5(1), 41-48

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (regression analysis)

Data on 145 North Carolina school districts in 1977-78

Teacher variables: mean teacher composite NTE score for a district

Student variables: failure rate on state high school competency exam taken in junior year, average achievement on the state Norm Referenced Achievement Test taken in junior year, family background, including per capita income

FINDINGS

Higher average teacher NTE scores are associated with lower student failure rates in both reading and mathematics.

Higher average teacher NTE scores have a positive, but smaller effect on mean student achievement on the Norm Referenced Achievement Test.

When per capita income is added to the estimation equations, effects of teacher NTE scores are reduced, but remain positive.

Question 2. To what extent does subject knowledge contribute to the effectiveness of a teacher? Is there a significant advantage to having an advanced degree in the subject taught as opposed to a subject major? To having a subject major as opposed to a minor?

Chaney (1995, May)

Student outcomes and the professional preparation of eighth-grade teachers in science and mathematics

Unpublished manuscript. Prepared for NSF Grant RED-9255255. Rockville, MD: Westat, Inc.

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (cross tabulation and multiple regression)

1988 cross-sectional data from the National Longitudinal Study of 1988 (NELS:88), including teacher transcripts

24,599 eighth-grade students and their teachers

Teacher variables include highest degree, types of courses teachers took in subject area and in science and mathematics education, and teachers' GPA in subject area.

Student variables include achievement on NELS:88 proficiency exams.

FINDINGS

Teacher's highest degree was not systematically related to student achievement.

Student mathematics achievement was higher for those with a teacher who majored in mathematics as an undergraduate or graduate student.

Student science achievement was higher for those with a teacher who majored in science as a graduate student.

In mathematics, teachers with low GPAs and little background in both advanced mathematics and mathematics education were less likely to treat algebra as a major topic. In science, no such pattern existed for courses taken, but teachers with low GPAs were less likely to treat chemistry and atomic theory as major topics.

In mathematics, student achievement was higher when teachers had taken both higher mathematics courses and mathematics education courses. Achievement was also higher for teachers with higher GPAs.

In science, student achievement was higher when teachers had more courses in earth and physical sciences. Achievement was also higher for teachers with higher GPAs.

After controlling for differences in teacher assignments, background in advanced mathematics courses predicted student achievement, but GPA and mathematics education did not. Teacher GPA and having taken over 40 credits in earth and physical science predicted student achievement, but background in science education did not.

Darling-Hammond, Berry, & Thoreson (2001)

Does teacher certification matter? Evaluating the evidence

Educational Evaluation and Policy Analysis, 23(1), 57-77

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (regression analysis)

National Educational Longitudinal Study of 1988 (NELS:88)

Teacher variables: degree level, major, certification type, state

Student variables: NELS test scores and family background

FINDINGS

Most teachers who held temporary or emergency certification have qualifications resembling those of teachers with standard certification.

Among these teachers, those who have more education training appear to do better in producing student achievement.

Denton & Lacina (1984, Spring)

Quantity of professional education coursework linked with process measures of student teaching

Teacher Education and Practice, 39-46

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey and comparative population study (non-parametric sign tests)

Eighty-two secondary-level student teachers: 55 education majors and 27 students seeking teacher certification while majoring in other fields. Education majors had 12 more semester hours (34 vs. 22) of education coursework than majors in other subjects.

Locally developed rating scales used by university supervisors to rate student teachers' instructional competencies, personal and professional competencies, and planning effectiveness for two curriculum units.

FINDINGS

No significant difference between education majors and other majors in ratings of planning effectiveness.

Between-group differences in ratings of instructional competency were small.

Druva & Anderson (1983)

Science teachers' characteristics by teacher behavior by student outcome: A meta-analysis of research

Journal of Research in Science Teaching, 20(5), 467-479

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Meta-analysis based on 65 studies of K-12 US science teachers: 52 studies were dissertations, 11 journal articles, and 2 were unpublished articles.

Teacher variables included demographic variables, education, experience, knowledge, and personality variables.

Student outcomes included a variety of achievement, performance, and attitude measures.

FINDINGS

Student achievement was positively related to the number of biology courses taken (for biology teachers), the number of science courses taken, and attendance at academic institutes.

Student attitude toward science was positively related to the number of science courses taken.

Student outcomes are positively associated with preparation in education and academic work generally.

The relationship between teachers' training in science and cognitive student outcome increases with the level of science course.

Ehrenberg & Brewer (1994)

Do school and teacher characteristics matter? Evidence from *High School and Beyond*

Economics of Education Review, 13(1), 1-17

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (regression analysis)

High School and Beyond (HSB) longitudinal study

Over 30,000 students from over 1,100 secondary schools, initially interviewed in 1980

Student outcome data includes test scores (as sophomores and 2 years later) in mathematics, vocabulary, and reading; dropping out; and family background.

Teacher variables, measured at the school level, include degree level, experience, and selectivity of undergraduate institution.

Unit of analysis is school.

FINDINGS

Having more teachers with an MA has positive effect on Black students' gain scores and a negative effect for White students.

Having teachers from more selective undergraduate programs (hence with higher aptitude) leads to higher gain scores, especially for Black students.

Ehrenberg & Brewer (1995)

Did teachers' verbal ability and race matter in the 1960s? Coleman revisited

Economics of Education Review, 14(1), 1-21

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research

Data from Coleman's 1966 Equality of Educational Opportunity study

Original study included over 570,000 students and 60,000 teachers. This reanalysis uses data from 969 elementary schools and 256 high schools.

Teacher variables include verbal aptitude, race, experience, and highest degree.

Student variables included family background and a "synthetic" gain score for achievement, computed by computing the difference between scores of students at different grade levels within a school.

Unit of analysis is school.

FINDINGS

Findings for elementary schools:

Overall, schools with higher verbal scores for teachers have higher student gains, teachers' experience is positively associated with student gains, and teacher degree level is unrelated to student gains.

The connections are more complicated when broken down by race of students and teachers. The percentage of Black teachers in a school is negatively associated with achievement gains for White students. Teacher experience affects gains only for White students. Advanced degrees have a positive effect for Black students, but a negative effect for White students. Higher verbal scores for Black teachers have a positive affect for all students; higher verbal scores for White teachers benefit only White students. Higher White teacher experience helps only White students; higher Black teacher experience has no effect for either group. Higher degree level for Black teachers raises Black gain scores; higher degree level for White teachers lowers White gain scores.

Findings for secondary schools:

Higher teacher verbal aptitude leads to higher gain scores for White students, but not for Black. White teacher verbal aptitude helps both groups; Black teachers' verbal aptitude helps neither.

Higher degree levels for Black teachers helps both groups; higher degree levels for White teachers lowers gains for White students.

The proportion of teachers in a school that are Black is positively associated with Black student gains and negatively associated with White student gains.

Eisenberg (1977)

Begle revisited: Teacher knowledge and student achievement in algebra

Journal for Research in Mathematics Education, 8(3), 216-222

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Replication study

Regression analysis

N=28 junior high school teachers

Teachers took the Algebra Inventory Form B examination in fall 1973

Teacher variables included: Algebraic Inventory Form B scores, years of experience, number of postcalculus mathematics courses, and college mathematics courses GPA

Their students (N=807) had taken two examinations in the fall: one authored by the investigator, the other the Mathematics Inventory examination. 715 students took the Mathematics Inventories III and IV in the spring.

Grades and other standardized test scores were taken from student school records.

FINDINGS

No relationship was found between teacher variables and student achievement. The researcher concludes that teacher subject matter knowledge had little effect of student achievement.

An unexpected finding was that students of teachers who had attended NSF institutes in 1970 had more initial mathematical knowledge than students of teachers who did not attend.

Ferguson & Ladd (1996)

How and why money matters: An analysis of Alabama schools

In H. F. Ladd (Ed.), *Holding schools accountable: Performance-based reform in education* (pp. 265-298). Washington, DC: Brookings Institute

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research (regression analysis)

1990-91 State data from Alabama

29,544 fourth graders in 690 schools

Teacher variables: experience, degree level, and college-admission ACT scores (available for 25% of teachers in the sample)

Student variables: reading and mathematics achievement on Stanford Achievement Test, prior-year scores on Basic Competency Test, family background

School is unit for some analyses; district for other analyses.

FINDINGS

Average teacher ACT score is positively related to student achievement, especially in reading.

Proportion of teachers with master's degrees has a small positive effect on mathematics achievement.

Proportion of teachers with at least 5 years experience had no association with student achievement.

Grossman (1990)

The making of a teacher: Teacher knowledge and teacher education

New York: Teachers College Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

Case studies of six first-year English teachers, three who entered teaching with no formal preparation, three who had graduated from the same teacher education program

Interviews with and observations of the teachers

Interviews with and observations of the teacher preparation program

FINDINGS

The three teachers who had no formal teacher preparation felt little need to plan for teaching Shakespeare: All felt confident because they were knowledgeable about Shakespeare. All equated subject matter preparation with planning to teach. In addition to relying on their subject matter knowledge, all three of the teachers relied on their own experiences as K-12 and university students (what Lortie has called their "apprenticeship of observation").

The three teachers with teacher preparation entered teacher preparation with different views of English as a discipline, but they all shared a similar set of beliefs and knowledge about teaching English. They agreed that they needed to help students make connections between their own experiences and the literature they encountered in school. They all agreed that they needed to use a process-oriented approach to the teaching of writing. While they drew on their previous subject matter knowledge and apprenticeship of observation (like the other teachers), they drew more heavily on the knowledge that they acquired in the subject-specific teacher preparation coursework they had taken. They all saw planning as preparing to translate subject matter knowledge for students; they all thought that planning was a necessary step in the process of teaching. They did not (unlike the teachers with no preparation) presume that students would find English inherently interesting, and they focused on how to make English interesting to their students, and how to link the content to the students' lives through instructional scaffolding.

The teachers varied in their conceptions of English as a school subject. Two believed that the central purpose of English was to engage in literary criticism, others felt that the central purpose was to help students express themselves in writing. Some saw the text as central in literary analysis, others saw using texts so that students could explore their own lives as central. Some placed emphasis on the text, others place emphasis on students' experiences. Two of the students with no teacher preparation based their conceptions of English teaching on their undergraduate experiences. Two of the teachers with teacher preparation credited their curriculum and instruction teacher education courses with their knowledge and beliefs about the content and purpose of teaching English.

Two of the teachers without teacher preparation emphasized the mastery of forms of writing and grammar in the teaching of writing. The other four teachers emphasized the need to help students express their ideas before helping students master technical aspects of writing.

The teachers planned curriculum in different ways depending on their conceptions of English.

The teachers who did not go through teacher preparation learned that they could not teach English at the level that they had learned it in college. However, they also had troubled learning from their experience. They lacked frameworks for making sense of their experiences with students. They presumed that they would only teach students like themselves — motivated. Two of the three non-teacher preparation teachers decided to leave teaching. The teacher preparation teachers made sense of their experiences with students by noting patterns, and were able to adjust their curricula based on those experiences. The teacher preparation teachers also presumed that they would teach a broad array of students, and did not assume that all students needed to be like they had been in high school or college.

The curriculum and instruction coursework in the teacher preparation program appeared to impact the participants' knowledge and beliefs about teaching English. Four features seemed critical: a coherent vision of teaching and learning was presented and ran throughout the coursework; there was a collaborative relationship between the prospective teachers, their supervisors, and the professor; material was presented in a scaffolded way that allowed prospective teachers to

develop their understanding over time and supported the development of a reflective stance; and the coursework presumed a developmental perspective on learning to teach.

Kennedy (1998)

Learning to teach writing: Does teacher education make a difference?

New York: Teachers College Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Longitudinal survey and interview study

Report based on the Teacher Education and Learning to Teach (TELT) study.

Data from 75 students from a dozen teacher education programs, five of which were preservice programs.

Data also collected on faculty in these programs.

Variables were teacher education student and faculty beliefs about writing and about teaching writing.

Data collected through interviews in which teachers were asked to interpret and respond to a series of hypothetical classroom situations.

FINDINGS

Programs differed in substantive orientation, with some focused on traditional topics (e.g., classroom management) and others introducing reform ideas such as the process of writing.

The substantive orientation of the program had an impact on teachers' beliefs about writing and teaching writing.

The substantive orientation of programs also affected what students entered the program, so that the beliefs of teachers on entering the program were associated with the orientation of the program.

Hawkins, Stancavage, & Dossey (1998)

School policies and practices affecting instruction in mathematics: Findings from the National Assessment of Educational Progress

(NCES 98-495). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey

National Assessment of Educational Progress, 1996

39 states and jurisdictions participated in the 1996 NAEP.

FINDINGS

Eighty-three percent of teachers of fourth-grade students have college majors in education rather than in mathematics or mathematics education. Thirteen percent of fourth-grade students were taught mathematics by a teacher with a college major in mathematics (9%) or mathematics education (4%). However, nearly one third of fourth graders were being taught mathematics by a teacher who had a mathematics teaching certificate.

Sixty-two percent of eighth-grade students had teachers with college majors in mathematics or mathematics education. Eighty-one percent were taught by teachers who had a mathematics teaching certificate.

Fourth-grade students whose teacher had a college major in mathematics education or education outperformed students whose teachers had a major in a field other than education, mathematics education, or mathematics. Fourth graders who were taught by teachers with degrees in mathematics did not outperform students taught by teachers with degrees in education.

The type of teaching certificate (mathematics, education, or other) held by the teachers of fourth graders was not related to fourth graders' scores on 1996 NAEP math assessment.

Eighth-grade students with teachers who had a college major in mathematics (average NAEP scale score of 276) outperformed students whose teachers had a college major in education (average NAEP scale score of 265) or a field other than education, mathematics education, or mathematics (average scale score of 248) on the 1996 NAEP mathematics assessment.

Eighth-grade students whose teachers had a teaching certificate in mathematics performed better than other eighth graders.

Fourth and eighth graders taught by teachers with more than 5 years of teaching experience outperformed students whose teachers had less than 5 years experience.

Teachers of eighth-grade students reported having more knowledge of the NCTM standards than teachers of fourth graders. The more knowledgeable an eighth-grade teacher reported of NCT standards, the higher their students' performance on NAEP mathematics assessment.

However, family variables explain most of the variance across state scores and gains from 1992 to 1996. State educational systems can account for some score difference across the states for students from similar families. Other things being equal, higher per-pupil expenditure, lower teacher-per-pupil ratio in lower grades, higher reported adequacy of teacher-reported resources, lower teacher turnover, and higher participation levels in public prekindergarten all show positive, statistically significant effects on NAEP achievement.

Monk & King (1994)

Multilevel teacher resource effects on pupil performance in secondary mathematics and science: The role of teacher subject-matter preparation

In R. G. Ehrenberg (Ed.), *Contemporary policy issues: Choices and consequences in education* (pp. 29-58). Ithaca, NY: ILR Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (regression analysis)

Longitudinal Study of American Youth (LSAY)

51 randomly selected school sites; base sample of 2,829 students; selected localities nationwide

Teacher survey about number of undergraduate and graduate courses in mathematics, life science, and physical science.

Student achievement measured by selected NAEP items.

FINDINGS

Found small positive direct effect of mathematics teachers' subject matter preparation during sophomore year for high pre-test students.

Looking at 2-year gain, positive effect of subject matter preparation of sophomore year mathematics teacher for low pre-test students.

Positive effect of sophomore- and junior-year mathematics teachers' subject matter preparation for whole sample where the gain in performance is measured over 2 years.

For life sciences, teachers' subject matter preparation had no significant effect on student performance.

For physical sciences, positive effect of subject matter preparation of sophomore-year teacher for high pre-test students.

For physical sciences, negative effect of subject matter preparation of junior-year teacher.

For physical sciences, the mean level of subject matter preparation for teachers in the school had a positive effect on the performance of low-pretest students.

For life sciences, a high level of variability in subject matter preparation of teachers in the school had a positive effect for high-pretest students, but a negative effect for low-pretest students.

Reynolds (1995)

The knowledge base for beginning teachers: Education professionals' expectations versus research findings on learning to teach

Elementary School Journal, 95(3), 199-221

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Content validity studies/Survey:

Inventory of the Professional Functions of Elementary School Teachers

Inventory of General Principles of Teaching and Learning

Inventory of Knowledge of Education in the Elementary School Form 1 (content)

Knowledge of Education in the Elementary School Form 2 (content-specific pedagogy)

Description of Enabling Skills for Teachers

Draft inventory of important teacher knowledge and skill was developed and then reviewed by and External Panel and an Advisory/Test Development Committee.

Inventories were then turned into surveys and sent to teachers, teacher educators, and administrators.

Analysis of means and correlations.

FINDINGS

Teaching Tasks Study:

Eighty-five elementary school teaching tasks were administered. Respondents judged 62% of the tasks between moderately important (3.0 on a Likert scale) and extremely important (5.0). More important tasks were clustered in categories: planning and preparing for instruction, managing the classroom, implementing instruction, and evaluating student learning and instructional effectiveness.

All of the 10 highest ranking tasks were also judged to be significant on an effectiveness scale (four points ranging from 0 (does not differentiate at all) to 4 (differentiates well)). Three of the highest rated tasks were: (a) encourage a variety of critical thinking skills, (b) facilitate student learning, and (c) enhance student confidence and self-esteem.

The opportunity to learn scale was also a 3 point scale (0 = not at all, 3 = to a great extent). Teacher educators report that their teacher preparation programs provide opportunities to learn the tasks that were judged the most important. Six of the highest ranked teaching tasks that teacher educators reported they provide opportunities to learn were preparing lesson plans, using a variety of instructional approaches, writing instructional objectives, enhancing student confidence, using motivational strategies, and encouraging appropriate student behavior.

Teachers, teacher educators, and administrators expect new teachers to perform most of the tasks that experienced teachers perform.

The Study of General Principles of Teaching and Learning:

Seventy-five percent of the knowledge statements were rated between moderately important (2) and very important (4). The most important knowledge statements were clustered in the domain of Management of the Learning Process. Among the top 10 rated knowledge statements were how to select motivational techniques, different disciplinary styles, repertoire of teaching strategies, relationships of learn characteristics to teaching techniques, student affective development, how to structure lessons based on objectives, how to structure evaluation plans, and creating a climate for learning.

Most of the lowest-rated knowledge statements concerned curriculum design and planning, as well as professional issues, including social and historical events that influence curricular planning, roles of professional organizations, and political issues.

The Study of Content and Content-Specific Pedagogical Knowledge:

Seventy-two percent of the knowledge statements on Form 1 (content of the elementary curriculum) were rated between moderately important (2) and very important (4). The most highly-rated items were clustered in traditional content areas (language arts, mathematics, reading, etc.). Among the highest-rated items were motivational strategies in reading, language arts, literature, and mathematics; methods for teaching mathematics; teaching strategies for language arts and mathematics; and teaching strategies for science.

Low-rated items included knowledge statements about problems in student work in the arts, common student misconceptions about the arts, instructional technologies in physical education, student errors in the arts that may result from cultural dialect or language differences, principles of linguistics, and standardized assessments in the arts.

Study of Enabling Skills:

Eighty-four percent of the enabling skills were judged between moderately important (3) and extremely important (5). The highest-rated areas were in writing and speaking, including determining main ideas, using a table of contents, performing computations, locating important ideas, and organizing ideas.

Seven of the lowest-rated areas included using a formula to determine length; recognizing style; interpreting range, variance, and standard deviation; using examples from the history of math; and recognizing relationships among variables.

Rosenfeld & Tannenbaum (1991)

Identification of a core of important enabling skills for the NTE Successor Stage I examination

(ERIC Document 384 661). Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Job analysis study

Literature reviews

Interviews with relevant informants

Committees of content experts

Survey to practicing teachers (N=2,269); state officials (N=289); and a supplemental group of Black and Hispanic teachers (N=236)

FINDINGS

A total of 134 enabling skills statements were developed, reviewed, and pilot tested. The statements clustered in six dimensions: reading, writing, mathematics, listening, speaking, and interactive communication.

Twenty-one of the 134 enabling statements were judged to be of little or no importance. All three respondent groups and all teachers (regardless of gender, school setting or level, subject taught, or geographic region) agreed on the relative importance of the enabling skills. One hundred thirteen enabling skills were judged as important or very important.

Rowan, Chiang, & Miller (1997)

Using research on employees' performance to study the effects of teachers on students' achievement

Sociology of Education, 70, 256-284

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey (regression analysis)

National Education Longitudinal Study of 1988 (NELS: 88) and NELS first follow-up

Subsample of 5,381 students attending 410 schools (382 public schools and 28 Catholic schools)

Teacher variables included score on a single-item math quiz and undergraduate and graduate major.

Student variables included score on 10th-grade mathematics test, course taking, and background variables.

FINDINGS

Teachers who correctly answered the math item had a small, but statistically significant effect on student achievement.

Teachers with a degree in mathematics had a small, but statistically significant effect on student achievement.

Rowan, Correnti, & Miller (2002)

What large-scale survey research tells us about teacher effects on student achievement: Insights from the Prospects Study of Elementary Schools

Teachers College Record

(RR. 051) Philadelphia, PA: CPRE Publications

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three-level, cross-classified, random effects model was used to analyze data on two cohorts of students in the Prospects data

Presage variables: special certification in reading or mathematics, BA in English or mathematics, and teacher experience

In mathematics, for the cohort beginning in first grade, N=5,454 in 1422 classrooms across 3 years in 138 schools. For the cohort beginning in third grade, N=5,926 students in 1,378 classrooms in 164 schools.

In reading, for the cohort beginning in first grade, N=6,053 students in 2,033 classrooms in 152 schools. For the cohort beginning in third grade, N=6,153 students in 1,713 classrooms in 166 schools.

FINDINGS

Only 6% of the teachers in the sample had either special certification or BAs in English or mathematics.

The researchers used a three-level linear hierarchical model of students' growth in academic achievement. In reading, neither teachers' degree status or teachers' certification status had significant effects on student achievement growth, but teacher experience did (d=.07 at early grades, d=.15 in later grades). In mathematics, teacher certification had no effect, and there was a positive effect of teachers' experience status on student achievement growth in mathematics, but only for the later grades (d=.18). Students taught by a teacher with an advanced degree in mathematics did worse than students who were taught by a teacher not having a mathematics degree (d=-.25).

Question 3. To what extent does knowledge of pedagogical theory, learning theory, or child development contribute significantly to a teacher's effectiveness? What pedagogical knowledge is most important?

Chaney (1995, May)

Student outcomes and the professional preparation of eighth-grade teachers in science and mathematics

Unpublished manuscript. Prepared for NSF Grant RED-9255255. Rockville, MD: Westat, Inc.

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (cross tabulation and multiple regression)

1988 cross-sectional data from the National Longitudinal Study of 1988 (NELS:88), including teacher transcripts

24,599 eighth-grade students and their teachers

Teacher variables include highest degree, types of courses teachers took in subject area and in science and mathematics education, and teachers' GPA in subject area.

Student variables include achievement on NELS:88 proficiency exams.

FINDINGS

Teacher's highest degree was not systematically related to student achievement.

Student mathematics achievement was higher for those with a teacher who majored in mathematics as an undergraduate or graduate student.

Student science achievement was higher for those with a teacher who majored in science as a graduate student.

In mathematics, teachers with low GPAs and little background in both advanced mathematics and mathematics education were less likely to treat algebra as a major topic. In science, no such pattern existed for courses taken, but teachers with low GPAs were less likely to treat chemistry and atomic theory as major topics.

In mathematics, student achievement was higher when teachers had taken both higher mathematics courses and mathematics education courses. Achievement was also higher for teachers with higher GPAs.

In science, student achievement was higher when teachers had more courses in earth and physical sciences. Achievement was also higher for teachers with higher GPAs.

After controlling for differences in teacher assignments, background in advanced mathematics courses predicted student achievement, but GPA and mathematics education did not. Teacher GPA and having taken over 40 credits in earth and physical science predicted student achievement, but background in science education did not.

Cornett (1984)

A comparison of teacher certification test scores and performance evaluations for graduates in teacher education and in arts and sciences in three Southern states

A final report submitted by the Southern Regional Education Board to the National Endowment for the Humanities in partial fulfillment of Grant OP-20102-83. Unpublished manuscript. (ERIC Document ED 243 882). Atlanta: Southern Regional Education Board

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey and comparative population study (t-tests)

Three related studies of teachers in Georgia, Louisiana, and North Carolina. Sample sizes of 703, 229, and 292. (A fourth study was not included because differences in samples made interpretation difficult.)

Teacher variables included scores on the Georgia Teacher Certification Test, scores on the National Teacher Examinations (Weighted Common Examinations and Area Examinations), scores on the North Carolina Teacher Performance Appraisal Instrument, scores on a local district teacher evaluation instrument, type of certification (regular or temporary/provisional), and years of experience

FINDINGS

Scores on the Georgia Teacher Certification Test (a measure of content knowledge in teaching field reflecting the curriculum in Georgia schools) were more dependent on level (i.e., bachelor's vs. master's) than on program (i.e., education degree vs. arts and science degree). Arts and science graduates score slightly higher than teacher education graduates at the bachelors' level; that is reversed at the masters' level.

On the NTE Weight Common Exam (which is weighted for professional education content), temporarily certified new teachers in Louisiana (including those with no education coursework) scored higher than regularly certified new teachers. For the more specialized elementary education area test, regularly certified teachers scored higher.

In North Carolina, no difference in performance evaluations was found between provisionally certified (arts and science graduates) and regularly certified teachers. NTE Weighted Common scores were slightly higher for the provisionally certified group.

Darling-Hammond, Berry & Thoreson (2001)

Does teacher certification matter? Evaluating the evidence

Educational Evaluation and Policy Analysis, 23(1), 57-77

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (regression analysis)

National Educational Longitudinal Study of 1988 (NELS:88)

Teacher variables: degree level, major, certification type, state

Student variables: NELS test scores and family background

FINDINGS

Most teachers who held temporary or emergency certification have qualifications resembling those of teachers with standard certification.

Among these teachers, those who have more education training appear to do better in producing student achievement.

Denton & Lacina (1984, Spring)

Quantity of professional education coursework linked with process measures of student teaching

Teacher Education and Practice, 39-46

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey and comparative population study (non-parametric sign tests)

Eighty-two secondary-level student teachers: 55 education majors and 27 students seeking teacher certification while majoring in other fields. Education majors had 12 more semester hours (34 vs. 22) of education coursework than majors in other subjects.

Locally developed rating scales used by university supervisors to rare student teachers' instructional competencies, personal and professional competencies, and planning effectiveness for two curriculum units.

FINDINGS

No significant difference between education majors and other majors in ratings of planning effectiveness.

Between-group differences in ratings of instructional competency were small.

Druva & Anderson (1983)

Science teachers' characteristics by teacher behavior by student outcome: A meta-analysis of research

Journal of Research in Science Teaching, 20(5), 467-479

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Meta-analysis

Meta-analysis based on 65 studies of K-12 US science teachers: 52 studies were dissertations, 11 journal articles, and 2 were unpublished articles.

Teacher variables included demographic variables, education, experience, knowledge, and personality variables.

Student outcomes included a variety of achievement, performance, and attitude measures.

FINDINGS

Student achievement was positively related to the number of biology courses taken (for biology teachers), the number of science courses taken, and attendance at academic institutes.

Student attitude toward science was positively relared to the number of science courses taken.

Student outcomes are positively associated with preparation in education and academic work generally.

The relationship between teachers' training in science and cognitive student outcome increases with the level of science course.

Grossman (1990)

The making of a teacher: Teacher knowledge and teacher education

New York: Teachers College Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

Case studies of six first-year English teachers, three who entered teaching with no formal preparation, three who had graduated from the same teacher education program

Interviews with and observations of the teachers

Interviews with and observations of the teacher preparation program

FINDINGS

The three teachers who had no formal teacher preparation felt little need to plan for teaching Shakespeare: All felt confident because they were knowledgeable about Shakespeare. All equated subject matter preparation with planning to teach. In addition to relying on their subject matter knowledge, all three of the teachers relied on their own experiences as K-12 and university students (what Lortie has called their "apprenticeship of observation").

The three teachers with teacher preparation entered teacher preparation with different views of English as a discipline, but they all shared a similar set of beliefs and knowledge about teaching English. They agreed that they needed to help students make connections between their own experiences and the literature they encountered in school. They all agreed that they needed to use a process-oriented approach to the teaching of writing. While they drew on their previous subject matter knowledge and apprenticeship of observation (like the other teachers), they drew more heavily on the knowledge that they acquired in the subject-specific teacher preparation coursework they had taken. They all saw planning as preparing to translate subject matter knowledge for students; they all thought that planning was a necessary step in the process of teaching. They did not (unlike the teachers with no preparation) presume that students would find English inherently interesting, and they focused on how to make English interesting to their students, and how to link the content to the students' lives through instructional scaffolding.

The teachers varied in their conceptions of English as a school subject. Two believed that the central purpose of English was to engage in literary criticism, others felt that the central purpose was to help students express themselves in writing. Some saw the text as central in literary analysis, others saw using texts so that students could explore their own lives as central. Some placed emphasis on the text, others place emphasis on students' experiences. Two of the students with no teacher preparation based their conceptions of English teaching on their undergraduate experiences. Two of the teachers with teacher preparation credited their curriculum and instruction teacher education courses with their knowledge and beliefs about the content and purpose of teaching English.

Two of the teachers without teacher preparation emphasized the mastery of forms of writing and grammar in the teaching of writing. The other four teachers emphasized the need to help students express their ideas before helping students master technical aspects of writing.

The teachers planned curriculum in different ways depending on their conceptions of English.

The teachers who did not go through teacher preparation learned that they could not teach English at the level that they had learned it in college. However, they also had troubled learning from their experience. They lacked frameworks for making sense of their experiences with students. They presumed that they would only teach students like themselves — motivated. Two of the three non-teacher preparation teachers decided to leave teaching. The teacher preparation teachers made sense of their experiences with students by noting patterns, and were able to adjust their curricula based on those experiences. The teacher preparation teachers also presumed that they would teach a broad array of students, and did not assume that all students needed to be like they had been in high school or college.

The curriculum and instruction coursework in the teacher preparation program appeared to impact the participants' knowledge and beliefs about teaching English. Four features seemed critical: a coherent vision of teaching and learning was presented and ran throughout the coursework; there was a collaborative relationship between the prospective teachers, their supervisors, and the professor; material was presented in a scaffolded way that allowed prospective teachers to develop their understanding over time and supported the development of a reflective stance; and the coursework presumed a developmental perspective on learning to teach.

Howey & Zimpher (1989)

Profiles of preservice teacher education: Inquiry into the nature of programs

Albany, NY: State University of New York Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Observational case studies

6 case studies of teacher preparation programs that sampled from (a) schools of education in major research universities, (b) state universities that emphasized teaching over research, and (c) smaller liberal arts schools. All in the Midwest.

Document analysis

Interviews with and observations of teacher education programs

FINDINGS

Descriptions of six teacher education programs

Different conceptions of teaching ran across the different programs, from a competency-based conception grounded in behavioral psychology to the notion of a liberally educated person conception.

Field experiences also varied across institutions.

Faculty ethos across the institutions was characterized by a sense of pride, an ethic of hard work, collegiality, and caring for the students.

The programs were characterized by:

1. Clear conceptions of teaching, schooling, and learning
2. Faculty coalesced around programs with particular emphases or that were experimental
3. Programs were considered both reasonable and clear
4. Programs are rigorous and academically challenging
5. The curriculum is characterized by themes that tie together courses and experiences
6. There is a reasonable balance between general knowledge, pedagogical knowledge, and experiences designed to develop pedagogical knowledge and skill.
7. Several programs had student cohorts
8. The programs took an interdisciplinary or integrative approach to the curriculum of teacher preparation
9. Students encountered benchmark or milestone experiences
10. The curriculum was paced appropriately and there was sufficient "life space" for prospective teacher learning and development
11. Programs had adequate curriculum materials, resources, information and communication technologies, and a well conceptualized laboratory component.

The study was not designed to document the effectiveness of these program characteristics. The study focused on documenting the perceptions of the participants in the programs.

Kennedy (1998)

Learning to teach writing: Does teacher education make a difference?

New York: Teachers College Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Longitudinal survey and interview study

Report based on the Teacher Education and Learning to Teach (TELT) study.

Data from 75 students from a dozen teacher education programs, five of which were preservice programs.

Data also collected on faculty in these programs.

Variables were teacher education student and faculty beliefs about writing and about teaching writing.

Data collected through interviews in which teachers were asked to interpret and respond to a series of hypothetical classroom situations.

FINDINGS

Programs differed in substantive orientation, with some focused on traditional topics (e.g., classroom management) and others introducing reform ideas such as the process of writing.

The substantive orientation of the program had an impact on teachers' beliefs about writing and teaching writing.

The substantive orientation of programs also affected what students entered the program, so that the beliefs of teachers on entering the program were associated with the orientation of the program.

McGinnis & Parker (1999)

Teacher candidates' attitudes and beliefs about subject matter and pedagogy measured throughout their reform-based mathematics and science teacher preparation program

(ERIC Document 433 341). Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey study

September 1995- October 1997 teacher candidates in a reform-based program (that was being implemented at multiple institutions) periodically completed the Attitudes and Beliefs about the Nature and the Teaching of Mathematics and Science questionnaire (37 Likert scale items). The subscales were beliefs in the nature of mathematics and science, attitudes towards mathematics and science, beliefs about the teaching of mathematics and science, attitudes toward using technology to teach mathematics and science, and attitudes towards teaching mathematics and science.

In this study, the researchers analyze the responses of students at five institutions on seven occasions. The sample sizes for those seven occasions were 96, 61, 57, 64, 48, 72, and 51.

FINDINGS

The researchers report on how teacher candidates' attitudes and beliefs about mathematics and science changed over 3 years.

Over the 3 years, teacher candidates' attitudes and beliefs on all of the subscales improved and became more aligned with the vision of mathematics and science presented in reform documents. Changes in teacher candidates' attitudes and beliefs were statistically significant for the subscales measuring beliefs abour the nature of mathematics and science, beliefs about teaching mathematics and science, and attitudes towards mathematics and science ($p<.05$).

Reynolds, Tannenbaum, & Rosenfeld (1992)

Beginning teacher knowledge of general principles of teaching and learning: A national survey

(RR. 92-60, ERIC Document 385 570). Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Job analysis study to document the content validity of Praxis II

Literature reviews

External Review Panel of teachers, administrators, teacher educators, and state department officials

Advisory Development Committee

Survey: Job Analysis Inventory

64 items in five domains: human development and the learning process, curriculum planning and design, management of the learning process, assessment and the learning process, and professional issues related to teaching and learning. (N=734)

FINDINGS

Sixteen of the 64 statements were rated below the cut point of 2.50 by one or more subgroups of respondents.

All of the correlations in ratings were in the .90s, suggesting that there is relative agreement about the ratings across subgroups (gender, experience, race/ethnicity, school level, job category, and geographic region).

Respondents weighted management of the learning process highest (27.52 mean percent weight, SD= 9.38), followed by human development and the learning process (20.90 mean percent weight, SD= 8.97), curriculum planning and design (20.35, SD= 7.25), assessment and the learning process (19.41, 6.50), and professional issues related to teaching and learning (11.95, 5.86).

Rosenfeld, Reynolds, & Bukatko (1992)

The professional functions of elementary school teachers

(RR. 92-53). The Praxis Series: Professional Assessments for Beginning Teachers. Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three job analyses were conducted in order to provide evidence for the content validity of new performance assessments (The Praxis Series: Professional Assessments for Beginning Teachers) to be developed by the Educational Testing Service.

Each study had two parts: expert panels who established an inventory of tasks, and a national survey to solicit the judgments of professionals concerning those tasks.

The sample for the survey included 3,602 teachers, 125 administrators, and 232 teacher educators.

FINDINGS

The expert panels generated a list of over 80 tasks, that were then clustered along six dimensions: planning and preparing for instruction, managing the classroom, implementing instruction, evaluating student learning and effectiveness, administrative responsibilities, and additional responsibilities. Then a survey was sent to various education professionals, asking them to rate the tasks in terms of importance for their own work and for the newly licensed teacher.

Findings for the elementary study: Fifty percent or more of the respondents judged all tasks to be performed by the newly licensed teacher. There was high agreement among the judges, with most correlations between groups to be in the .90s. Fifty-three of the 85 tasks met the 3.50 eligibility standard. The most important tasks were to be found in planning and preparing for instruction, managing the classroom, implementing instruction, and evaluating student learning and instructional effectiveness. The 10 highest rared rasks included establishing classroom rules and procedures, monitoring student in-class behavior, monitoring and adjusting classroom activities, managing classroom time effectively, encouraging desired student outcomes, discouraging undesirable student behavior, using motivational techniques and activities, facilitating student learning and encouraging effort, providing opportunities to apply learning, and enhancing student confidence and self-esteem.

Findings for the middle and secondary school job analyses (not sum-

marized in this report) were very similar. Forty-four of the 77 tasks presented to the respondents in the middle school survey met the 3.50 standard. Fifty-seven of the 87 tasks in the secondary school survey met the same standard.

Rosenfeld & Tannenbaum (1991)

Identification of a core of important enabling skills for the NTE Successor Stage I examination

(ERIC Document 384 661). Princeton, NJ: Educational Testing Service

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Job analysis study

Literature reviews

Interviews with relevant informants

Committees of content experts

Survey to practicing teachers (N=2269); state officials (N=289); and a supplemental group of Black and Hispanic teachers (N=236)

FINDINGS

A total of 134 enabling skills statements were developed, reviewed, and pilot tested. The statements clustered in six dimensions: reading, writing, mathematics, listening, speaking, and interactive communication.

Twenty-one of the 134 enabling statements were judged to be of little or no importance. All three respondent groups and all teachers (regardless of gender, school setting or level, subject taught, or geographic region) agreed on the relative importance of the enabling skills. One hundred thirteen enabling skills were judged as important or very important.

Skipper & Quantz (1987)

Changes in educational attitudes of education and arts and science students during four years of college

Journal of Teacher Education, 38(3), 39-44

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (longitudinal design analyzed using ANCOVA with pre-test as covariate)

Complete data on 45 education majors and 63 arts and sciences majors from a Midwestern university. Data also collected from 43 education faculty, 92 arts and sciences faculty, and 77 cooperating teachers.

Education Scale, developed by other investigators in a prior study to measure progressive vs. traditional attitudes toward teaching and learning.

FINDINGS

Education majors entered college as significantly less progressive than the arts and sciences students, but at the end of college the two groups were no longer significantly different.

Among the faculty groups, education faculty were significantly more progressive than the arts and sciences faculty and cooperating teachers.

Question 4. To what extent does high-quality field-based experience prior to certification contribute significantly to a teacher's effectiveness? What are the characteristics of high-quality field-based experience? Do professional development schools exhibit these characteristics?

Brink, Grisham, Laguardia, Granby, & Peck (2001)

Who needs student teachers?

Action in Teacher Education, 23(3), 33-45

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

The study was conducted in one elementary and one middle school professional development school (PDS)

The student population is largely middle class, with little racial or ethnic diversity among the 800 students. The teacher education program (Master's in Teaching, MIT) lasts for 15 months and is heavily field-based. Fifty students enroll in the program every year, and their field placements begin on the first day of school in September, culminating in 10 weeks of full-time student teaching in the spring.

Five student teachers are clustered in each of the two PDSs that were involved in this study. All 10 of the student teachers in these two PDSs volunteered to participate in a research project.

Interviews with student teachers, their cooperating teachers, and the school principals. Biweekly observations of each student teacher for the year

Work samples for each student teacher participant, including journal entries and children's work. Each student teacher completed an action research project, the final report of which was also used as data for this investigation.

FINDINGS

The researchers found that mentor teachers felt that the presence of the student teachers had an impact on their work lives. They spent more time planning, they reflected more on their teaching, and they experienced an increase in their sense of self efficacy. They also reported learning more about new instructional materials, strategies, and skills. Children experienced increased opportunities for individualized instruction, and an enhanced curriculum since the student teachers often introduced new projects and activities into the curriculum through their teacher education coursework assignments. The presence of the student teachers also appeared to have an impact on the school in general: school climate was impacted through the presence of the student teachers, the school-university partnership, and the positive aspects of the PDS. The student teachers' action research projects also had a positive impact on school activities which included things like creating a student-generated school newspaper focused on test-

taking skills, literature response circles, making literacy connections at home, and evaluating a commercial spelling program. The very presence of the student teachers led to schoolwide discussions among the mentor teachers, their colleagues, and the principal. These discussions increased communication and camaraderie in the entire school.

There were also several negative effects reported, including the observation that student teachers might not cover the same amount of material as their mentors would have, the need to attend to the student teachers' needs drew mentors' attention off of the curriculum and children, and mentor teachers reported feeling some isolation from their colleagues as they spent more and more time with their student teachers.

Bullough, Kauchak, Crow, Hobbs, & Stokes (1997)

Professional development schools: Catalysts for teacher and school change.

Teaching and Teacher Education, 13(2), 153-169

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

The study involved seven PDSs that have had a 5-year involvement with the University of Utah.

Forty-nine interviews. Six or seven faculty and administrators at each school were interviewed about school demographics, PDS successes and failures, and how the idea of a PDS played out in their particular schools. The schools ranged in size from 500 children to over 2,200, and from working class urban with high population diversity to middle class suburban with low population diversity.

FINDINGS

The researchers focused on three questions: "How do PDSs influence teacher professional development and schools? Do teachers' views of teacher education shift as a consequence of participating in PDS activities? What contextual variables influence the development of PDSs and their effectiveness?"

The researchers found moderate teacher change. At five schools, teachers appeared to become more reflective. At four schools, teachers reported that they had changed their practice as a result of working with teacher candidates whose new ideas rejuvenated their instruction. The PDS teachers did not display changed ideas about the value of teacher education: Theory was something "done" at the university; practical experience is more important than theory; and teachers are born, not made. Furthermore, the participating teachers had relatively simplistic notions of what a PDS was. School change was more variable, and school size appeared to be a critical variable whether or not a school changed. In the elementary schools, school change appeared to happen most often around Cooperative Master's degree program projects. Principal leadership and turnover also appeared to have varying effects on school change. Teacher burnout with the program was also a factor, and in the small schools with fewer teachers, the teachers grew weary of the extra demands of working with the candidate teachers. Finally, teachers in urban schools with high risk students remained unconvinced that the PDS concept was appropriate for those settings.

Bullough, Young, Erickson, Birrell, Clark, Egan, Berrie, Hales, & Smith (2002)

Rethinking field experience: partnership teaching versus single-placement teaching

Journal of Teacher Education, 53(1), 68-80

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

The researchers investigated the impact of single placements (one student teacher with one mentor teacher) versus partnership placements (two preservice teachers with one mentor teacher). Partner and mentor relationships were assigned randomly. The study involved 21 preservice teachers (12 in partner placements and 9 in single placements) and 18 mentor teachers.

Interviews with student teachers and mentors

Time logs of preservice teachers' activities

Preservice teacher and mentor planning sessions were audiotaped and transcribed.

FINDINGS

For the single placement teachers, the mentor teachers were not very engaged while the preservice teachers were teaching. Roles were clearly differentiated with preservice teachers teaching and mentors correcting papers for preparing for lessons. Preservice teachers taught the curriculum laid out by the mentor. The preservice teachers saw themselves as fitting into the expectations and classroom of the mentor. Preservice teacher-mentor relationships were quite formal.

For the partner-placement teachers, the mentors and preservice teachers tended to plan together with a great deal of interaction and support. Partner-placement teachers were more engaged in planning. The preservice teachers saw themselves as supporting one another: They became emotionally and professionally involved with one another. The mentor teacher both suggested curricular topics and gave the preservice teachers feedback on their teaching. All of the preservice teachers liked working with a partner. The partner-placement teachers felt they had more control over both what they taught and how they taught. Partner-placement teachers experienced more roles: They worked with small groups more and assisted individual students more.

Cobb (2000)

The impact of professional development school on preservice teacher preparation, inservice teachers' professionalism, and children's achievement: Perceptions of inservice teachers.

Action in Teacher Education, 22(3), 64-76

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey

The research took place in one PDS, an elementary school in Texas that was part of the Texas Education Agency's Centers for Professional Development and Technology grants.

The school had 620 students, grades K-6, and was 76% Caucasian with 33% of the student population economically disadvantaged.

Thirty five inservice teachers were surveyed to assess the attitudes and opinions of the faculty who had participated in the PDS activities. The researchers aimed to determine the impact of the PDS on children, preservice teachers, and practicing teachers' professionalism.

Likert scale survey (1 = strongly disagree to 5 = strongly agree) was administered to all participating teachers (N=35) in the school at the end of the 3rd year of involvement (78% response rate) and again at the end of the 4th year of involvement (61% response rate).

FINDINGS

The researchers found that while the teachers thought the PDS effort had had a positive impact on students, they were unsure of the impact on students' standardized test scores. The respondents did believe that the PDS effort had a positive impact on new teacher preparation: 57% strongly agreed with the claim that their program graduates were better prepared than other new teachers in the 3rd year, 70% in the 4th year. The teachers felt that their participation in the PDS had a positive impact on teacher professionalism, although they did not report changing their beliefs or instruction based on their participation in the PDS activities.

Grisham, Laguardia, & Brink (2000)

Partners in professionalism: Creating a quality field experience for preservice teachers

Action in Teacher Education, 21(4), 27-40

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study of five prospective teachers and their mentor teachers

The central question of the research was: What is a quality field experience in a professional development school?

The research was conducted on the Master's in Teaching (MIT) program, a 15-month, full-time master's program, which includes summer coursework, and a year of field experiences combined with additional coursework.

Five female prospective teachers who all worked in one PDS

Three interviews with each teacher

Journals kept by the teachers and their university supervisors

Systematic observations of the student teachers (using either fieldnotes or videotaping)

Action research projects were conducted by all of the participants and those too were used as data.

FINDINGS

Eight factors that the researchers believe contribute to a quality field experience for prospective teachers include: yearlong experience in one school; clustering student teachers as a support system; offering on-site literacy methods courses; the presence of teacher study groups and action research projects in the school; enhanced supervision of student teachers by university supervisors who played multiple roles (collaborating with the steering committee, working closely with the principal, assisting teachers with the formulation of their action research project questions, and participating in the school's teacher study groups); the creation of a steering committee; providing each prospective teacher with a second field experience; and ensuring that the student teachers were treated with having equal status with their collaborating and mentor teachers.

Knight, Wiseman, & Cooner (2000)

Using collaborative teacher research to determine the impact of professional development school activities on elementary students' math and writing outcomes

Journal of Teacher Education, 51(1), 26-38

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three studies: two studies that compared student achievement, and one interpretive study

The research took place in an elementary PDS where up to 200 university students per week were involved in preservice and inservice professional development at the school.

Two programs were investigated in the study: Writing Buddies and Math Buddies. In the Writing Buddies program, 150 prospective teachers from the university were trained to help elementary students with their writing. The training involved both a lecture by a university instructor on the college campus, laboratories with elementary teachers from the PDS in their classrooms, and a one-hour laboratory during which prospective teachers worked with small groups of elementary students and helped them with their writing. In Math Buddies, 40 preservice teachers attended a mathematics methods class, which was co-taught by a university faculty member and nine practicing teachers who had collaboratively designed an integrated mathematics-science-technology curriculum. The preservice teachers also worked with 2nd, 3rd, and 4th graders in the PDS, facilitating the use of computer programs for problem solving.

The researchers conducted three studies. In the first study, 750 elementary school students were asked to write on a common topic in the fall, before participating in the Writing Buddies program. In the spring, after participating in the program, students were asked to write to another common topic. Practicing and prospective teachers were trained to score the writing using a rubric that was developed by the research team in collaboration with teachers at the school. All raters had to achieve an interrater reliability score of 85% or higher to participate in the activity.

In the second study, researchers and teachers developed a test to measure students' progress on solving mathematics problems. Two hundred eighty-four elementary school students took the test at the beginning of the year and at the end of the year.

In a third study, teachers interviewed participants in the two programs about the results from the first and the second study.

FINDINGS

In the first study, researchers found, using multivariate and univariate analyses of variance, that students scored higher after their participation in Writing Buddies. Differences in elaboration at all grades levels except for second grade, and differences in mechanics for the first and second graders accounted for the majority of the differences. Effect sizes were calculated and showed that first graders had the greatest gains. Second, third, and fourth graders had more modest gains. The state criterion referenced test was also administered to all

third graders in the fall and the spring, and student mastery of the writing portion of the test rose from 77% to 90%.

In the study of mathematical problem solving, researchers found, using tests for correlated samples, that students scored higher at every grade level after participating in Math Buddies program with preservice teachers ($p<.01$). Student achievement on the state criterion-referenced test also improved: For the third and fourth graders prior to participating in the program, mastery rates on the state test were 70% and 64%; after the Math Buddies program, the mastery rates were 77% and 79%. Interviews with the participants attributed student test score increases to the PDS activities.

Malone, Jones, & Stallings (2002)

Perspective transformation: Effects of a service-learning tutoring experience on prospective teachers

Teacher Education Quarterly, 29(1), 61-81

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

College undergraduates enrolled in a private university in North Carolina (N=108) who were enrolled in one of three introductory teacher education courses. The students all participated in a service-learning activity that required tutoring local school children.

Data included structured essays written by the students at the beginning and end of each course, as well as an end-of-semester questionnaire.

FINDINGS

Themes across the essays clustered into four areas: perspectives on identity and personal development (clarification of career and life goals, personal growth, increased confidence); perspectives on teaching and learning (learning course concepts, awareness of learning from tutee, more holistic view of learning, changed perspective on teaching and teachers, application of course concepts); perspectives on service and responsibility to community (awareness of positive influence on tutee, valuable insights into the "real world", stronger connection to community; and personal satisfaction.

Students reported that the service learning experience helped them to learn more about educational issues, gain increased mastery over the conceptual material in the course, develop empathy with school children, and develop more tolerance and patience. Students developed new perspectives on teaching, learning, responsibility to the community, and education.

Mantle-Bromley, Gould, McWhorter, & Whaley (2000)

The effect of program structure on new teachers' employment and program satisfaction patterns

Action in Teacher Education, 22(1), 1-14

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey and comparative population study (ANOVA)

Population: graduates from three options within a university's teacher education program: a traditional program; Project Promise (PP) — an exclusive, relatively expensive 10-month postbaccalaureate program; and a version of the traditional program with an added one-semester PDS experience, intended to achieve some of the advantages of the PP model at lower cost.

Surveys were completed by 42% of the population: 247 from the traditional program, 75 from the PDS program, and 40 from the PP program.

Variables included employment patterns, job satisfaction, and program satisfaction.

FINDINGS

For the employment variables (percent working in schools, percent employed full time), the PDS program performed better than the traditional program, but not as well as the PP program. The differences between the PDS program and the other two programs were not statistically significant.

For those employed full time, the three samples did not differ significantly from one another in responses to the job satisfaction questions.

PP ratings were significantly more positive that traditional program ratings in classroom management and technology. PDS ratings were in the middle, not significantly different from either of the other two programs.

The PP program received higher program satisfaction ratings than either the PDS or traditional programs in diversity and teaching strategies.

There were no significant differences among the programs in ratings of lesson planning preparation.

Reynolds, Ross, & Rakow (2002)

Teacher retention, teaching effectiveness, and professional preparation: A comparison of professional development school and non-professional development school graduates

Teaching and Teacher Education, 18(3), 289-303

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Comparative population telephone survey study

Researchers investigated the questions: How do PDS and non-PDS graduates compare in terms of retention in teaching? According to school principals, how proficient are the graduates of the PDS and non-PDS programs? How satisfied were the teachers with their PDS or non-PDS teacher preparation?

The researchers compared graduates of a PDS and non-PDS experience at George Mason University. The PDS program involved three semesters, including a summer of coursework and field experiences followed by a year-long internship. The non-PDS teacher preparation program included two 7-week student teaching experiences, and coursework spread over five semesters.

Telephone and written surveys. Two written surveys were used: one for graduates of the programs and one for their supervising principals.

The sample for the 10-minute telephone survey included 80 teachers who had graduated from the PDS or non-PDS programs in 1996 or

1998, which was approximately 42% of the entire population of graduates.

Written surveys were sent to 70 of the teachers who had been interviewed (and who were willing to respond to the survey). The response rate for the written survey was 51% (N=36).

A written survey was then sent to the principals of graduates who were currently teaching in public schools and who had responded to the telephone survey. The response rate for the principal survey was 55% (56 out of a sample of 64).

Qualitative analyses were conducted on the telephone interview data, and descriptive statistics, chi-square analyses, and analyses of variance were conducted on the written survey data.

FINDINGS

Phone surveys indicated that 85% of the PDS and non-PDS graduates were teaching, and that a quarter of them were teaching in George Mason University partnership schools. The primary reason for not teaching was so that graduates could be at home with small children. Most of the graduates intended to stay in teaching (95% of the PDS graduates, 74% of the non-PDS graduates). Most of the graduates also intended to stay in the schools where they were currently teaching (76% PDS, 64% non-PDS), and believed that the school cultures in which they taught were largely positive, promoting important teaching practices, encouraging faculty sensitivity to issues of diversity, and encouraging the involvement of parents and the community in school affairs, encouraging teachers to be involved in a range of professional development and policy initiatives. The only statistically significant difference between PDS and non-PDS graduates in terms of school culture was in the area of collaborative relationships of institutions of higher education, where the PDS graduates reported a higher commitment to such collaborations in their schools than non-PDS graduates. PDS and non-PDS graduates reported that they continued their professional development. Both groups were also involved in education renewal efforts, assuming leadership roles, working collaboratively with colleagues, working with parents and community members. There were no significant differences across the groups.

Principals' rating for both groups also tended to be similar. For two teaching tasks, though, there were significantly higher ratings for PDS graduates: sensitivity to ethnic and cultural differences, and balancing the various demands of teaching. Largely, however, principals found both groups of graduates comparable in their teaching effectiveness. When compared to graduates of other teacher education programs, the principals found the PDS graduates significantly more able. But the principals' comments suggest that individual differences might be more important than program differences.

There was a significant difference in how PDS and non-PDS graduates rated their satisfaction with their teacher preparation: 89% of the PDS graduates rated teacher preparation as either excellent or good, while only 50% of the non-PDS graduates judged their teacher preparation in this way. It would appear that PDS graduates are more satisfied with their preparation.

Rock & Levin (2002)

Collaborative action research projects: Enhancing preservice teacher development in professional development schools

Teacher Education Quarterly, 29(1), 7-21

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study

5 preservice teachers and their on-site teacher educator mentors in two different PDS sites

Pre- and post interviews

Mid-term individual interview

Audiotapes of planning and evaluation conferences

Research/dialogue journals

Action research plans

Action research projects

Field notes

Structured in-class writing

FINDINGS

Preservice teachers: (a) clarified their personal teaching theories, (b) explored their sense of teacher self, (c) gained awareness of their students, (d) acquired knowledge of teaching and curriculum, and (e) gained awareness and appreciation for inquiry and reflection

Sandholtz & Wasserman (2001)

Student and cooperating teachers: Contrasting experiences in teacher preparation programs

Action in Teacher Education, 23(3), 54-65

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Comparative survey study

The research compared teacher education graduates (n=26) and cooperating teachers (n=33) in two teacher education programs associated with the same university and same public school district: one traditional teacher education program (18 student teachers and 20 collaborating teachers), and one that involved a professional development school (8 student teachers, 13 collaborating teachers).

Surveys were administered to both preservice teachers (response rate 81%) and cooperating teachers (response rate 66%). In addition, exit interviews were conducted with all participants.

FINDINGS

Cooperating teachers most often identified problems associated with working with preservice teachers to include the disruption of classroom management, interruption of instruction, and a shifting of time and energy to be devoted to the student teacher. They identified the chance to gain new ideas and collaborate with colleagues as two benefits of working with student teachers. They felt that this led to improvements in their own instruction and more time to work in small groups or individualized instruction with students.

Student teachers also identified discipline and classroom control as their biggest problem. There were no statistical differences between student

teachers in the PDS versus those in the traditional program. When asked who they go to for help, student teachers in the traditional program nominared their cooperating teacher and other teachers at their schools. PDS graduates nominated a wider array of colleagues: cooperating teachers, their peers, their university supervisors, and other teachers.

There were statistically significant differences between the PDS and non-PDS student teachers in terms of the benefits of teacher preparation. PDS student teachers had fewer concerns, and more confidence in their own self-efficacy, in their impact on student learning, and in dealing with student problems. There were no significant differences in PDS and non-PDS student teachers' concerns about school climate, instructional materials, professional freedom, or student acceptance.

Cooperating teachers and student teachers rated their respective PDS and non-PDS teacher preparation programs highly, and there were no statistical differences in the ratings. Student teachers ranked the student teaching experience the highest of the program components. Non-PDS student teachers offered more suggestions for program improvement than did PDS student teachers, and several of their recommendations (have field experiences start at the beginning of the year, for example) were similar to practices already in place in the PDS program.

Skipper & Quantz (1987)

Changes in educational attitudes of education and arts and science students during four years of college

Journal of Teacher Education, 38(3), 39-44

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (longitudinal design analyzed using ANCOVA with pre-test as covariate)

Complete data on 45 education majors and 63 arts and sciences majors from a Midwestern university. Data also collected from 43 education faculty, 92 arts and sciences faculty, and 77 cooperating teachers.

Education Scale, developed by other investigators in a prior study to measure progressive vs. traditional attitudes toward teaching and learning.

FINDINGS

Education majors entered college as significantly less progressive than the arts and sciences students, but at the end of college the two groups were no longer significantly different.

Among the faculty groups, education faculty were significantly more progressive than the arts and sciences faculty and cooperating teachers.

Yerian & Grossman (1997)

Preservice teachers' perceptions of their middle level teacher education experience: A comparison of a traditional and a PDS model

Teacher Education Quarterly, 24(4), 85-101

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey and comparative population study (ANOVA); interviews with subsample

Forty-four graduates from a teacher education program (TEP) and 30 graduates from a version of the program with a core seminar and field experience in a middle-grades Professional Development School.

Questionnaire gathered responses about personal background, work history, teacher education, and beliefs about teaching. Interviews focused on the PDS component of the program.

FINDINGS

Students in the PDS group felt more knowledgeable about several aspects of middle-grades teaching.

The proportion of graduates who felt that their university work was connected to their work in the field was higher for the PDS group.

Graduates in the PDS group felt more certain that they could affect student achievement by trying different teaching methods and were more likely to recognize the contribution of other teachers to their own effectiveness.

Graduates in the PDS group had more positive perceptions of their university supervisors.

Graduates in the PDS group felt more knowledgeable about students with disabilities and about integrating special education students in regular classrooms.

Question 5. Is greater teacher effectiveness and retention in the profession likely to be provided by 5-year teacher preparation programs than by 4-year programs? In general, is teacher attrition influenced by program model?

Andrew & Schwab (1995)

Has reform in teacher education influenced teacher performance? An outcome assessment of graduates of an eleven-university consortium

Action in Teacher Education, 18(3), 43-53

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (cross tabulation)

1,390 1985-1990 graduates from 11 universities and colleges, seven of which had 5-year teacher education programs.

481 principals of schools at which these graduates were employed

Locally developed Survey of Graduates and Teacher Effectiveness Survey.

FINDINGS

Graduates of 5-year programs were significantly more likely to enter teaching.

Graduates of 5-year programs were significantly more likely to be still

teaching at the time of the survey and were significantly more likely to report that they intended to be in teaching in 5 years.

Ratings on the Teacher Effectiveness Survey did not differ significantly between the two groups.

A significantly higher percentage of teachers from 4-year programs reported that they had moved out of the classroom into an administrative or non-teaching position.

A significantly higher percentage of teachers from 5-year programs reported serving as committee heads, serving as workshop presenters, and taking on professional leadership responsibilities beyond their school.

Question 6. Are there "alternative route" programs (i.e., programs that give teachers classroom assignments after 3 months or less of teaching-specific preparation) that graduate high percentages of effective new teachers with average or higher-than-average rates of teacher retention? What are the important characteristics of these programs?

Darling-Hammond, Hudson, & Kirby (1989)

Redesigning teacher education: Opening the door for new recruits to science and mathematics teaching
(RAND-R-3661-FF/CSTP, ERIC No. ED 309 144).
Santa Monica, CA: Rand

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research

Survey sent to participants and graduates of nine special teacher education programs for mathematics and science teachers. The categories of programs were: non-traditional recruitment, alternative certification, and retraining. Total number of surveys returned was 482.

Survey questions included training received in program, perceptions of program strengths and weaknesses, future career plans, and demographic information.

FINDINGS

Program duration, intensity, and content vary tremendously. For example, number of course credits ranged from 9 to 45; duration ranged from 16 weeks to 2 or more years; some included guided field experience; others did not.

Common program features included a goal of offering an alternative to traditional undergraduate programs, targeted at a specific population (e.g., midcareer transfers), that is less costly for students in time and money.

The special focus of these programs makes them vulnerable to changes in funding or perceived needs.

Students in programs with more pedagogical study before entering the classroom and more classroom supervision gave higher ratings to their programs.

Compared to "traditional" program recruits, students in these programs are older and more likely to be minority. Compared to the overall teaching force, they are more likely to be male; compared to the mathematics and science teaching force, they are more likely to be female.

Program graduates entry into teaching and retention in the first few years was comparable to the overall teaching force.

Goebel, Ronacher, & Sanchez (1989)

Alternative certification program, 1988-89: Houston Independent School District
Unpublished manuscript. (ERIC Document 332 103).
Houston, TX: Department of Research and Evaluation, Houston Independent School District

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Evaluation study

One hundred seventy-seven interns in the Alternative Certification Program (ACP) were compared with 192 experienced teachers (EXP) and 158 first-year certified teachers (FYC). ACP interns were split into two groups: those hired in the 1-4 hiring cycles (ACP1 N=33), and those hired in the 5-7 hiring cycles (later hirers had more experience at the time of the comparison) (ACP2 N=144).

MAT-6 achievement scores for students were matched with teachers and class averages were calculated. ANCOVA

Survey administered to 208 ACP interns, 178 (86%) returned

FINDINGS

All groups were comparable on ethnic characteristics, except that the FYC group had fewer Blacks. Groups were also comparable on gender, except that the ACP group had a greater number of males.

The ACP program filled 208 of the districts 700 teaching vacancies (29%) in 1988-89.

There were significant differences ($p < .001$) between the four teacher groups in student achievement. Students assigned to EXP teachers and ACP interns with experience had slightly higher achievement than students assigned to FYC teachers and ACP interns with little or no experience. An omega square analysis showed that teachers account for only 4% of the between group variance in achievement.

The authors conclude that students of ACP interns perform as well on achievement tests as students taught by other teacher groups.

Majority of ACP interns felt supported by principals, supervising teachers, and ACP staff. Majority found the training sessions effective in preparing them for entry level requirements.

Hawk & Schmidt (1989)

Teacher preparation: A comparison of traditional and alternative programs

Journal of Teacher Education, 40(September-October), 53-58

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Two-group comparison

Sample: 53 first-year mathematics and science teachers who had completed a traditional teacher preparation program (TPT); 16 students in a Lateral Entry Program (LEP) at the same university, in which students received 6 weeks of preservice training before beginning a year in which they taught at least 3 periods a day under supervision of a mentor and attended a weekly seminar.

NTE Mathematics and/or Biology Area exams (before school year), NTE Professional Knowledge exam (after school year), ratings across the school year on the Teacher Performance Appraisal Instrument (TPAI)

FINDINGS

The LEP group and TPT group were not significantly different in their performance on the NTE examinations.

The TPT group had high percentages of teachers at the top level (Above Standard) of the TPAI classroom performance instrument for four (management of time, management of students, instructional presentation, instructional feedback) of the five classroom functions assessed. The LEP group had better performance for instructional monitoring.

For both groups, 85% or more of the students performed at "At Standard" or better for all five areas of the TPAI.

Kane, Parsons, & Associates, Inc. (1999)

A survey of principals in schools with Teach for America corps members: Report of Findings

Unpublished manuscript. New York: Author

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Evaluation study of Teach for America in 1999

Telephone interviews with principals using professional interviewers (N=119)

Questionnaire (N=117)

FINDINGS

Fifty-two percent of the respondents report that TFA teachers are most often valued because they are highly motivated and enthusiastic. Thirty-one percent of respondents note that TFA graduates are also valued because they are well educated and knowledgeable about the content they are assigned to teach. Seventeen percent report that the TFA corps members are intelligent and learn and adapt quickly.

Disadvantages include the fact that corps members only stay for 2 years or for an "insufficient amount of time" (35% of respondents). Only 16% said that TFA corps members lack sufficient educational experience or lack knowledge and skill in discipline and management (13%).

Ninety-six percent of the principals reported that TFA corps members have a strongly advantageous (63%) or moderately advantageous (33%) impact on their schools and students. The reasons for that positive impact include teaching abilities (well prepared, professional, related well to students, good teachers) and motivation (energetic, enthusiastic, dedicated). Ninety-percent of the principals felt that TFA corps members had positive effects on students overall and on their academic achievement. Eighty-four percent of the principals believe that by the end of the school year, TFA corps members will have led to average academic gains of at least one grade level.

When asked about the strengths of TFA corps members, 67% of principals noted their motivation and energy (dedicated, hard working, willing to improve, etc.); 46% noted their teaching skills (motivates students, good curriculum development, ability to manage classrooms well, etc.). Perceived weaknesses included difficulty with maintaining classroom control (38%), personality-related problems (21%), and inexperience (17%).

TFA corps members received strong ratings for motivation, a positive attitude, integrity, openness to feedback, ability to think logically, setting high expectations for students, and acting with sensitivity.

Seventy-seven percent of the principals reported that corps members were thought to be "much above average" (44%) or somewhat above average (33%) when compared to other beginning teachers. Sixty-four percent of the principals felt that TFA graduates outperformed the overall teaching force in their schools.

Karge, Young, & Sandlin (1992)

Teaching internships: Are they a viable route to California alternative certification

Teacher Education Quarterly, 19(3), 9-18

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population study (ANOVA)

Twenty-four first-year teachers and 23 teachers in the California Teaching Intern Program. The 1st-year teachers graduated from a traditional program at the same institution that operated the Intern program. Interns all had at least 2 years of field experience.

Teacher observation was done with a locally developed rating scale assessing the classroom environment, teacher involvement with students, student on-task behavior, and classroom management. A time-sampling procedure was also used to teacher-student, student-student, and student-on-task behavior.

FINDINGS

Ratings of beginning teachers were higher than ratings of interns for all observed areas.

Mantle-Bromley, Gould, McWhorter, & Whaley (2000)

The effect of program structure on new teachers' employment and program satisfaction patterns

Action in Teacher Education, 22(1), 1-14

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

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Population: graduates from three options within a university's teacher education program: a traditional program; Project Promise (PP) — an exclusive, relatively expensive 10-month postbaccalaureate program; and a version of the traditional program with an added one-semester PDS experience, intended to achieve some of the advantages of the PP model at lower cost.

Surveys were completed by 42% of the population: 247 from the traditional program, 75 from the PDS program, and 40 from the PP program.

Variables included employment patterns, job satisfaction, and program satisfaction.

FINDINGS

For the employment variables (percent working in schools, percent employed full time), the PDS program performed better than the traditional program, but not as well as the PP program. The differences between the PDS program and the other two programs were not statistically significant.

For those employed full time, the three samples did not differ significantly from one another in responses to the job satisfaction questions.

PP ratings were significantly more positive that traditional program ratings in classroom management and technology. PDS ratings were in the middle, not significantly different from either of the other two programs.

The PP program received higher program satisfaction ratings than either the PDS or traditional programs in diversity and teaching strategies.

There were no significant differences among the programs in ratings of lesson planning preparation.

Paccione, McWhorter, & Richburg (2000)

Ten years on the fast track: Effective teacher preparation for nontraditional candidates

In D. J. McIntyre & S.M. Byrd (Eds.), *Research on effective models for teacher education: Teacher education yearbook VIII* (pp. 111-126). Thousand Oaks, CA: Corwin Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Three studies:

Study 1: Cost benefit analysis

Random samples of equivalent size and content area specialization from (a) Project Promise (PP), an experimental teacher preparation program for nontraditional candidates, from (b) undergraduates in a traditional teacher licensure program at Colorado State University, and (c) participants in a postbaccalaureate licensure program.

Compared attrition and employability rates

Costs were measured through: faculty costs, travel costs, and faculty usage costs

Also compared general satisfaction

Study 2: A follow-up study

Surveyed completers of PP (N=36), the traditional program (N=78), and a PDS program (N=36).

Program satisfaction survey, involving 5 point Likert scale items (1 for poor to 5 for very well) on how well teachers were prepared for classroom management, diversity, lesson planning, technology, and teaching strategies.

An ANOVA was conducted for each of the five variables

Study 3: Principal's Satisfaction Study

Twenty-eight-item questionnaire was administered to 16 principals who supervised PP completers in 1995-96. Principals were asked to rate the PP completers (1 for significantly inferior to 5 for remarkably better) with the "average" teacher of equal teaching experience.

FINDINGS

Study 1: The Project Promise costs are over four times those of the general program.

All 15 of the Project Promise completers rated their satisfaction as 5 (very satisfied). The postbaccalaurate sample and the undergraduate samples rated their satisfaction 3.72 (slightly less than somewhat satisfied) and 4.44 (between somewhat satisfied and very satisfied) respectively.

Eighty-seven percent of the PP completers got jobs, compared to 60% of the undergraduate sample and 40% of the postbaccalaureate sample.

More PP candidates completed their teacher preparation program, more were hired by school districts, and more remained in teaching than candidates in the traditional licensure program.

Study 2: PP ratings were significantly higher than the traditional program and PDS program ratings for four (classroom management, diversity, technology, and teaching strategies) of the five dimensions. Only lesson planning showed no significant differences.

Study 3: Principals rated the PP completers higher than the average teacher on every dimension.

Raymond, Fletcher, & Luque (2001, August)

Teach for America: An evaluation of teacher differences and student outcomes in Houston, Texas

Unpublished manuscript. Stanford, CA: CREDO, Hoover Institution

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population analysis (cross tabulation, regression analysis)

Three samples of teachers in the Houston Independent School District: 117 Teach For America (TFA) graduates hired to teach grades 4-8 between 1996 and 2000; 1,685 other teachers hired to teach grades 4-8 during that period; approximately 7,000 other grade 4-8 Houston teachers.

Student data from approximately 132,000 students in grades 4-8

Teacher variables included: degree, certification, Texas teacher exam scores, experience, grade, and school.

Student variables included: school; teacher; minority status; SES; age; English language proficiency; testing exemption status; and state assessment test scores in mathematics, reading, and English Language Arts.

FINDINGS

When comparing TFA teachers with other Houston teachers, the differences in student achievement scores (controlling for prior achievement, the background of students and their classmates, and teacher experience), favored the TFA teachers but were generally not statistically significant.

The differences across teacher groups in student achievement scores were larger in mathematics than in reading.

The variability in teachers' average student achievement scores was smaller for the TFA teachers than for the other teachers.

As compared to the other new teachers, the TFA teachers were more likely to have at least a bachelor's degree and less likely to be a member of a minority group.

As compared to the other new teachers TFA teachers were more likely to remain teaching in the district for at least 3 years.

Question 7. Does requiring state certification for new teachers contribute significantly to the likelihood that they will be effective? What kinds of certification vehicles can provide the greatest assurance?

Ayers & Qualls (1979)

Concurrent and predictive validity of the National Teacher Examinations

Journal of Educational Research, 73(2), 86-92

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

1973 to 1977, graduates from a teacher education program at Tennessee Technological University, longitudinal study

American College Test (ACT) scores

National Teacher Examinations (NTE) scores, summarized in the Weighted Common Examinations Total (WECT)

GPAs

California F-scale, forms 45 and 40, an instrument designed to measure prejudices and antidemocratic tendencies

Principal ratings using the Teacher Evaluation by Supervisor Form

Two forms of the Student Evaluation of Teaching (SET-I, SET-II)

Observational data using the Classroom Observation Record

Tuckman Teacher Feedback Form

Two groups of teachers were created: grades 1-6 and grades 7-12.

FINDINGS

The best predictors of achievement on the NTE tests were overall GPAs ($p<.01$). There was also a significant correlation between composite scores on the ACT and NTE scores ($p<.01$).

In general, there were no significant relationships between NTE scores and principals' rating, except for a positive correlation between principal rating and of secondary school teachers' subject matter competency and WECT scores ($p<.05$). A positive correlation was found between the composite score on the Student Evaluation of Teaching -I and the WCET ($p<.05$).

More open-minded teachers, as measured by the California F-scale, achieved higher scores on the NTE.

A significant relationship was found between secondary school teachers' tendency to lecture and their WCET scores ($p<.01$). Students of teachers with higher WCET scores were more responsible, confident, and alert ($p<.05$). In general, there was no significant relationship between classroom observational data and NTE scores, nor was there a significant relationship between pupil ratings and NTE scores.

Goodlad (1990)

Teachers for our nation's schools

San Francisco: Jossey-Bass

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study using surveys, interviews, and observations

Visits to 29 teacher education institutions during 1987-88, spending 10-14 researcher-days per site

Used surveys for faculty and students; interviews with students, faculty, and administrators; and review of documents

FINDINGS

In higher education, teacher education is the most affected by outside forces, especially state agencies. This has eroded curricular autonomy.

Heads of teacher education commonly square their curricula with the most recent list of state requirements, more or less resigned to circumstances beyond their control.

The current system of state dictates of teacher education curriculum have a "stultifying impact . . . on program renewal." (p.100)

State focus on regulation tends to lower program quality.

NCATE is seen as important by regional institutions, less so for flagship and major public, major private, and liberal arts private institutions.

Hawkins, Stancavage, & Dossey (1998)

School policies and practices affecting instruction in mathematics: Findings from the National Assessment of Educational Progress

(NCES 98-495). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey

National Assessment of Educational Progress, 1996

39 states and jurisdictions participated in the 1996 NAEP.

FINDINGS

Eighty-three percent of teachers of fourth-grade students have college majors in education rather than in mathematics or mathematics education. Thirteen percent of fourth-grade students were taught mathematics by a teacher with a college major in mathematics (9%) or mathematics education (4%). However, nearly one third of fourth graders were being taught mathematics by a teacher who had a mathematics teaching certificate.

Sixty-two percent of eighth-grade students had teachers with college majors in mathematics or mathematics education. Eighty-one percent were taught by teachers who had a mathematics teaching certificate.

Fourth-grade students whose teacher had a college major in mathematics education or education outperformed students whose teachers had a major in a field other than education, mathematics education, or mathematics. Fourth graders who were taught by teachers with degrees in mathematics did not outperform students taught by teachers with degrees in education.

The type of teaching certificate (mathematics, education, or other) held by the teachers of fourth graders was not related to fourth graders' scores on 1996 NAEP math assessment.

Eighth-grade students with teachers who had a college major in mathematics (average NAEP scale score of 276) outperformed students whose teachers had a college major in education (average NAEP scale score of 265) or a field other than education, mathematics education, or mathematics (average scale score of 248) on the 1996 NAEP mathematics assessment.

Eighth-grade students whose teachers had a teaching certificate in mathematics performed better than other eighth graders.

Fourth and eighth graders taught by teachers with more than 5 years of teaching experience outperformed students whose teachers had less than 5 years experience.

Teachers of eighth-grade students reported having more knowledge of the NCTM standards than teachers of fourth graders. The more knowledgeable an eighth-grade teacher reported of NCT standards, the higher their students' performance on NAEP mathematics assessment.

However, family variables explain most of the variance across state scores and gains from 1992 to 1996. State educational systems can account for some score difference across the states for students from similar families. Other things being equal, higher per-pupil expenditure, lower teacher-per-pupil ratio in lower grades, higher reported adequacy of teacher-reported resources, lower teacher turnover, and higher participation levels in public prekindergarten all show positive, statistically significant effects on NAEP achievement.

Murnane, Singer, Willett, Kemple, & Olsen (1991)

Who will teach? Policies that matter

Cambridge, MA: Harvard University Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research and comparative population analysis (cross tabulation, logistic regression, survival analysis)

State databases from Michigan (30,614 individuals who entered public school teaching in Michigan between 9/72 and 9/81) and North Carolina (50,502 individual licensed by North Carolina for public school teaching between 1/74 and 12/85)

National Longitudinal Surveys of Labor Market Experience (NLS) (2,539 individuals who graduated from college between 1967 and 1985)

Demographic characteristics, education, subject-matter specialty, career status, salary, and entering school district.

FINDINGS

In North Carolina, removal of the licensure requirement for a minimum NTE test score increased the number of college graduates who applied for a teaching license. Reinstatement of the requirement reduced the number of applicants. The effect was more pronounced for Blacks than for Whites.

During the period in which the NTE requirement was eliminated, those licensees who took nevertheless took the NTE examination even though it was not required were more likely to enter teaching in North Carolina within 3 years than those who did not take the exam.

Licensees with higher NTE scores were less likely to enter teaching in North Carolina within 3 years of licensure.

Mitchell, Robinson, Plake, & Knowles (Eds.) (2001)

Testing teacher candidates: The role of licensure in improving teacher quality

Washington, DC: National Academy Press

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Surveys and document analysis

Descriptive statistics

FINDINGS

All states require a B.A. in education or in a content area; most have alternative routes. Most states require student teaching, which varies from 9 to 18 weeks.

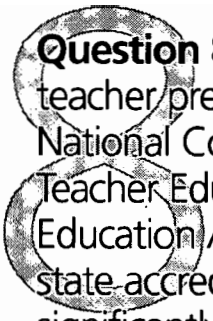
Over 600 examinations are currently used, most states have at least one test of basic skills, general knowledge, and/or content/pedagogical knowledge. The tests are primarily multiple choice and constructed response. Educational Testing Service (ETS) and National Evaluation Systems (NES) are the two primary producers of teacher licensure tests. States vary in how they use those tests for licensure: 19 use basic skills tests for entry into teacher preparation, 1 for graduation, and 18 use basic skills tests for licensure. Three states use subject matter tests for admission to teacher preparation, three use them for graduation, and 25 for licensure. Twenty-six states use tests of pedagogical knowledge for licensure, 2 for graduation. Seven states use tests of subject-specific pedagogical knowledge for either licensure or graduation. Eight states have no testing requirements. Most states use expert panels to set passing scores. There continue to be disparities in the passing rates of test takers across racial/ethnic groups: on Praxis in 1998-99, the passing rate for African Americans on the reading test was 50%, for Hispanics 65%, for Asian Americans 59%, and for Whites 86%. In mathematics, the trend was similar: 48% for African Americans, 65% for Hispanics, 86% for Whites. Asian Americans did substantially better on reading than mathematics, with a passing rate on the mathematics portion of 82%. Similar differences were found in passing rates for test takers in California and Connecticut. However, the data have serious limitations and should not be oversimplified.

Less than 40% of teacher education programs are nationally accredited; the majority of states use regional accreditation of institutions in order to recognize teacher preparation programs. All states require teacher preparation programs to obtain state approval; all use state established standards for that approval. Fourteen states have created independent professional standards boards/commissions to establish licensure standards. In more than 40 states, teacher preparation programs can substitute NCATE approval for state approval.

Thirty-five states have specific established entry requirements for teacher preparation programs, almost all include a test of basic skills.

Most states have a 2- or 3-tiered licensure process. Thirty-five states require initial licenses, and the standard professional license can be obtained after additional requirements are fulfilled. Almost all states issue various restricted/temporary licenses, especially for areas that are hard to staff. Forty-seven states allow the basic skills requirement to be waived for temporary/emergency licenses. Content area examinations can be waived for such licenses in 49 states.

28 states have beginning teacher support systems, but they are voluntary in 10 of those states.



Question 8. Does the accreditation of teacher preparation programs (by the National Council for Accreditation of Teacher Education, the Teacher Education Accreditation Council, or a state accrediting agency) contribute significantly to the likelihood their graduates will be effective and will remain in the classroom? What accreditation measures are likely to be most effective?

Goodlad (1990)

Teachers for our nation's schools

San Francisco: Jossey-Bass

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study using surveys, interviews, and observations

Visits to 29 teacher education institutions during 1987-88, spending 10-14 researcher-days per site

Used surveys for faculty and students; interviews with students, faculty, and administrators; and review of documents

FINDINGS

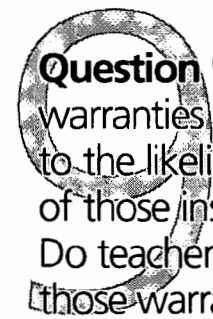
In higher education, teacher education is the most affected by outside forces, especially state agencies. This has eroded curricular autonomy.

Heads of teacher education commonly square their curricula with the most recent list of state requirements, more or less resigned to circumstances beyond their control.

The current system of state dictates of teacher education curriculum have a "stultifying impact . . . on program renewal." (p.100)

State focus on regulation tends to lower program quality.

NCATE is seen as important by regional institutions, less so for flagship and major public, major private, and liberal arts private institutions.



Question 9. Do institutional warranties for new teachers contribute to the likelihood that new graduates of those institutions will be effective? Do teachers given remediation under those warranties demonstrate increased classroom effectiveness?

There was no research on this topic.

Question 10. Are there any teacher preparation strategies that are likely to increase the effectiveness of new teachers in hard-to-staff or low-performing schools? What about in urban or remote rural schools?

Cook & Cleaf (2000)

Multicultural perceptions of 1st-year elementary teachers' urban, suburban, and rural student teaching placements.

Urban Education, 35(2), 165-174

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Survey research; comparative population study (ANOVA)

Forty-one respondents, all first-year teachers who graduated from a teacher education program with an urban focus. The program enrolls students from suburban backgrounds, but most of them take jobs in urban schools.

Respondents had done student teaching in four types of schools: urban schools associated with Comer Program, other urban schools, suburban schools, and rural schools.

Three-item survey constructed for this study, asking for teacher perceptions of the influence of student teaching on (a) their teaching success; (b) their understanding of sociocultural needs of students; and (c) their preparation to work with parents from a variety of racial ,ethnic, and socioeconomic backgrounds

FINDINGS

Analysis compared responses across the four student teaching settings.

No statistically significant differences were found in responses to the question asking whether the student teaching assignment contributed to their success as 1st-year teachers.

The mean responses for the urban school samples were significantly higher than for the suburban or rural on the question asking respondents to indicate the degree to which their student teaching setting contributed to "their understanding of the sociocultural needs of students."

The mean responses for the urban schools samples were also significantly higher for the questions asking respondents "to indicate the degree to which their student teaching setting prepared them to work with parents from a variety of racial ethnic, and socioeconomic backgrounds."

Sconzert, Iazzetto, & Purkey (2000)

Small-town college to big-city school: Preparing urban teachers from liberal arts colleges.

Teaching and Teacher Education, 16(4), 465-490

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Interpretive study, using interviews before and after the program and examining reflective essays written as assignments during the program

Study of 12 students who participated in the Urban Education Program, operated by the Associated Colleges of the Midwest, in Fall 1998

Interview protocols and framework for analyzing reflective essay developed specifically for this study

FINDINGS

The investigators claim that three areas of change "are more likely to result from characteristics specific to the Urban Education Program [than from student teaching as a general experience]" (p.480). These three are: "adapting course content and instructional delivery to students' needs and out-of-school experiences is necessary; learning from students and from one another contributes to a productive learning environment; and being aware of color (and class) in relationships with students is critical" (p.480).

Stallings, Bossung, & Martin (1990)

Houston Teaching Academy: Partnership in developing teachers

Teaching and Teacher Education, 6(4), 355-365

RESEARCH TRADITION / SAMPLE SIZE / VARIABLES

Evaluation study; Two-group comparison

Forty-four Experimental Student Teachers (EST) (i.e., those in the Houston Teaching Academy) were compared to 25 Control Student Teachers (CST) (who were not in an urban school).

Stallings Observation Instrument (SOI), originally developed for evaluations of Head Start and Follow Through. Scales are classroom organization, interactive instruction, and student behavior management.

Interviews were also conducted with former student teachers around attitudes toward teaching and plans for the future.

Principal ratings for graduates of program hired in Houston.

FINDINGS

EST group changed on all behavioral variables; CST group changed on only one.

In classroom management, EST group started off with more problems, but got better. CST group, who were not in urban schools, had fewer problems to start with, but didn't improve over the year.

At the time the study was published, more than half of the graduates were teaching in Houston; another quarter were teaching in low-income, non-inner-city schools.

Question 11. Is setting more stringent entrance requirements for teacher preparation programs or more selective pre-screening of preparation program candidates likely to ensure they will be more effective?

We found no research that met our criteria on this topic.

Appendix B
Nominated Literature Not Included in This Review[9]

Allegro, A. (1992). *The assessment of alternative certification practices: Panel presentations.* Proceedings of the Second National Research Symposium on Limited English Proficient Student Issues: Focus on Evaluation and Measurement. Washington, DC: Office English Language Acquisition, Language Enhancement, and Academic Achievement for Limited English Proficient Students (formerly the Office of Bilingual Education and Minority Languages Affairs).

REASON No research methodology explained.

Anyon, J. (1994). Teacher development and reform in an inner-city school. *Teachers College Record, 96*(1), 14-31.

REASON Not related to ECS questions.

Ashton, P. T. (1996). Improving the preparation of teachers. *Educational Researcher, 25*(9), 21-22, 35.

REASON Position statement.

Ashton, P. T., & Crocker, L. (1987). Systematic study of planned variations: The essential focus of teacher education reform. *Journal of Teacher Education, 38*(3), 2-8.

REASON Review article.

Ball, D. L. (1988). *Research on teaching mathematics: Making subject matter part of the equation.* (Research Report 88-2). East Lansing, MI: National Center for Research on Teacher Education, College of Education, Michigan State University.

REASON Literature and conceptual review. Empirical data are used, but research methodology not explained. Not a report of original research.

Ballou, D., & Podgursky, M. (1999). Reforming teacher training and recruitment: A critical appraisal of the National Commission on Teaching and America's Future. *Government Union Review, 17*(4), 1-53.

REASON Not a report of original research.

Blackburn, R. T., Chapman, D. W., & Cameron, S. M. (1981). "Cloning" in academe: Mentorship and academic careers. *Research in Higher Education, 15*(4), 315-327.

REASON Nothing about teacher preparation; concerns mentoring in higher education. Not related to ECS questions.

Bliss, T. (1990). Alternative certification in Connecticut: Reshaping the profession. *Peabody Journal of Education, 67*(3), 35-54.

REASON Description of a program. No research methods explained.

Borko, H. (1986). Clinical teacher education: The induction years. In J. V. Hoffman & S. A. Edwards (Eds.), *Reality and reform in clinical teacher education* (pp. 45-63). New York: Random House.

REASON Description of a program. No research methods explained.

Bradshaw, L., & Hawk, P. (1996). *Teacher certification: Does it really make a difference in student achievement?* Unpublished manuscript. (ERIC Document ED405308). Greenville, NC: ENCCARE.

REASON Review article.

[9] In the original report, we did not provide documentation of the full range of materials that we reviewed, nor the reasons why we discarded particular pieces. Here we aim to learn from that past mistake, and provide an accounting of the nominated literature and the reasons for its exclusion from this addendum. There were three major reasons why a nominated article was not included: incomplete or insufficient description of research methodology; mismatch between the research and the ECS questions; or the piece was not a report of original research (e.g., literature reviews, program descriptions, position statements, etc.).

Brooks, D. M. (1986). *Richardson new teacher induction program: Final data analysis and report.* Unpublished manuscript. (ERIC Document ED278627).

REASON Insufficient description of research design and methodology.

Button, K., Ponticell, J., & Johnson, M. J. (1996). Enabling school-university collaborative research: Lessons learned in professional development schools. *Journal of Teacher Education, 47*(1), 16-20.

REASON Not related to ECS questions; insufficient description of research methodologies.

Byrd, D. M., & McIntyre, D. J. (1999). *Research on professional development schools: Teacher education yearbook VII.* Thousand Oaks, CA: Corwin Press.

REASON Most of the chapters do not directly address the ECS questions. Those chapters that are relevant do not contain sufficient description of the research methodology.

Carter, K., & Richardson, V. (1989). A curriculum for an initial-year-of-teaching program. *The Elementary School Journal, 89*(4), 405-419.

REASON Program description and conceptual argument about what a program ought to entail. Not a report of original research.

Clark, D. L., & McNergney, R. F. (1990). Governance of teacher education. In W.R. Houston (Ed.), *Handbook of research on teacher education* (pp. 101-118). New York: Macmillan.

REASON Literature review.

Cochran-Smith, M., & Lytle, S. L. (1999). The teacher research movement: A decade later. *Educational Researcher, 28*(7), 15-25.

REASON Review article.

Colbert, J. A., & Wolff, D. E. (1992). Surviving in urban schools: A collaborative model for a beginning teacher support system. *Journal of Teacher Education, 43*(3), 193-199.

REASON No description of research methods for relevant conclusions.

Coleman, J., Hoffer, T., & Kilgore, S. (1982). Cognitive outcomes in public and private schools. *Sociology of Education, 55*(2-3), 65-76.

REASON Does not address ECS questions.

Corcoran, T. B., Shields, P. M., & Zucker, A. A. (1998). *The SSIs and professional development for teachers.* Menlo Park, CA: SRI International.

REASON Description of professional development done by SSIs, but does not address ECS questions.

Darling-Hammond, L. (Ed.). (1994). *Professional development schools: Schools for developing a profession.* New York: Teachers College Press.

REASON The cases presented are descriptions of various PDSs. Insufficient description of research methodologies used in the individual cases.

Darling-Hammond, L. (2000). Reforming teacher preparation and licensing: Debating the evidence. *Teachers College Record, 102*(1), 28-56.

REASON Response to a critique of NCTAF. Does not present new research.

Darling-Hammond, L. (Ed.). (2000). *Studies of excellence in teacher education.* New York: National Commission on Teaching and America's Future & American Association of Colleges for Teacher Education.

REASON Insufficient descriptions of method.

Darling-Hammond, L., & Sclan, E. M. (1996). Who teaches and why: Dilemmas of building a profession for twenty-first century schools. In J. Sikula, T. J. Buttery, and E. Guyton (Eds.), *Handbook of research on teacher education (2nd ed.)* (pp. 61-101). New York: Simon & Schuster Macmillan.

REASON Literature review.

Dial, M., & Stevens, C. J. (1993). Introduction: The context of alternative teacher certification. *Education and Urban Society, 26*(1), 4-17.

REASON Review article.

Dill, V. S. (1994). Teacher education in Texas: A new paradigm. *The Educational Forum, 58*(2), 147-154.

REASON Description of policy changes. Not a research study.

Dill, V. S. (1996). Alternative teacher certification. In J. Sikula, T. J. Buttery, and E. Guyton (Eds.), *Handbook of research on teacher education (2nd ed.)* (pp. 932-960). New York: Simon & Schuster Macmillan.

REASON Review article.

Ducharme, E. R., & Ducharme, M. K. (1996). Needed research in teacher education. In J. Sikula, T. J. Buttery, and E. Guyton (Eds.), *Handbook of research on teacher education (2nd ed.)* (pp. 1030-1046). New York: Simon & Schuster Macmillan.

REASON Review article.

Education Standards Commission. (1988). *Teachers for Florida's classrooms: The experimental alternate certification program for secondary teachers. Report and recommendations of the Education Standards Commission.* Tallahassee, FL: Author.

REASON Summary of alternative certification programs and report on telephone surveys with Florida. Insufficient explanation of research methodology.

Erekson, T. L., & Barr, L. (1985). Alternative credentialing: Lessons from vocational education. *Journal of Teacher Education, 36*(3), 16-19.

REASON Review article.

Evertson, C. M., Hawley, W. D., & Zlotnik, M. (1985). Making a difference in educational quality through teacher education. *Journal of Teacher Education, 36*(3), 2-12.

REASON Review article.

Feiman-Nemser, S., & Parker, M. B. (1990). *Making subject matter knowledge part of the conversation or Helping beginning teachers learn to teach.* (Research Report 90-3). East Lansing, MI: National Center for Research on Teacher Learning.

REASON Insufficient description of research and analysis methods.

Ferguson, R. F. (1998). Can schools narrow the black-white test score gap? In C. Jencks & M. Phillips (Eds.), *The Black-White test score gap* (pp. 318-374). Washington, DC: Brookings Institution Press.

REASON Summary of research reported elsewhere; not a report of original research

Fowler, R. C. (2001). *An analysis of the recruitment, preparation, attrition, and placement of the Massachusetts signing bonus teachers.* Unpublished manuscript.

REASON No research methods explained

Froomkin, J. N. (1976). Policy issues in the education industry. In *Education as industry* (pp. 455-474). Cambridge, MA: Ballinger.

REASON Commentary from a conference; not a report of original research with methodology explained.

Fry, P. G., & McKinney, L. J. (1997). A qualitative study of preservice teachers' early field experiences in an urban, culturally different school. *Urban Education, 32*(2), 184-201.

REASON Study of a single time teaching a single course, with no basis for comparison that would support inferences about the effects of this course.

Fullan, M. G., & Stiegelbauer, S. (1991). Professional preparation of teachers. In *The new meaning of educational change.* New York: Teachers College Press.

REASON Essay and overview, not a report of original research.

Galbraith, M. W., & Gilley, J. W. (1985). An examination of professional certification. *Lifelong Learning, 9*(2), 12-15.

REASON Position piece and review article.

Galvez-Hjornevik, C. (1986). Mentoring among teachers: A review of the literature. *Journal of Teacher Education, 37*(1), 6-11.

REASON Review article.

Gideonse, H. D. (Ed.). (1992). *Teacher education policy: Narratives, stories, and cases.* Albany: State University of New York Press.

REASON Focuses on policy development. Does not address the ECS questions.

Gilbert, S. L. (1997). The 'four commonplaces of teaching': Prospective teachers' beliefs about teaching in urban schools. *The Urban Review, 29*(2), 81-96.

Gold, Y. (1990). Beginning teacher support: Attrition, mentoring, and induction. In W. R. Houston (Ed.), *Handbook of research on teacher education* (pp. 548-594). New York: Macmillan.

REASON Literature review.

Gold, Y., & Roth, R. A. (1993). Emotional-physical needs. Chapter 5 of *Teachers managing stress.* Washington, DC: Falmer Press.

REASON No research methods explained; does not directly relate to ECS questions.

Goldhaber, D. D., & Brewer, D. J. (1999). Teacher licensing and student achievement. In M. Kanstoroom, and C. E. Finn (Eds.), *Better teachers, better schools* (pp. 83-102). Dayton, OH: The Thomas B. Fordham Foundation.

REASON Later version of this paper already included in original review.

Goodlad, J. I. (1990). Better teachers for our nation's schools. *Phi Delta Kappan, 72*(3), 185-194.

REASON Summary of research reported in book. The book is included in the review, this article is redundant with that and was not intended to explain the research methods entailed in the research.

Griffin, G. (1985). Teacher induction: Research issues. *Journal of Teacher Education, 36*(1), 42-46.

Griffiths, M., & Tann, S. (1992). Using reflective practice to link personal and public theories. *Journal of Education for Teaching, 18*(1), 69-84.

REASON Review or thought piece.

Groulx, J. G. (2001). Changing preservice teacher perceptions of minority schools. *Urban Education, 36*(1), 60-92.

REASON Results do not directly address ECS questions.

Haberman, M. (1994). Preparing teachers for the real world of urban schools. *The Educational Forum, 58*(2), 162-168.

REASON Thought piece, not research report.

Hanushek, E. A. (1994). Money might matter somewhere: A response to Hedges, Laine, and Greenwald. *Educational Researcher, 23*(4), 5-8.

REASON Does not directly address ECS questions.

Hanushek, E. A. (1996). A more complete picture of school resource policies. *Review of Educational Research, 66*(3), 397-409.

REASON A response to Greenwald, Hedges, and Laine's (1996) meta-analysis.

Hargreaves, A. (1994). Restructuring: Beyond collaboration. In *Changing teachers, changing times: Teachers' work and culture in the postmodern age* (pp. 241-264). London: Cassell.

REASON Does not directly address ECS questions.

Hawley, W. D. (1992). The theory and practice of alternative certification: Implications for the improvement of teaching. *Peabody Journal of Education, 67*(3), 3-34.

REASON Review article.

Healy, G. C., & Welchert, A. J. (1990). Mentoring relations: A definition to advance research and practice. *Educational Researcher, 19*(9), 17-21.

REASON Review article.

Hedges, L. V., Laine, R. D., & Greenwald, R. (1994). Money does matter somewhere: A reply to Hanushek. *Educational Researcher, 23*(4), 9-10.

REASON Does not address ECS questions.

Hobbs, S. F., Bullough, R. V., Kauchak, D. P., Crow, N. A., & Stokes, D. (1998). Professional development schools: Catalysts for collaboration and change. *The Clearing House, 72*(1), 47-50.

REASON Insufficient description of research methodology.

Hoffman, N. E., Reed, W. M., & Rosenbluth, G. S. (Eds.). (1997). *Lessons from restructuring experiences: Stories of change in professional development schools.* Albany: State University of New York Press.

REASON Most chapters are descriptions of PDS experiences and are not the result of a program of research. One chapter includes information on the assessment of the PDS efforts, but there is insufficient description of the methods of data analysis.

Hoffman, J. V., & Edwards, S. A. (Eds.). (1986). *Reality and reform in clinical teacher education.* New York: Random House.

REASON Most of the chapters do not address ECS questions. Some chapters that are related do not include descriptions of research methodology.

Hoffman, J. V., Edwards, S. A., O'Neal, S., Barnes, S., & Paulissen, M. (1986). A study of state-mandated beginning teacher programs. *Journal of Teacher Education, 37*(1), 16-21.

REASON Focuses on the issue of induction, which is beyond the scope of the ECS questions.

Huffman, G., & Leak, S. (1986). Beginning teachers' perceptions of mentors. *Journal of Teacher Education, 37*(1), 22-25.

REASON Does not address ECS questions.

Huling-Austin, L. (1986). What can and cannot reasonably be expected from teacher induction programs? *Journal of Teacher Education, 37*(1), 2-5.

REASON Essay on induction. Not a report of original research.

Huling-Austin, L. (1990). Teacher induction programs and internships. In W. R. Houston (Ed.), *Handbook of research on teacher education* (pp. 535-548). New York: Macmillan.

REASON Literature review.

Huling-Austin, L. (1992). Research on learning to teach: Implications for teacher induction and mentoring programs. *Journal of Teacher Education, 43*(3), 173-180.

REASON Literature review.

Huling-Austin, L. (1989). Research on beginning teacher assistance programs. In *Assisting the beginning teacher* (pp. 39-55). Reston, VA: Association of Teacher Educators.

REASON Literature review.

Humphrey, D. C., Adelman, N., Esch, C., Riehl, L. M., Shields, P. M., & Tiffany, J. (2000). *Preparing and supporting new teachers: A literature review.* Menlo Park, CA: SRI International.

REASON Literature review. We used this review in our original review to locate relevant literature. The authors did not use criteria for deciding whether an article met certain research standards. However, their conclusions concerning the state of teacher preparation research are quite similar to those in our original report.

Hutton, J. B. (1987). *Alternative teacher certification: Its policy implications for classroom and personnel practice.* Commerce, TX: East Texas State University, Center for Policy Studies and Research in Elementary and Secondary Education.

REASON Methodology does not give sufficient evidence to compare AC teachers to other first year teachers on measures of teaching effectiveness.

Ingersoll, R. M. (1997). *The status of the profession: 1990-91* (SASS) (NCES 97-104). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

REASON Does not address the ECS questions.

Johnston, S. (1992). Images: A way of understanding the practical knowledge of student teachers. *Teaching and Teacher Education, 8*(2), 123-136.

REASON Not US teachers.

Joyce, B. R. (1988). Training research and preservice teacher education: A reconsideration. *Journal of Teacher Education, 39*(5), 32-36.

REASON Review article.

Keltner. D. P. (1994). Troops to teachers: Alternative certification and the military. *The Educational Forum, 58*(2), 182-186.

REASON Not a report of research. This is a program description. No explanation of research methods included.

Kennedy, M. M. (1999). The problem of evidence in teacher education. In R. Roth (Ed.), *The role of the university in the preparation of teachers* (pp. 87-107). London: Falmer Press.

REASON Review article. We used this article in the original report to create the criteria for inclusion. This is not a report of original research, but a review of the problems in research in teacher preparation more generally.

Kirby, S. N., Naftel, S., & Berends, M. (1999).Components of teacher demand. In *Staffing at-risk school districts in Texas* (pp. 35-61). Santa Monica, CA: RAND.

REASON Does not directly address the ECS questions.

Kleinfeld, J. (1998). The use of case studies in preparing teachers for cultural diversity. *Theory into Practice, 37*(2), 140-147.

REASON A report of a teacher education instructional practice, not a report of research. No research methods described.

Knauth, S. (1994). Teachers for Chicago: Changing the connections. *The Educational Forum, 58*(2), 209-213.

REASON A description of a program. No research methodology explained.

Kram, K. E. (1985). Relationships at work. In *Mentoring at work* (pp. 1-21). Glenview, IL: Scott, Foresman.

REASON Does not address the ECS questions; does not discuss mentoring in teacher education but mentoring more generally.

Larson, J. C. (2000). *The role of teacher background and preparation in students' algebra success.* Rockville, MD: Montgomery County Public Schools.

REASON Evaluation report done within the school system.

Lemlech, J. K., & Hertzog-Follart, H. (1993). Linking school and university through collegial student teaching. *Teacher Education Quarterly, 20*(4), 19-27.

REASON Insufficient description of research methodology.

Levin, H. M. (1980). Teacher certification and the economics of information. *Educational Evaluation and Policy Analysis, 2*(4), 5-18.

REASON Discussion paper, not a research report.

Lewis, L., Parsad, B., Carey, N., Bartfai, N., Farris, E., & Smerdon, B. (1999). *Teacher quality: A report on the preparation and qualifications of public school teachers* (NCES 1999-080). Washington, DC: NCES.

REASON Only addresses ECS questions in literature review portion of the report.

Lippman, L., Burns, S., & McArthur, E. (1996). *Urban schools: The challenge of location and poverty* (NCES 96-184). Washington, DC: NCES.

REASON Does not address ECS questions.

Littleton, M., & Larmer, B. (1998). Alternative education: Reflection on the past and implications for the future. *Teacher Education and Practice, 14*(1), 1-9.

REASON Description of policies, not a research report

Loucks-Horsley, S. (1995). Professional development and the learner centered school. *Theory into Practice, 34*(4), 265-271.

REASON Essay, not a research report.

Lovelace, T., & Martin, C. E., Jr. (1984). *The revised National Teacher Examinations as a predictor of teachers' performance in public school classrooms.* Unpublished manuscript. Lafayette: University of Southwestern Louisiana.

REASON Conference paper. No evidence of peer review.

Mantle-Bromley, C. (nd). *The status of early theories of professional development school potential.* Unpublished manuscript. Seattle, WA: Author.

REASON Unpublished manuscript. No evidence of peer review.

McDiarmid, G. W. (1992). What to do about differences? A study of multicultural education for teacher trainees in the Los Angeles Unified School District. *Journal of Teacher Education, 43*(2), 83-93.

REASON Does not directly address ECS questions.

McKibbin, M. (1988). Alternative certification in California. *Teacher Education Quarterly, 15*(3), 49-59.

REASON Evaluation report done by staff of the organization sponsoring the program.

McKibbin, M., & Ray, L. (1994). A guide for alternative certification program improvement. *The Educational Forum, 58*(2), 201-208.

REASON Review article.

Melnick, S. L., & Zeichner, K. M. (1995). *Teacher education for cultural diversity: Enhancing the capacity of teacher education institutions to address diversity issues.* (Research Report 95-4). East Lansing, MI: National Center for Research on Teacher Learning.

REASON Interim report of research project. Insufficient description of research methods and analysis.

Mitchell, D. et al. (1997). *Standards of quality and effectiveness for beginning teacher support and assessment programs.* Sacramento: California Commission on Teacher Credentialing.

REASON Not a report of research.

Moskowitz, J., & Stephens, M. (1997). *From students of teaching to teachers of students: Teacher induction around the Pacific Rim* (APEC Number: #97-HR-01.1). Washington, DC: U.S. Department of Education.

REASON Not U.S. Teacher induction is beyond the scope of the ECS questions.

Murnane, R. S. (1983). Understanding the sources of teaching competence: Choices, skills, and the limits of training. *Teachers College Record, 84*(3), 564-569.

REASON Not a research study.

Murnane, R. S. (1987). Understanding teacher attrition. *Harvard Educational Review, 57,* 177-182.

REASON Does not address ECS questions.

Noordhoff, K., & Kleinfeld, J. (1993). Preparing teachers for multicultural classrooms. *Teaching and Teacher Education, 9*(1), 27-39.

REASON Little information on methodology and no basis for comparison to other approaches to teacher education.

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REASON Does not address ECS questions.

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REASON Not a research report.

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REASON Inadequate description of research methods.

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REASON Weak link between evidence and conclusions.

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REASON Inadequate description of research methods.

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REASON Conference paper. No evidence of peer review.

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REASON Does not address ECS questions.

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Creating Effective Teachers: Concise Answers for Hard Questions

An Addendum to the Report *Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations*

In recent years, a growing number of consensus panels and research reports have attempted to state clearly what is known about the impact of good teaching and teacher education on PK-12 student learning. The ERIC Clearinghouse on Teaching and Teacher Education and the American Association of Colleges for Teacher Education are pleased to add to this growing body of literature with the publication of this addendum to the report *Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations* (Wilson, Floden, & Ferrini-Mundy, 2001). Commissioned by the Education Commission of the States, this addendum addresses questions that are of particular interest to state education policy makers and elaborates on a number of questions posed in the original work. This work should interest a wide range of stakeholders-including education faculty, students, teachers, administrators, policy makers, and the general public.

- **Mary E. Dilworth,** ERIC Clearinghouse on Teaching and Teacher Education

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