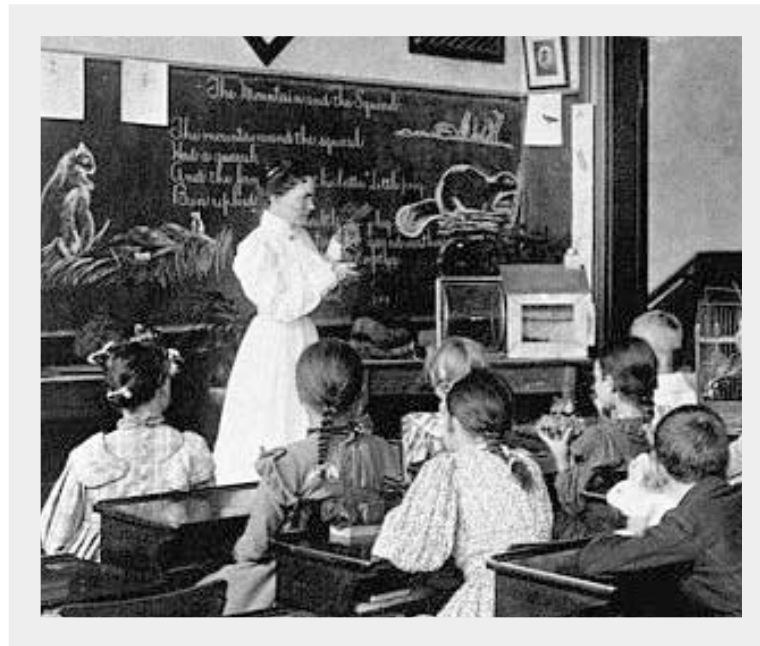


TEACHER CERTIFICATION RECONSIDERED:

STUMBLING FOR QUALITY

APPENDIX



REVIEW OF RESEARCH

TEACHER CERTIFICATION AND EFFECTIVE TEACHING

Appendix

Review of Research
Teacher Certification and Effective Teaching

The Abell Foundation
111 South Calvert Street
Suite 2300
Baltimore, Maryland 21202
Telephone: 410-547-1300
Facsimile: 410-539-6579
E-mail: abell@abell.org
www.abell.org

Explanation of Review

Most of the studies included in this table were cited by certification advocates as evidence of certification's value. Also included is research examining the relationships of various teacher attributes/background with student achievement.

A distinction between the two types of research is noted.

Research that has met the highest standard (blind, peer review) is marked by a ✓+ .

Research that was subjected to an objective, internal review is marked by a ✓ .

Research that was unpublished or was not peer reviewed is marked by an ✕ .

Research that controlled for necessary variables such as student poverty is marked by a ✓ .

Research that did not control for important variables is marked by an ✕ .

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Adams, R.D., Hutchinson, S., and Martray, C. 1980	<i>A developmental study of teacher concerns across time. Paper presented at the American Educational Research Association, Boston</i>	Not Retrievable	Darling-Hammond cites this dissertation as one of three studies suggesting that the typical problems of beginning teachers are lessened for those who have had adequate preparation prior to entry (see also Glassberg, 1980; Taylor and Dale, 1971).
Alexander, K., Entwisle, D., Thompson M. 1987	<i>School performance, status relations, and the structure of sentiment: Bringing the teacher back in. American Sociology Review 52 (October): 665-682</i>	Teacher's race and SES are interrelated, and their effect on student achievement is mixed.	A study done in Baltimore in 1982-83, examining teacher's race and SES, reporting that high status black teachers are the best at producing gains for white students; but for black students they are average in producing gains in verbal scores and below average for mathematics scores. Only black teachers of low SES produce higher gains for black students than for white students and only in math, where they produce very low gains for white students.
Andrews, J. Blackmon, C. and Mackey, J. 1980	<i>Preservice performance and the National Teacher Examinations. Phi Delta Kappan, 61(5): 358-359</i>	NTE scores and college GPAs do not correlate with supervisor's ratings of new teachers.	This study examined 269 student teachers, presumably from the same university as that of the authors (Louisiana State University). Evertson et al. claim this study shows that NTE scores have an inverse relationship with student achievement. Darling-Hammond (1999)cites this study as one of five (Ayers and Qualls, 1979; Haney et al., 1986; Quirk et al., 1973; Summers and Wolfe, 1977) that found no relationship between NTE subject speciality tests and teacher performance, "as measured by student outcomes or supervisory ratings" (page 6).
Armor, D., et al. 1976	<i>Analysis of the school preferred reading program in selected Los Angeles minority schools. Rand Corporation Report, No.R-2007-LAUDS</i>	Student SES, background, and initial test scores are most accountable for subsequent achievement gains but teachers also have a significant effect on student achievement.	A study analyzing 6th grade reading achievement in 20 minority schools which had shown large or consistent percentile-point gains on the CTBS tests. The school and classroom factors, which appeared to contribute significantly to the gains, were associated with the following factors: teachers' professional development, frequent parent-teacher contact, and allowing teachers some curriculum flexibility. Ferguson cites this study to demonstrate that differences <i>among teachers</i> in the average achievement gains of their students can be highly statistically significant.
Armour-Thomas, E., Clay, C., Domanico, R., Bruno, K., & Allen, B. 1989	<i>An outlier study of elementary and middle schools, New York: New York City Board of Education</i>	Three teacher characteristics significantly affect student achievement: having a master's degree, having 16 years or more of classroom experience, and having secured tenure.	Darling-Hammond (1996;1997;1999;2000) cites extensively this unpublished 1989 manuscript studying six schools in New York City: three high performers and three low performers, all of which shared similar poverty rates. She makes an assertion that 90% of the variation in students' reading and math achievement between these sets of schools was due to teachers' qualifications, including degrees, certification status, and experience.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Unpublished paper delivered at a conference, no indication of what the study was measuring, how many teachers were involved in the study, if it controlled for poverty, and if any of the problems experienced by the teachers had an impact on student achievement.	Yes	✗	✗
--	No	✓+	✓
The citation of this article by Evertson et al. and by Darling-Hammond along with their assertions about its claims, provide an excellent example of the misinterpretation of research findings by certification advocates. This article did not compare student achievement with NTE performance, but used supervisors' ratings. The assertion by Darling-Hammond that this study provides evidence of a negative relationship between subject matter tests and any measure of teaching performance is, at best, debatable, given that the authors found a positive relationship for English and elementary speciality tests. The negative relationship was found in two speciality areas of teaching where content knowledge of teachers is not well articulated: physical education and special education.	Yes	✗	✗
--	No	✓	✓
In this paper, the term "certification status" does not refer to the kind of preparation the teachers in these schools received, only whether or not they had tenure. (A teacher could have been tenured and entered teaching through an alternative route.) The paper is comparing experienced teachers (whose background we do not know) against substitutes and provisional teachers. The favorable standing of the experienced teachers is not surprising. There is little research of merit in this report. After surveying these six schools, the researchers come up with some none-too-surprising results: that the high performing schools were able to keep teachers longer. Aggregation bias causes a serious problem in this study. The authors assigned a single average school test scores to the records of roughly 180 teachers, so the student achievement dependent variable had only six possible values (three high values and three low ones). To report an R-squared in this situation (without any explanation of the very peculiar data set) is inappropriate, and demonstrates a meager understanding of statistics. Further, this paper was never published, which in any other field would discount its consideration.	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Ashton, P. 1996	<i>Improving the preparation of teachers.</i> Educational Researcher 25(9):21-22	Certified teachers receive higher supervisor ratings than do uncertified teachers.	Fetler cites this article by Ashton for stating that teachers without preparation have trouble anticipating and overcoming barriers to student learning, and are likely to hold low expectations for low-income children. Reducing certification requirements will worsen the quality of education of low income children.
Ashton, P. and Crocker, L. 1986	<i>Does teacher certification make a difference?</i> Florida Journal of Teacher Education, 3: 73-83	Education coursework has a positive effect on teaching performance.	Earlier version of the 1987 literature review by the same authors.
Ashton, P. and Crocker, L. 1987	<i>Systematic study of planned variations: The essential focus of teacher education reform.</i> Journal of Teacher Education, 2(8).	Education coursework has a positive effect on teaching performance.	<p>Of-quoted meta-analysis that looks at the effects of education coursework and subject matter coursework on student achievement. Darling-Hammond (1999) and others cite this review of the research as primary evidence of a "consistent positive effect of teachers' formal education training on supervisory ratings and student learning." The authors state that 4 out of 7 studies show that fully certified teachers provide greater student achievement than uncertified or provisionally certified teachers. In contrast, only 5 of 14 studies they reviewed showed a positive relationship between teacher's knowledge of subject matter (as measured by credits in coursework) and student achievement.</p> <p>Darling-Hammond (2000) cites this article as one of 10 studies that support her assertion that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (page 22). Of the ten studies [including Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; McPerkes, 1967], only Monk could arguably provide unequivocal support for Darling-Hammond's statement on the student achievement variable.</p>
Ayers, J. and Qualls, G. 1979	<i>Concurrent and predictive validity of the NTE.</i> Journal of Educational Research, 73 (2): 86-92	NTE scores do not predict pupils' ratings of teachers. Teachers' GPA correlate with NTE scores; Supervisors' evaluations have a low correlation with NTE scores.	A study done of teachers graduating from Tennessee Technical University in 1973. Evertson et al. state that this study demonstrates that NTE scores have an inverse relationship with student achievement. Darling-Hammond (1999) reaches a similar conclusion, citing this study as one of five (Andrews et al., 1980; Haney et al., 1986; Quirk et al., 1973; and Summers and Wolfe, 1977) that found no relationship between NTE subject speciality tests and teacher performance "as measured by student outcomes or supervisory ratings" (page 6).
Baker, D and Smith, T. 1997	<i>Teacher turnover and teacher quality: Refocusing the issue.</i> Teachers College Record, 99 (1): 29-35	Predicting teacher supply and demand is improved by the availability of Schools and Staffing Survey	Bradshaw notes that schools with higher levels of student poverty tend to have more teachers teaching out of their field of expertise.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Article presents no data. It acknowledges that "radical improvements in teacher education are needed" (page 21).	Yes	✓+	Na
--	Yes	✗	Na
Ashton and Crocker identify four studies that they claim prove the value of teacher certification, but none of the four provide much in the way of equivocal evidence (see McNeil, 1974; Taylor, 1957; Hice, 1970; and Perkes, 1967). Ashton and Crocker's assertion that only 5/14 studies showed a positive correlation between student achievement and credits in subject matter coursework does not withstand scrutiny. All but three of these 14 studies were doctoral dissertations and the three that were published suffer from insufficient sample sizes. No serious researcher would have considered them.	Yes	✓+	Na
The only measure in this study was pupils' ratings of teachers, which are highly subjective and for which there is no established relationship with student achievement. It looked primarily at the NTE Core Battery; its analysis of NTE subject speciality tests was limited to teachers at the elementary level where a teacher's subject matter speciality is not quite as clear as it is for a secondary teacher. The study also did not use student achievement as the measure of effectiveness. Only one of the five studies cited by Darling-Hammond presents any findings on the NTE speciality tests; and its findings were, in fact, positive (Summers and Wolfe, 1977). The research produced an interesting finding on the correlation between ACT scores and NTE scores: teachers' ACT scores have a higher correlation with their scores on the NTE than do their college GPAs.	Yes	✓+	✗
--	No	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Baker, E. 1996	<i>Report on the content area performance assessments. Never published</i>	--	Education Trust cites this study which compared how social studies teachers rated their own level of understanding about various historical periods and, then, compared teacher expertise to student achievement. There was an almost perfect match: students performed best in the domains where teachers indicated the most expertise in their subject.
Ballou, D. and Podgursky, M. 1997	<i>Reforming teacher training and recruitment: A critical appraisal of the recommendations of NCTAF. Government Union Review 17(4)</i>	NCATF offers a misleading and distorted picture of the crisis in teacher education.	In a challenge to NCATF's publication " <i>What Matters Most</i> ," Ballou and Podgursky maintain that there is little reason to believe that professional boards, mandatory NCATE accreditation, or National Board certification--all advocated by NCATF--will enhance student achievement. On the contrary, given the hurdles NCATF would erect for teacher licensing and program accreditation, there is good reason to expect teacher recruitment would suffer. NCATF's proposals represent a major shift in decision-making power from local school boards and State education agencies to private, producer-dominated organizations.
Ballou, D. and Podgursky, M. 2000	<i>Reforming teacher preparation and licensing: What is the evidence? Teachers College Record www.tcrecord.org</i>	There is little evidence that the reforms for teacher preparation advocated by Darling-Hammond and the National Commission for Teaching and America's Future (NCTAF) would be effective nor are they supported by research.	This paper challenges NCTAF's <i>Doing What Matters Most</i> and Darling-Hammond's 1999 <i>State Policy Evidence</i> paper, faulting NCTAF for making misleading statements and misinterpreting data.
Barr, A. et al. 1961	<i>Wisconsin studies of the measurement and prediction of teacher effectiveness. Madison, WI: Dunbar Publications</i>	Predicting teacher effectiveness is exceedingly complex.	This paper looked at studies conducted over 40 years, including 70 doctoral dissertations, examining 180 different measures of teacher characteristics, but could not identify a set of measures that seemed to have much power to predict teacher effectiveness. The vast majority of these studies used supervisors' ratings as the measure of teacher effectiveness.
Beery, J. 1960	<i>Does professional preparation make a difference? Journal of Teacher Education 13; also Ed 052 156; Coral Gables, Florida</i>	Completion of education courses is reflected in more effective teaching, at least during the first year.	A study of 76 pairs of emergency and regularly certified teachers found that the two types of teachers matched on a survey instrument modified by Beery for this study. According to Greenberg, fully certified teachers were rated consistently and significantly by "competent observers" to be more effective.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
This paper appears not to have been published.	No	✗	?
--	No	✓+	Na
Ballou and Pogursky share our concerns with the quality and rigor of Darling-Hammond's analyses.	No	✓+	Na
Supervisory ratings are not reliable measures of student achievement because they depend on the construct of the ratings instrument.	No	✗	Na
The study used a survey and ratings instrument modified by Berry as the measure of effectiveness. No measure of student achievement was examined. It considered none of the largely influential environmental variables such as school and student poverty which also would have altered the outcomes of supervisors' evaluations.	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Begle, E. 1972	<i>Teacher knowledge and student achievement in algebra.</i> School Mathematics Study Group Reports, Number 9. Stanford University, California School Mathematics Study Group, Washington, D.C.: National Science Foundation	Teacher's knowledge of subject matter has an insignificant effect on student achievement. Knowledge of subject matter has a curvilinear effect.	Evertson et al. cite this study as one showing there is an educationally insignificant relationship between teacher knowledge and student achievement (page 6).
Begle, E. 1979	<i>Critical Variables in Mathematics Education: Findings from a Survey of the Empirical Literature.</i> Mathematical Association of America, Washington, D.C.: NCTM	Teacher coursework in methodology of subject area has a stronger effect on student achievement than coursework in the subject. Teacher evaluations do not correlate well with student achievement.	This posthumously published book reviews, in part, Begle's own earlier study involving a huge data base (112,000 students in 40 states) generated by the National Longitudinal Study of Mathematical Abilities (NLSMA). This long term study was done in the 1960s. Darling-Hammond (2000; restated in 2001) cites this study as one of 10 studies that support her assertion: "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (page 22) [See Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.]
Begle, E., and Geeslin, W. 1972	<i>Teacher Effectiveness in mathematics instruction, #28.</i> Washington D.C.:NCTM	The characteristics and behaviors that distinguish effective teachers remains unknown.	This study looks at the same data set described in Begle (1979), but is an earlier analysis of the data, looking at two years of data rather than five. Darling-Hammond states in her 1999 study(page 7): "... <i>Begle and Geeslin (1972) found in a review of mathematics teaching that the absolute number of course credits in mathematics was not linearly related to teacher performance.</i> " She also (2000) cites this article as one of ten studies that support her assertion that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (page 22) but this study, as most on her list, can be discounted. [See Begle, 1979; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.] In 2001, Darling-Hammond cites this study for showing that "the absolute number of course credits in mathematics was not linearly related ot teacher performance" (page 23).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>The small effect size from teacher's knowledge of subject matter on student achievement is well explained by Begle. He studied an "elite" group of teachers, all having been accepted to NSF Summer Institute and who were comfortable enough with their field to volunteer to have their knowledge tested by Begle. These teachers do not reflect sufficiently a broader population of teachers and the expected variance in knowledge of their subject matter. It is not much different than studying a group of surgeons who graduated from Johns Hopkins and finding that the recovery rate of their patients was about comparable. The more important question would be, how does the recovery rate of Hopkins patients compare with the recovery rate of patients treated by less-elite surgeons?</p>	Yes	✗	✗
<p>This is a scholarly work, employing defensible analyses at the time it was written for examining the data; nevertheless its results should be treated tentatively, as Begle's editor and colleague James Wilson advises. Begle's analysis suffers from "aggregation bias" (see Chapter 3 of this study). The data set that Begle examined contained far too many variables and the project assembled to analyze this data was given inadequate resources to control properly for these variables (all according to Wilson). Problematic characteristics to the data affect significantly any conclusions Begle is able to reach. One is the fact that there was a much greater variance in the number of subject matter courses that teachers took than the number of methodology courses that they took. Such data problems inevitably impact any correlations.</p>	Yes	✗	✗
<p>Darling-Hammond finds conclusions from this study that were not contained in the study. Begle and Geeslin did not look at course credits in mathematics in this study; she may be confusing this study with Begle's 1979 review of the NLSMA data where this variable was examined and which did yield stronger effects for math methodology courses than math courses taken beyond the calculus level.</p> <p>It was quite difficult to track this paper down and even harder to scrutinize its results. James Wilson, colleague and editor of Begle's work, retrieved it for us with the attached note: "I think a lot of people have cited this but never read it." The design of the study is extremely problematic. This study did not control for poverty or for any other environmental variables other than teacher quality, which may be reason alone to discount its results. In Begle's 1979 book reviewing the NLSMA analyses, he does not even refer to this study. Also, Begle and Geeslin used a single average score for the student achievement data associated with each teacher, which means that the distribution of scores were curtailed dramatically. The variables that the authors did examine--not the course credit count that Darling-Hammond attributes to this study--are an odd assortment, including whether or not the teacher had children of his own; whether his orientation was "nonauthoritarian"; whether the teacher had a "need for approval."</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Bledsoe, Cox and Burnham 1967	<i>Comparison between selected characteristics and performance of provisionally and professionally certified beginning teachers. ED 015 553; Atlanta: University of Georgia</i>	On supervisors' evaluations, fully certified teachers are rated higher than provisionally certified teachers.	A study of 470 beginning teachers in Georgia in the mid 1960's, showing that provisionally certified teachers quit teaching more often than professionally certified teachers, reported less job satisfaction, showed poorer attitudes towards teaching and they were, overall, less competent.
Bliss, T. 1995	<i>Alternate certification in Connecticut: Reshaping the profession. Peabody Journal of Education, 67(3): 35-54 ERIC NO: EJ460465</i>	Alternatively certified teachers are of value.	A study of Connecticut's alternative certification program, cited by Darling-Hammond, which consists of a strong, prolonged mentoring program. The only measures of teacher competency were evaluations by the teachers' pupils, supervisors, and principals.
Borman, S., Rachuba, L. 2000	<i>Qualifications and professional growth opportunities of teachers in high- and low-poverty elementary schools. Journal of Negro Education, 68 (3)</i>	High poverty schools offer fewer opportunities for professional growth; all other teacher variables are similar between low- and high-poverty schools.	This study examined questionnaires given to 712 teachers as part of the national <i>Prospects</i> study and discovered that teacher's experience, the number holding master's degrees and the percentage of certified teachers did not vary between low-, medium-, and high-poverty schools. The only real difference was availability of professional development.
Bowles, S., and Levin, H. 1968	<i>The determinants of scholastic achievement: An appraisal of some recent evidence. Journal of Human Resources, 3: 3-24.</i>	Teacher's verbal ability affects student achievement	Darling-Hammond cites this as one of three studies supporting the effect of verbal ability on student achievement.
Bradshaw, L. and Hawk, P. 1996	<i>Teacher certification: does it really make a difference in student achievement? Greenville, NC: Eastern North Carolina Consortium for Assistance and Research in Education</i>	Alternatively certified teachers and traditionally trained teachers are rated similarly and report similar achievement results with their students.	Alternative candidates are more likely to be male or minority. Achievement results for students are roughly similar, with some mixed, inconclusive results.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
In line with the thinking in the 1960's, Bledsoe is openly skeptical about using student achievement as a measure of teacher effectiveness, as the criterion contains <i>"some striking and potentially pernicious shortcomings. Such pupil gain cannot be treated without proper regard to the total social and psychological context within which the child functions including the ever-present danger of teaching for the test"</i> (page 24).	Yes	✗	✗
The authors own words call into any question any use of this study for discouraging alternative certification: <i>"The program has successfully brought qualified individuals into teaching who contribute excellent subject matter knowledge and professionalism. It has been an external catalyst for change in standard teacher education programs."</i> Student achievement was not measured.	Yes	✓+	✗
This study about teacher characteristics in very poor schools yields significantly different conclusions from those by Darling Hammond (1996 and 1990) and others such as Jonothan Kozol (1991) and J. Oakes (1990).	No	✓+	✓
--	No	✓+	Na
--	No	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Bruno, J., and Doscher, M. 1981	<i>Contributing to the harms of racial isolation: Analysis of requests for teacher transfer in a large urban school district.</i> Education Administration Quarterly, 17 (2):93-108	--	Teacher's verbal ability affects verbal achievement of students, according to Evertson et al.'s interpretation of this study.
Bullough, R., Knowles, J., Crow, N. 1989	<i>Teacher self-concept and student culture in the first year.</i> Teachers College Record, 91(2): 209-233	Preservice training programs fade quickly from new teachers' minds.	Case study indicating the difficulties faced by three teachers as they progressed through their first year of teaching.
Byrne, C. 1983	<i>Teacher knowledge and teacher effectiveness: A literature review, theoretical analysis and discussion of research strategy. Paper presented at the annual meeting of the Northeastern Educational Research Association (Ellenville, New York)</i>	--	A meta-analysis that found 17 studies showing positive relationship between teacher's knowledge of subject matter and student achievement; 14 showing no relationship. Evertson et al. cite this study as one of four showing there is "no or negative relationship between teacher knowledge and student achievement as measured by GPA and standardized tests" (see also Eisenberg, 1977; Maguire, 1966; and Siegel, 1969).
Caruthers, B. 1967	<i>Teacher preparation and experience related to achievement of fifth grade pupils in science.</i> Dissertation Abstracts International, 28 (06), 1078A	Teachers' knowledge of subject matter affects student achievement.	A study cited by Ashton and Crocker that found that pupils of inexperienced teachers who had good academic preparation in science (an average of 18 credit hours) outperformed pupils whose teachers were experienced but not prepared in science.
Center for the Study of Teaching and Policy 1998	<i>Policy and Excellent Teaching: Focus for a National Research Center.</i> University of Washington	Teacher quality is important.	This paper was provided by the Maryland State Department of Education as evidence of certification's value.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓+	✓
All three teachers were certified.	Yes	✓+	✗
Three of the four papers cited by Evertson et al. were never published, including this one, and the fourth (Eisenberg) had both methodological flaws and found that teacher's subject matter knowledge did matter. The consensus by Darling Hammond and Evertson et al. finding subject matter not to be significant is an odd conclusion. Byrne found only positive effects in his review of 30 studies, some significant, some not significant. To her credit, Darling Hammond acknowledges that many of the studies reporting insignificant positive effects may have studied teachers who were too much alike to show much variability.	Yes	✗	Na
Unpublished dissertation.	Yes	✗	✗
This paper presents no findings or summary of research. It is a position paper issued from a new research center whose mission is to investigate the relationship between excellent teaching and policymaking decisions.	Yes	✓	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Chaney, B. 1995	<i>Student outcomes and the professional preparation of 8th grade teachers. NSF/NELS:88 Teacher transcript analysis. Rockville, MD: Westat</i>	--	Teachers who take more courses in their subject matter tend to have students with higher levels of achievement.
Coleman, J. et al. 1966	Equality of educational opportunity. Washington, D.C.: Government Printing Office	Verbal ability correlates with student achievement; Teacher experience does not matter.	Enormous landmark study of 3,155 schools and 60,000 teachers, grades 6 and beyond, that altered how education research should be done, introducing the "production-function" approach. Darling-Hammond cites this as one three studies supporting the effect of verbal ability on student achievement. The test that Coleman used was a short 30-item vocabulary test. On the subject of teacher attributes, Coleman said this: " <i>Teachers appeared to matter, at least for Negroes. A list of variables concerning such matters as teachers' scores on a vocabulary test, their own level of education, their years of experience, showed little relation to achievement of white students, but some for Negroes, and increasingly with higher grade levels. Even so, none of these effects was large; the between-school variance was so little to begin with, dividing it up, parceling it out between this factor and that, produced unimpressive results at best, and demoralizing at worst.</i> "
Coleman, J. et al. 1982	<i>Cognitive outcomes in public and private schools. Sociology of Education, 55(2-3): 65-76</i>	Private and Catholic schools produce higher student achievement because there are greater academic demands and more ordered environments.	In this study, Coleman provides research as to the importance of school quality.
Copley, P. 1975	<i>A study of the effect of professional education courses on beginning teachers. Springfield: MO: Southwest Missouri State University ERIC: ED 098 147</i>	Education coursework helps beginning teachers have the right attitude.	Cited by Ashton and Crocker, this is a study of new teachers who had a variety of backgrounds but who graduated from the same university. The measure is a teaching effectiveness scale developed by doctoral dissertation students. The education majors fared better on the measure.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓	✓
Coleman's work is critized now for using crude measures, using averages rather than teacher or pupil specific data to generate findings, a practice which can distort findings (aggregation bias). Coleman's finding that student background is the most important variable has not been successfully challenged to this day; but his other findings, such as the surprisingly small impact that school resources have on achievement, continue to be challenged regularly. Hanushek notes that Coleman's research is now " <i>commonly held to be seriously flawed but his work is more important in terms of its intellectual history than its insights into schools and education programs.</i> " Coleman himself continued to refine his own results, showing the importance of teacher quality, especially on children who are poor.	No	✓	✓
--	No	✓+	✓
Not one of the measures assessed had anything to do with how much students were learning, but instead asked principals to evaluate teachers on such measures as how often they participated in professional meetings or if they had a good disposition or sense of humor.	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Cornett, L. 1984	<i>A comparison of teacher certification test scores and performance evaluations for graduates in three southern states, Southern Regional Education Board</i>	Liberal arts graduates outscore teacher education graduates in tests of general knowledge and professional education.	Haberman cites Cornett's findings for showing that uncertified teachers score higher on the NTE than regularly certified teachers.
Council for School Performance 1997	<i>Teachers with advanced degrees advance student learning. Atlanta: Georgia State University.</i>	--	Darling-Hammond cites this as one of three studies showing that students who achieve at higher levels are less likely to drop out when taught by teachers who have certification in their teaching field, master's degrees, and have enrolled in graduate studies.
Culpepper, J. 1972	<i>A comparison of the academic preparation of high school biology teachers to student achievement in biology...Unpublished doctoral dissertation, University of Arkansas, Fayetteville</i>	Not Retrievable	Study cited by Ashton and Crocker that found a positive correlation between teachers' credit hours earned in biology and student gains on a biology achievement test.
Darling-Hammond, L. 1992	<i>Teaching and Knowledge: Policy issues posed by alternate certification for teachers. Teaching Quality Policy Briefs, Center for the Study of Teaching and Policy ctpweb.org.</i>	Alternative certification of teachers is a high-risk strategy on the part of states to boost the numbers of eligible teachers.	Darling-Hammond reviews a number of studies on the effectiveness of relatively new alternative certification programs in several states, giving kudos to Maryland for developing a fairly good program, in her view. She distinguishes between the types of alternative route programs. To bolster her argument that alternative certification programs are risky and often produce candidates inferior to those produced by traditional routes, Darling-Hammond cites research by Lutz and Hutton (1989), Stoddart (1992), Bliss (1992), Darling-Hammond (1989), and Wale and Irons (1990).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Haberman asserts that this study did not compare liberal arts graduates with teacher education graduates, but compared temporarily certified teachers (who were liberal arts graduates who had already passed the NTE) with regularly certified teachers. His distinction is perplexing; the debate over certification should not be construed as an advocacy for substandard teaching candidates who could not have passed the relatively easy NTE.	Yes	✗	✗
This research is of little use. Darling-Hammond acknowledges that this study and the other two she cites for support of her thesis on the relationship between teacher background and dropout rates (see Sanders et al., Knoblock) are problematic. They did not control for poverty, language background, or other school resources. As such they should not be cited as evidence, even with this caveat.	Yes	✗	✗
Unpublished dissertation.	No	✗	?
On the most important question of the quality of graduates of alternative programs, the studies cited by Darling-Hammond found that graduates of alternative programs are at least as effective at raising academic achievement as those who graduate from traditional programs. Lutz and Hutton, for example, conclude that <i>[o]n virtually every indicator examined in this study, Alternatively Certified interns did as well as first-year teachers were doing</i> (p. 25). Darling-Hammond concludes correctly that assessments of program preparation depend often on whether one wants to see the glass half empty or half full (p137). She chooses to view traditional programs, often with questionable records, as half full; and she views alternative programs, often with promising results, as half empty.	Yes	✗	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Darling-Hammond, L. 1997	<i>Doing what matters most: Investing in quality teaching. National Commission on Teaching and America's Future</i>	The United States has no real system in place to ensure that teachers get access to the kinds of knowledge they need to help their students succeed.	Darling-Hammond makes many assertions, consistent with her arguments in favor of formal teacher preparation. On page 10 she writes the following: "Reviews of more than two hundred studies contradict the long standing myths that 'anyone can teach' and that 'teachers are born and not made.' This research also makes it clear that teachers need to know much more than the subject matter they teach. Teacher education, as it turns out, matters a great deal."
Darling-Hammond, L. 1999	<i>Teacher Quality and Student Achievement: A Review of State Policy Evidence. University of Washington: Center for the Study of Teaching and Policy</i>	Measures of teacher preparation and certification are by far the strongest correlates of student achievement in reading and math, even before controlling for poverty and language status.	Significant report, highly persuasive on the first read, and has already been absorbed into the mainstream knowledge of what people believe contributes to effective teaching. Darling-Hammond presents her well publicized analysis of NAEP data comparing these scores to the education background of 65,000 teachers, asserting that both certification and a degree in the field have a significant effect on student achievement. Wilson et al. cite this study as one of four (out of five reviewed) showing that certified teachers are stronger than noncertified teachers (see also Felter, 1999; Grossman, 1989; Hawk et al., 1985).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>All of the research containing the 200 studies cited by Darling-Hammond in this paper are analyzed in this appendix and none bear up to scrutiny. The 200 studies are derived from the following studies:</p> <p>Ashton and Crocker, 1987 (multiple studies dating from 1957 to 1986)</p> <p>Evertson, Hawley and Zlotnick, 1985 (multiple studies dating from 1946 to 1984)</p> <p>Darling-Hammond, 1992 (multiple studies dating from 1961-1990)</p> <p>Haberman, 1984 (1 study)</p> <p>Druva and Anderson, 1985 (65 studies dating from 1966-1975)</p> <p>Begle, 1979 (1 study)</p> <p>Erekson and Barr, 1985 (1 study)</p> <p>Greenberg, 1983 (4 studies, dating from 1967 to 1975)</p> <p>Guyton and Farakhi, 1987 (1 study)</p> <p>Denton and Lacina (4 studies, dating from 1979-1984)</p> <p>Perkes, 1967 (1 study)</p> <p>Hansen, 1988 (1 study)</p> <p>Hawk, Coble and Swanson, 1985 (1 study)</p>	Yes	✗	Na
<p>This study uses poor science, something the casual reader (or a reporter from Education Week) may fail to notice. Darling-Hammond's results from her analysis of NAEP scores and teacher background data are both implausible and inconsistent with other research. She reports massive effects of teachers on student achievement which are unseen in any other research. Even Ferguson's results (1991), which yielded results that were at the top end of the scale for the influence of an effective teacher on student achievement, pale in comparison to Darling-Hammond's findings. Further, her data do not always make sense and are not explained. Certainly no other researcher has replicated her findings. One of the variables she uses for analyzing 4th grade math scores is "percent of teachers out-of-field;" but fourth-grade teachers are not certified in math so how does she define them as "out of field"? Even if one were to accept Darling-Hammond's analysis, a teacher's certification status is only shown to have a significant effect on one out of six measurements that were performed: the 1992 reading scores for 4th graders.</p> <p>Most significantly, the basic problem with this study is that the analysis is done at the state-wide level. Studies of effects of school resources on student outcomes become increasingly problematic as they move further away from the classroom level. This problem is known as "aggregation bias." Most research scientists would not attempt to make conclusions drawn from this high level of aggregation (see Hanushek, 1996). On page 28, Darling-Hammond acknowledges the problems with her aggregation, stating that "Aggregating data to the state level produces different results than one would find on one looked at similar kinds of data at the individual student, teacher, school, or district level." <i>For the purpose of this profession</i>, Darling-Hammond then states that the data is still useful <i>assessing broad policy influences at the state level.</i>"</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Darling-Hammond, L. 1999b	<i>State Teaching Policies and Student Achievement</i>	Both teacher certification and teacher subject matter knowledge have enormous effects on student achievement.	This is a shorter version of Darling-Hammond's 1999 paper entitled <i>Teacher Quality and Student Achievement: A Review of State Policy Evidence</i> .
Darling-Hammond, L. 2000	<i>Reforming Teacher Preparation and Licensing: Debating the Evidence.</i> www.teacherscollegerecord.org	There is a body of professional knowledge about teaching and learning that should be formally imparted to individuals who want to teach.	A rejoinder to Ballou and Pogursky's article challenging the findings of her 1996 analysis. Darling-Hammond makes strong statements, backed up by numerous citations, which prove endlessly problematic upon examination. For example, Darling-Hammond reasserts her principal thesis, supported by ten studies: " <i>Knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge</i> " (page 22). These ten studies can be reviewed here (see Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1986; Monk, 1994; and Perkes, 1967). All but one of these studies (Monk) fail to provide unequivocal evidence to support Darling-Hammond's thesis for three principal reasons: 1) they did not use student achievement as the measure of teacher effectiveness; or, 2) their conclusions are far more debatable than Darling-Hammond acknowledges; or 3) they are fraught with methodological difficulties, such as inadequate sample sizes, lack of proper controls, or invalid measurements.
Darling-Hammond, L., Barry, B., and Thoreson, A. 2001	<i>Does teacher certification matter? Evaluating the evidence.</i> Educational Evaluation and Policy Analysis, Spring 2001	Teacher certification matters.	This paper challenges the Goldhaber and Brewer (2000) study which found that teacher certification did not affect student achievement in a study of 12th graders. Darling-Hammond asserts that Goldhaber and Brewer's analysis 1) demonstrated a poor understanding of how state certification systems work; 2) that they did not adequately examine the available data on the emergency certified teachers, who, Darling-Hammond claims, were similarly prepared to those with standard certification, and 3) that they neglected to include much of the existing research showing that certification does matter. Darling-Hammond also takes exception to their using a sample size of 58 emergency credentialed teachers out of a total number of 3,469 teachers, which leaves the sample "too vulnerable to sub-sampling error."
Darling-Hammond, L., Hudson, L., Kirby, S. 1989	<i>Redesigning teacher education: Opening the door for new recruits to science and mathematics teaching.</i> Santa Monica: The RAND Corporation	--	Paper discussing the various nontraditional routes into teaching, with nontraditional teaching programs supplying a significant number of mathematics and science teachers to school systems in their areas. Paper argues that these teachers cannot fully overcome the difficulties faced by all teachers making recruitment and retention of teachers difficult.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
see Darling-Hammond, 1999.	Yes	✗	Na
<p>Responding to Ballou and Pogursky's challenge of Darling-Hammond's 1999 analysis, she takes great issue with them for criticizing her vague characterization of the importance of "<i>teacher expertise</i>." They had asserted that Darling-Hammond essentially misled readers when she presented her elaborate case supporting the need for "teacher expertise," a mercurial term only loosely defined by Darling-Hammond. Ballou and Podgursky argue that more precision about what this term meant was in order, if the ultimate intent was to make the case for teachers needing to be certified or having master's degrees, and not obfuscated behind a term that the reader is uncertain as to its meaning or misled by. For example, when pressed, Darling-Hammond acknowledges that <u>teacher experience</u> is one of the variables that she included to strengthen the effect on student achievement from "teacher expertise." Without including experience, the effect size would not have been nearly so impressive. The other variables feeding into teacher expertise yield very little evidence for certification, but even more conclusively, master's degrees do not improve student achievement.</p> <p>Darling-Hammond also takes exception to Ballou and Pogursky's skepticism over Ferguson's 1991 study of Texas school districts. Her response to their challenge implies that Ferguson's conclusions should not be looked at skeptically, even if Ferguson's methodology may have been found wanting.</p> <p>Throughout, Darling Hammond claims Ballou and Pogursky have misconstrued her meaning on statements made in previous work, which Ballou and Pogursky found to be misleading, inconsistent, or just wrong. Darling-Hammond's assertions in both the 1999 and 2000 study are sufficiently addressed in the body of this paper and in this Appendix.</p>	Yes	✓+	✗
<p>The approximately 40 studies named by Darling-Hammond that support teacher certification benefits are the same studies cited in earlier papers, with the exception of an unpublished study released by the Los Angeles County Office of Education (1999). Goldhaber and Brewer (2001) dispute many of Darling-Hammond's claims in their rejoinder, published in the same issue.</p>	Yes	✓+	Na
<p>In it, Darling-Hammond acknowledges that new graduates from alternative teacher education programs have similar attrition rates as those from traditional programs and that they express similar concerns about their teaching experience.</p>	Yes	✓	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Darling-Hammond, L., Wise, A., and Pease, S. 1983	<i>Teacher evaluation in the organizational context: a review of the literature.</i> Review of Educational Research, 53: 285-237	Student achievement should be the definition of quality teaching.	The main point of this article, as summarized by Darling-Hammond in 1999, was to advocate using student achievement as the measure of teacher effectiveness. Darling-Hammond et al. provide considerable evidence of the lack of reliability, validity, generalizability, objectivity, and stability of teacher evaluations, be they performed by principals, students, other teachers, or supervisors.
Davis, C. 1964	<i>Selected teaching-learning factors contributing to achievement in chemistry and physics. Unpublished doctoral dissertation, University of North Carolina, Chapel Hill</i>	Teacher's science coursework and professional development improves student achievement.	The study involving 28 science teachers showed that their students achieved more if the teachers had taken more science coursework and had attended National Science Foundation summer institutes. Ashton and Crocker cite this dissertation, but dismiss the findings, with good cause, because too few teachers were involved. Darling-Hammond (1992) cites this study as one of three (<i>see also</i> Druva and Anderson, 1983; Taylor, 1957) to support a statement that the research finds " <i>consistently, positive relationships between student achievement in science and the teacher's background in both education courses and science courses.</i> "
Denton, J. and Lacina, L. 1984	<i>Quantity of professional education coursework linked with process measures of education.</i> Teacher Education and Practice, 1: 39-46.	Supervisors rank teachers higher who have had education coursework.	This study examined 82 student teachers, classified as education majors or noneducation majors. It compared the differences in their morale and ratings by their supervisors. The study is the <i>lone</i> study cited by Darling-Hammond (1992 on page 134; 1999 on page 8; 2001 on page 24) for showing a " <i>positive relationship between the extent of professional education coursework and teaching performance, including student achievement.</i> " She also cites this article as one of 10 studies that support her assertion that " <i>knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge</i> " (2000; page 22). [See also Begle, 1979; Begle and Geeslin, 1972; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.] Evertson et al. cite this study as one of three studies (out of four), providing evidence that student achievement is tied to teacher certification (<i>see also</i> Hall, 1962; Taylor, 1957).
Denton, J. and Smith, N. 1983	<i>Alternative teacher preparation programs: A cost effective comparison. Paper presented at the annual meeting of the American Educational Research Association (New Orleans)</i>	There is no difference between alternatively trained teachers and certified teachers.	Study of education majors at Texas A&M University, comparing traditionally trained teachers with students entering an alternative teaching program at the same university. Evertson et al. cite this study for " <i>finding no relationship between the GPAs of either education majors or nonmajors and the cognitive attainment of the students they taught</i> " as student teachers (page 4).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	Yes	✓+	Na
<p>The small sample size of 28 teachers is problematic, as is the fact that the dissertation was never published. Though Ashton and Crocker dismiss Davis for sound reasons, they do not dismiss two other studies reaching opposite findings, which had similarly small sample sizes. Darling-Hammond's citation of the three studies (including Druva and Anderson, Taylor) is puzzling. Presumably she equates National Science Foundation workshops, which practicing teachers take during the summer for professional development, as "background in education courses." This approach is a bit of a stretch.</p> <p>Druva and Anderson did not find a statistically significant relationship between education courses and student achievement. Taylor, 1957 did not use student achievement as a variable.</p>	Yes	✗	✗
<p>This article did not examine student achievement at all, as Darling-Hammond and Evertson et al. claimed. It looked only at two measures: the self-reported morale of student teachers and their supervisors' ratings of them. The only reference to student achievement is found in the conclusion, referring to earlier studies by Denton that compared the learning gains in classes taught by student teachers who were education majors to those who were not. Denton's methodology in these studies dismisses its relevance for making any generalizations: each student teacher designed her or his own assessment, independent of the other student teachers. Denton compared the student results across these unequated tests, a fact that was confirmed to us by Denton in an email dated July 24, 2001.</p>	Yes	✗	✗
<p>This study provides no clarity on the value of teacher certification. As in the above work by Denton, each student teacher in the study designed his/her own test to administer to his or her class and the results of students' scores on these disparate tests were compared. It is no more reliable than comparing student report grades.</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Druva, C., and Anderson, R. 1983	<i>Science teacher characteristics by teacher behavior and by student outcome: A meta-analysis of research.</i> Journal of Research in Science Teaching, 20(5): 467-479.	Coursework in subject matter, in education, and overall academic performance are positively associated with pupils' ratings and principals' evaluations.	Meta-analysis of 65 studies looking at multiple measures of teacher characteristics, including analysis of teacher's subject matter, experience and preparation. Darling-Hammond (2000) cites this article as one of 10 studies that support her assertion: "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (page 22). [See also Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Evertson et al., 1985, Ferguson and Womack, 1993; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.] This study is also one of three studies cited by Darling-Hammond in 1992 (see also Davis, 1964; Taylor, 1957) said to support the relationship between student achievement and education coursework in science.
Ducharme, R.J. 1970	<i>Selected preservice factors related to success of the beginning teacher. Doctoral dissertation; Louisiana State Agricultural and Mechanical College</i>	NTE and college entrance exams do not correlate with principals' expectations of teachers.	Dissertation comparing academic data of 105 elementary school teachers with "nine personal factors [that might] predict principals' ratings and pupil growth" according to Greenberg's interpretation of this study. The academic data included scores on college entrance exams, the NTE, teachers' GPAs and their ratings as student teachers. It found that the teachers' NTE scores and college entrance exams did not correlate with any of the "personal factors." However, teachers' GPAs did positively correlate with them.
Education Trust 1998	<i>Good teaching matters: How well qualified teachers can close the gap. Washington, DC: The Education Trust 3(2)</i>	Effective teachers as measured by verbal ability and content knowledge have an inordinately significant effect on student achievement.	Though verbal ability and content knowledge have been shown to be important, education coursework, advanced education degrees, teacher exams, and years of experience have not demonstrated a clear relationship to teacher effectiveness and student achievement. Citing research from unpublished studies in Dallas, Boston, and Hawaii, along with published evidence provided by Sanders, Ferguson, Goldhaber and Brewer, Education Trust casts attention on the significant impact that good and bad teachers have on student learning.
Education Trust 2000	<i>Honor in the boxcar: Equalizing teacher quality. Washington, D.C.: The Education Trust 4(1)</i>	Poor and minority children are assigned disproportionately teachers with low credentials.	--
Education Week 2000	<i>Students in Dire Need of Good Teachers Often get the Least Qualified or Less Experienced.</i> March 22, 2000 Education Week	Teachers of quality are important for minority student achievement.	News article provided by the Maryland State Department of Education as evidence of certification's value. It highlights problems of minority students who get the worst teachers, and quoting from the research looking at different teacher characteristics which may have an impact on teacher quality: race, teachers' social class, teachers with degrees from better colleges, higher scores on standardized tests.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>This study found that science coursework was more significant than education coursework when the variables were looked at separately. In order to achieve a statistically significant result under the category "Education and Performance," the authors bundle education courses with six other variables, including GPA, student teaching grade and experience. The relationship between education courses and student achievement was not statistically significant, but courses in science were.</p> <p>The quality of this meta-analysis should be questioned: 52 of the studies were dissertations; 2 were unpublished articles, and only 11 were studies published in journals, many of which were not refereed journals.</p>	Yes	✓+	Na
<p>This dissertation was never published. The dissertation did not look at student achievement or even supervisor's ratings, but at "personal factors that could <i>predict</i> pupil growth."</p>	Yes	✗	✗
<p>Too much of Education Trust's work is predicated on unpublished findings not scrutinized by peer review.</p>	No	✗	Na
--	No	✗	Na
<p>Nothing in the article provides any evidence that a certified teacher is more effective in the classroom than uncertified teachers. Lacking any established relationship between an individual's ability to pass the Praxis test and undergraduate teacher training, the case is not made. For example, in Maryland, Teach for America teachers, who do not have any undergraduate teacher training, pass the Praxis 1 test at a higher rate (i 1999, 93% compared to a significantly lower rate for Maryland teaching candidates of 63%).</p>	Yes	✗	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Educational Testing Service 1999	<i>The academic quality of prospective teachers.</i> Princeton, NJ: Educational Testing Service	Individuals who enter the teaching profession are more intelligent than previously acknowledged.	Maryland's education department cited this study as evidence of the value of certification. This study examines SAT and ACT scores for individuals who enter teaching as a career and finds they are more capable than previously assumed or measured, but that there is still a gap in ability, especially for elementary education majors. In addition, the study reports that individuals who are trained at institutions accredited by NCATE pass the national teachers' exam at a higher rate than those who do not attend teacher education programs.
Ehrenberg, R. and Brewer, D. 1994	<i>Do school and teacher characteristics matter? Evidence from high school and beyond.</i> Economics of Education Review, 14: 1-23	Verbal ability affects student achievement; selectivity of college is related positively to student achievement.	While verbal ability and selectivity of college are related strongly to student achievement, teacher race has <i>some</i> effect on student achievement; teacher's master's degrees have a <i>negative</i> effect on student achievement. After controlling for verbal ability, black teachers produced lower gains in elementary black students and white high school students than white teachers; but they produced higher gains for black high school students.
Ehrenberg, R., and Brewer, D. 1995	<i>Did teachers' verbal ability and race matter in the 1960s? Coleman revisited.</i> Economics of Education Review, 14: 1-21	Teacher's verbal ability effects student achievement.	Teacher's scores on short verbal ability test correlated with higher student achievement, after controlling for teacher's experience and graduate education.
Ehrenberg, R., Goldhaber, D., and Brewer, D. 1994	<i>Do teacher's race, gender, and ethnicity matter? Evidence form the National Education Longitudinal Study of 1988.</i> Industrial and Labor Relations Review, 48: 547-61	Race of teacher does not affect student achievement	Study showed no statistical significant effect of the race of the teacher on students' scores on NELS.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
There are two substantial errors in the methodology of this report: 1) Praxis II pass scores vary considerably from state to state as does the share of test-takers who graduate from NCATE-accredited schools. The positive relationship between the number of NCATE schools and the Praxis pass rate <i>may</i> simply reflect the fact that NCATE schools tend to be located in states with low cutoff scores. 2) Researchers classified test-takers on the basis of the college they attended and not whether they were enrolled in or completed a teacher training program. In fact, 14 percent of the sample of test-takers report that they were never enrolled in a teacher training program.	Yes	✓	✓
--	No	✓+	✓
--	No	✓+	✓
--	No	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Eisenberg, T. 1977	<i>Begle revisited: Teacher knowledge and student achievement in algebra.</i> Journal of Research in Mathematics Education, 8(3): 216-222	Teacher's knowledge of subject matter and the number of postcalculus courses correlate with student achievement.	Study of 28 algebra teachers looking at relationship between teacher's knowledge of algebra, experience, college mathematics GPA, and number of postcalculus courses taken with student scores on algebraic concepts and skills. Evertson et al. cite this as one of 4 studies, showing there is no or negative relationship between teacher knowledge and student achievement as measured by GPA and standardized tests (page 6).
Elkind, D. 1999	<i>Educational research and the science of education.</i> Educational Psychology Review, 11(3)	Educational research has not developed a science of education.	--
Ellis, J. 1961	<i>Relationships between aspects of preparation and measures of performance of secondary teachers of social studies.</i> Journal of Educational Research, 55: 24-28	--	Ashton and Crocker cite this study for finding that certified teachers receive higher ratings from their principals.
Erekson, T.L. and Barr, L. 1985	<i>Alternative credentialing: Lessons from vocational education.</i> Journal of Teacher Education, 36(3): 16-19	Vocational education alternative teachers need more in-service and may leave at a higher rate.	Darling Hammond (1992) cites this paper about vocational education teachers for finding that "teachers with substandard certification are less effective overall than prepared teachers" (131). She cites it in 1999 and again in 2001 as one of six studies that found that the education preparation influences teachers ratings and student achievement (see also Hice, 1970; Lupone, 1961; McNeil, 1974; Roupp et al., 1979; Hansen, 1988).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>Evertson et al.'s interpretation of Eisenberg is indefensible. They cite this study to support their belief that subject matter is not all that important, because of the lack of an effect from GPA found by Eisenberg, without mentioning that teacher's knowledge of subject matter clearly did have a significant effect, as measured by their knowledge of algebraic structures and postgraduate calculus coursework.</p> <p>The other three studies cited by Evertson et al. were never published (Maguire, 1966; Byrne, 1983; and Siegel, 1969). Even discounting this problem, the findings from these studies too are mischaracterized.</p> <p>The number of teachers (28) studied does not permit the results to be generalized with any confidence.</p>	Yes	✓+	✓
--	No	✓+	Na
<p>Ratings are unreliable measures of teacher effectiveness as the correlation depends on the construct of the ratings instrument.</p>	Yes	✓+	✗
<p>The article-which is not a study--does not say alternatively trained vocational education teachers are less effective, and certainly not in terms of their students' achievement. It suggests that such teachers may request more in-service help and may have a higher turnover rate, but no research is cited.</p>	Yes	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Everston,C., Hawley, W., and Zlotnik, M. 1985	<i>Making a difference in educational quality through teacher education.</i> Journal of Teacher Education 36	Education coursework has a positive effect on supervisor's ratings of teachers. Preservice training in pedagogy is not effective. Teachers' knowledge of subject matter appears to have an insignificant impact on student achievement.	Mediocre review of the research on teacher preparation. In reviewing the research on teacher preparation, Evertson et al. found 13 studies (7 of which were dissertations) that compare the relationship of certification with teacher effectiveness. Of these 13, 3 found a positive effect on <u>student achievement</u> from <u>teacher certification</u> (see Hall, 1962; Taylor, 1957; Denton and Lacina, 1984). Evertson et al. also review studies on the relationship between teacher's <u>subject matter knowledge</u> and <u>student achievement</u> . Darling-Hammond summarizes his review of these 8 studies, stating that 5 of the 8 studies reported no relationship and the remaining 3 found a small positive relationship (see Druva and Anderson, 1983; Massey and Vineyard, 1958; Begle, 1972; Maguire, 1966; Siegel, 1969; Eisenberg, 1977; Byrne, 1983; Hawk et al., 1985). Darling-Hammond (2000) also cites this article as one of 10 studies that support her assertion that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (p. 22). [see Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.]
Farkas, G., et al. 1990	<i>Cultural Resources and School success: Gender, ethnicity, and poverty groups within an urban district.</i> American Sociological Review 55 (1): 27-42	Teacher's race effects student attendance.	Ferguson cites this study for finding that teacher's race affected attendance but not students' achievement.
Feiman-Nemser, S. and Parker, M.	<i>Making subject matter part of the conversation or helping beginning teachers learn to teach.</i> East Lansing, MI: National Center for Research on Teacher Education	--	Darling-Hammond et al. (2001) cite this study as one of six providing evidence that principals, supervisors, and colleagues tend to rate recruits from alternative certified programs "less highly on their instructional skills" [page 25; see also Jelmsberg, 1995; Lenk, 1989; Gomez and Grobe 1990, Mitchell, 1987, Texas Education Agency, 1993]. They also cite it for the greater level of difficulties such teachers face "planning curriculum, teaching, managing the classroom and diagnosing students' learning needs."

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>When we read the three studies Evertson et al. claim support the relationship between student achievement and teacher certification, we reached different conclusions. Of the three: Hall (1962) was never published and should have been discounted; Denton and Lucina (1984) did not even look at measures of student achievement; Taylor (1957) went to great lengths to say something positive about teacher certification by combining its effect with measures of teacher experience.</p> <p>Too, Darling-Hammond's interpretation that 5 out of 8 studies showed no effect on student achievement from subject matter coursework is wrong, not even reflecting Evertson et al.'s math. They seem to put the tally at 4 versus 4, (though most were not significant.) Of the five we were able to retrieve (three were unpublished dissertations), all showed at least a positive effect (see Druva and Anderson, Massey, Begle, Byrne, Hawk et al.).</p> <p>Apart from the errors that Evertson et al. make in their review of this research, they are far more hesitant in reaching any strong conclusions than Darling-Hammond is when she refers to this article. They begin by stating <i>"we acknowledge at the outset that although the number of studies related to teacher education is large, the research is often of dubious scientific merit and fails frequently to address the types of issues about which policy makers are most concerned."</i> They acknowledge the poor retention of material learned in teacher preparation coursework: <i>"overall, there is very good reason to believe that much of what prospective teachers learn in their formal college training is not transferred to their classroom behavior or even that many of the specific skills they acquire do not survive practice teaching."</i></p>	Yes	✓+	Na
--	No	✓+	✓
<p>The measure that Darling-Hammond et al. cite is not a student achievement measure. The authors use only supervisor's ratings, whose relationship with student achievement is not reliably correlated.</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Ferguson, R. and Ladd 1996	<i>How and why money matters: An analysis of Alabama schools. In H. Ladd (ed.), Holding Schools Accountable. Washington, DC: Brookings Institution: 265-298</i>	Teacher's cognitive ability has a strong effect on student achievement. Teachers' possession of master's degrees has a small effect. Teacher experience does not affect student achievement.	Fairly well designed study that analyzed the scores on student achievement tests in 690 Alabama schools. Ferguson and Ladd measured the importance of teacher's cognitive ability on student achievement, by examining teachers' ACT composite scores, both math and verbal. They found this measure to have as much influence on student achievement as whether or not the students' parents went to college. Also, teacher experience was measured by contrasting those who had more than five years of experience against those who had less; not surprisingly, no effect was found (a finding consistent with other research). Darling-Hammond notes the somewhat larger influences of master's degrees in this study compared to Ferguson (1991). Darling-Hammond notes that this study found somewhat smaller influence of teacher test scores, which she labels the ACT test as a "pre-college measure of general academic ability," compared to Ferguson's 1991 study of the "licensing examinations" in Texas, though Ferguson describes it purely as a test of verbal ability, in no way a pedagogical test.
Ferguson, R. 1991	<i>Paying for public education: New evidence on how and why money matters. Harvard Journal on Legislation 28:465-498</i>	Teacher's verbal ability affects student achievement. To a much lesser extent, teacher's experience also affects student achievement. Possession of a master's degree has a small impact on student achievement. Teacher's race does not affect student achievement.	Important study examining 900 Texas school districts, 2.4 million students and 150,000 teachers in grades 1-7. It challenges the findings from Coleman's 1966 landmark study and Hanushek's 1989 survey finding that schools have little impact on student achievement independent of student background and SES. After controlling for family and community background, this study finds that teacher's verbal ability, as measured by teacher performance on the Texas literacy test, has a strong correlation with student achievement. Given that the TECAT was an easy test (a 97% pass rate), Ferguson found it surprising that TECAT scores proved to be such a powerful predictor. This strong effect is followed by smaller but positive effects for teacher experience, followed by master's degrees. Darling-Hammond et al. cite this study for its findings on verbal ability, characterizing the TECAT as a test of "verbal ability, logical thinking, research skills and professional knowledge" and then as a test of pedagogical and subject matter knowledge (2001; page 23) though it clearly was not testing much with a 97% pass rate. She also bundles the various measures of the study to report an effect from "teachers' expertise" consisting of scores on a licensing examination, master's degrees, and experience. By combining these variables, Darling-Hammond reports that teacher expertise accounted for more of the inter-district variation in students' reading and mathematics achievement in grades 1 through 11 than student socioeconomic status. In 2001, Darling Hammond et al. state that Ferguson "found positive ... effects on student achievement of teacher certification status and teacher's scores on certification tests that measure knowledge of teaching as well as subject matter."
Ferguson, R. 1991b	<i>Racial patterns in how school and teacher quality affect achievement and earnings. Challenge 2 (1): 1-26</i>	--	In 1998, Ferguson cites this earlier study of his for its evidence on college training and test scores for teachers.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>The positive effect from teachers master's degrees was found only in math, not reading, and the effect was small.</p> <p>Though the entire study included 690 schools, the analysis of teachers ACT scores included only 35 schools, due to the difficulty of collecting teacher ACT scores.</p>	Yes	✓	✓
<p>Darling-Hammond's somewhat liberal interpretation of the teacher test indicates her unwillingness to acknowledge the paramount importance of verbal ability. The professional knowledge tested on the TECAT constituted a tiny section of the test consisting of certain job-related vocabulary; Ferguson clearly defines the test as a basic literacy test. A more accurate summary would have noted that all but a small fraction of the variance was attributable to teacher's verbal ability, and certainly not master's degrees, which Ferguson notes comprised about 5% of the variance.</p> <p>In addition to Ferguson, Darling-Hammond et al. (2001) cite three other studies to support their statement relating student achievement to certification status, but none of them do. See Strauss and Sawyer, 1986; Los Angeles County Office of Education, 1999; and Fetler, 1999.</p> <p>Ferguson's study may suffer from a classic methodological misinterpretation known as <i>aggregation bias</i>. As the measure of student achievement, Ferguson analyzed the averages of teacher and student variables in particular schools, not the variables of individual teachers and students. Ferguson's findings may well be right, and if so his work can rightfully be considered groundbreaking, but his findings would first benefit from disaggregation, as he himself admits.</p>	Yes	✓+	✓
--	No	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Ferguson, R. 1998	<i>Can schools narrow the Black-White test score gap?</i> Ferguson, R., "Can schools narrow the black white test score gap?" in C. Jencks and Phillips (eds), <i>The Black White Test Score Gap</i> . Washington, DC: Brookings, 318-374.	Teacher's intelligence affects student achievement.	In this study, Ferguson cited Greenwald, Hedges and Laine to support his contention that teacher test scores and quality of college serve as more refined and powerful predictors of teacher success than general indicators of degrees and certification.
Ferguson, S. and Womack, S. 1993	<i>Impact of subject matter and education coursework on teaching performance.</i> Journal of Teacher Education, 44 (1): 55-63.	Teacher's college GPA and score on the NTE do not correlate with their subsequent supervisor's ratings.	Study of 266 graduates of the teacher education program at Arkansas Tech University. Darling-Hammond (1999, 2001) cites this study claiming it showed that education coursework explained "four times (16%) the variance in teacher performance" than did measures of content knowledge, NTE and GPA in the major (4%). She also (2000) cites this article as one of 10 studies that support her assertion that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (p.22). [See also Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Guyton and Farokhi, 1987; Monk, 1994; Perkes, 1967.] Wilson et al. cite this study as one of three studies that showed pedagogical coursework to be more important than measures relating to subject matter knowledge [see also Guyton and Farokhi, 1987; Monk, 1994].
Fetler, M. 1999	<i>High School Characteristics and Mathematics Tests results.</i> Education Policy Analysis Archives, 7(9)	Teacher experience and preparation are significantly related to achievement.	Study looks at huge data base of students attending 795 regular California high schools and their scores on the Stanford Achievement Test in mathematics. Darling-Hammond cites this study for demonstrating the problems with emergency-credentialed teachers: a strong negative relationship between average student scores and percentage of teachers on emergency certification. Wilson et al. cite this study as one of four (out of five they reviewed) showing that certified teachers are stronger than noncertified teachers. [See also Darling Hammond 1999; Grossman, 1989; Hawk et al., 1985.] Darling-Hammond et al. (2001) cite it again for its findings relating certification with student achievement, one of four (see also Ferguson, 1991; Los Angeles County Office of Education, 1999; Strauss and Sawyer, 1986; yet none of these four provide support for this statement.)
Friedman, S 2000	<i>How much of a problem? A reply to Ingersoll (1999).</i> Educational Researcher	The relationship between teacher's knowledge of subject matter and student achievement is neither strong nor established.	This is a rejoinder to Ingersoll's article on the importance of teachers's knowledge of subject matter.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓	✓
<p>This study adds little value to the debate over certification for two reasons. First, it uses supervisor's evaluations as the measure of effective teacher performance. Evaluations generally do not control for student SES. It has been well documented that evaluations are not a reliable predictor of student achievement; their reliability depends upon the particular construct of the evaluation. Second, this study is limited to one university that has very low entrance requirements, making it unlikely that enough variance in student ability, background, and coursework is present to reflect a broader population. The variance may be too narrow or at least skewed toward the lower end of ability.</p> <p>The authors also draw conclusions about the relative importance of education coursework over subject matter knowledge, but look only at inadequate measures of subject matter knowledge: college GPA (which would have included grades on education coursework) and NTE Core Battery scores (which is 40% pedagogy and not a test of subject matter). The authors also make unsupported statements. Given the poor quality of this study, we were surprised Wilson et al. felt it merited inclusion in their 2001 review of teacher quality research.</p>	Yes	✓+	✗
<p>The study makes a critical distinction, subsequently ignored by others when citing its findings. This distinction was confirmed to us in a conversation on August 24, 2001 with the author. The two groups that were studied were classified as "fully credentialed" or "emergency credentialed." The fully credentialed teachers <i>included</i> alternative certification teachers, including those who bypassed the certification route in California by taking a subject matter test. The emergency credentialed teachers by-in-large met no standard of quality, by any measure, by failing the subject matter knowledge test or not passing the test state teacher's exam, among some of the reasons. The author's principal and clear lament is the lack of subject matter knowledge in mathematics, with little mention at all of education coursework that may be lacking.</p>	Yes	✓+	✓
Friedman takes exception to Ingersoll's assertion that it is very important for teachers to be prepared to teach their subject area.	Yes	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Fuller, E. 1999	<i>Does teacher certification matter? High school certification status and student achievement. A draft may be available from the author at edfuller@mail.utexas.edu Charles Dana Center in Austin, Texas.</i>	Teacher credentials affect student achievement	This paper reportedly looked at Texas 3rd, 4th and 5th graders. Its findings were featured prominently in Education Week . ("Teacher study links teacher certification, student success," May 12, 1999) and cited extensively by Darling-Hammond in 1999 and 2000. Preliminary analysis of students' pass rate on the 1997 Texas Assessment of Academic Skills (TAAS) indicated that student pass rates in districts with greater proportions of licensed teachers were significantly higher when compared to districts with lower proportions of licensed teachers. Darling Hammond notes that " <i>the findings were significant even after controlling for students' socioeconomic status, school wealth and teacher experience...and were especially influential on the test performance of elementary students</i> " (p13; p9).
Galambos, E.C. 1985	<i>Teacher preparation: The anatomy of a college degree. Atlanta, GA: Southern Regional Education Board</i>	Education majors are less prepared than academic majors	The SAT scores of education majors are below those of students in arts and sciences by an average of 70 points.
Glassberg, S. 1980	<i>A view of the beginning teacher from a developmental perspective. Paper presented at the American Educational Research Association(Boston)</i>	--	Darling-Hammond cites this article as one of three that suggest that the typical problems of beginning teachers are lessened for those who have had adequate preparation prior to entry (see also Adams et al., 1980; Taylor and Dale, 1971).
Goebel, S., Ronacher, K., Sanchez, K. 1989	<i>An evaluation of HISD's alternative certification program at the academic year: 1988-1989. ERIC: 322103 Houston: HISD Department of Research and Evaluation</i>	Teacher certification does not affect student achievement.	Darling-Hammond notes that this study did not control for students' initial test scores and did not match comparisons of teachers by years of experience. First-year traditionally certified teachers were compared with two groups of alternatively certified teachers: 1-4 years of experience and 5-7 years of experience.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
This study has not been published, as Darling-Hammond's citation implies. In fact, well over two years later the author has yet to release a draft for distribution, but has only made available a draft "for discussion purposes only." Darling Hammond's statement that the findings were especially strong for elementary students is puzzling as the study only looks at elementary-age students. Her statement that the findings were significant, even after controlling for poverty and teacher experience are, also, largely in error. The author's preliminary analysis confined any significant effect to Hispanics <i>only</i> . No other groups demonstrated any effect from teacher credentials.	Yes	✗	✓
--	No	✗	✓
This paper was not published and has not undergone prerequisite academic scrutiny. We reviewed published papers written by the author in the same time period which were on this subject and none presented empirical data on the problems faced by beginning teachers, comparing how they were trained.	Yes	✗	Na
Few studies cited by Darling-Hammond control for student poverty.	No	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Goldhaber, D. and Brewer, D. 2000	<i>Does teacher certification matter? High school certification status and student achievement.</i> Educational Evaluation and Policy Analysis, 22: 129-145	Teachers who are certified in their subject matter have a significantly positive effect on student test scores compared to those who are provisional or who are certified outside their subject area. Teachers with a degree in subject area have higher student achievement than those who do not.	Study compares 12th grade student achievement with over 3,000 teachers who had one of the following backgrounds 1) probationary or emergency certification; 2) private school certification (an ambiguous term that even the researchers were not able to define); 3) no certification in their subject area; 4) standard certification in their subject area (in math and science only). Wilson et al cite this study as one of six (out of seven reviewed) that showed a positive effect on student achievement from subject matter training [see also Darling-Hammond, 1999; Guyton and Farokhi, 1987; Hawk et al., 1985; Monk, 1994; Rowan et al., 1997]. Darling-Hammond (1999) cites this study for showing that "fully certified teachers have a statistically significant positive impact on test scores relative to teachers who are not certified in their subject area, as do teachers who hold a degree in math or math education" (p13).
Goldhaber, D. and Brewer, D. 2001	<i>Evaluating the evidence on teacher certification: A rejoinder.</i> Educational Evaluation and Policy Analysis, Spring 2001	The literature cited by Darling-Hammond, Barry and Thorenson do not meet basic standards of research.	In a rejoinder to Darling-Hammond et al.'s challenge of Goldhaber and Brewer (2000) study, the authors clarify statements made in the 2000 study, but of primary interest to us was their review of the 45 studies cited by Darling-Hammond et al. defending teacher certification. Only 16 out of 45 were published in a peer review journal. Half of the 16 were more than 15 years old. Most of the studies were only tangentially relevant to the debate over teacher certification. Goldhaber and Brewer note that five of the 16 studies were literature reviews, all but one of which concluded that the literature is so rife with methodological problems that very few conclusions can be justifiably drawn.
Goldhaber, D., and Brewer, D. 1996	<i>Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity.</i> Journal of Human Resources, 32: 505-23 ERIC: ED400237	High school mathematics teachers who are certified in mathematics, have a major in mathematics, or have a master's in mathematics demonstrate a positive effect on student achievement.	Study of 5,149 students and 2,245 teachers, examining 10th grade mathematics test scores using the National Educational Longitudinal Study of 1988. This data base offered advantages others have not, because it linked students to a specific class and teacher. In addition to the measures of certification, major, and master's degrees, the authors note there were significant <i>unobservable</i> variables of teacher quality that affected student achievement.
Goldhaber, D., and Brewer, D. 1997	<i>Evaluating the effect of teacher degree level on educational performance.</i> In W. Fowler (Ed.) Developments in school finance, Washington, D.C.: US Dept. of Ed., National Center for Educational Statistics, 199-210.	Certification in math or science has a small effect on student achievement.	While Goldhaber and Brewer found that the percentage of teachers with BA's, MA's, and certification in mathematics or science is positively related to student achievement, the effects are small, a finding which is consistent with previous findings about the relationship of teacher's education and degrees with student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Darling-Hammond's interpretation is puzzling: this study found that teachers with a BA in math education had a negative effect on their students' math achievement.	No	✓+	✓
--	No	✓+	Na
--	No	✓+	✓
It would appear from their findings that education coursework had a negative effect on student achievement. The positive difference may have been the subject matter coursework that teachers had to take to become certified in math or science.	No	✓	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Goldhaber, D., and Brewer, D. 1998	<i>Why should we reward degrees for teachers.</i> Phi Delta Kappan, October 1998: 134-138	Teacher certification does not positively affect student achievement and, in fact, may impede student achievement; master's degrees outside teacher's subject matter do not affect student achievement.	Study looked at over 18,000 10th grade students in the NELS 1988 database, linking students to specific classes and teachers (eliminating problem of data aggregated at school or district level) and comparing their gains from an 8th grade achievement test. The authors found that teacher experience, teacher certification and possession of a master's degree were not associated with higher student test scores. In English, teacher certification actually had a significantly negative effect. Teacher coursework in subject matter had a small but significant effect on student test scores. Authors conclude that only advanced degrees that are specific to the teacher's subject area or discipline should be rewarded.
Gomez, D(eboria) and Grobe, R. 1990	<i>Three years of alternative certification in Dallas: Where are we? Paper presented at the annual meeting of the American Educational Research Association. Boston, MA.</i>	There is no measurable difference between alternatively trained teachers and fully certified teachers.	In five different papers, Darling-Hammond cites Gomez and Grobe study as a key study, central to her thesis that certification contributes to student achievement. She states that this study found that alternatively trained teachers in Texas are not as knowledgeable about instructional techniques and models and are judged more uneven in their teaching performance. The only finding pertaining to student achievement, according to Darling-Hammond, was higher achievement gains in language arts of students of certified teachers. Miller et al. also cite Gomez and Grobe, and report a somewhat different conclusion: they cite the study's findings as suggesting that alternative certification routes do not necessarily lead to lower student outcomes.
Grady, M., Collins, P. and Grady, E. 1991	<i>Teach for America 1991 Summer Institute Evaluation Report. Unpublished manuscript</i>	--	Darling-Hammond et al. cite this study for its findings that alternatively trained teachers have greater difficulties planning curriculum, teaching, managing the classroom and diagnosing students' learning needs.
Greenberg, J.D. 1983	<i>The case for teacher education: Open and Shut.</i> Journal of Teacher Education, 34(4): 2-5	Certified teachers have higher supervisory ratings than noncertified teachers.	Article reviewing the "open and shut" case for teacher's formal preparation. Darling Hammond (1992) cites Greenberg, 1983 as one of three sources to support her statement that "fully prepared and certified teachers are generally more highly rated and more successful with students than teachers without full preparation" (p130; see also Ashton and Crocker, 1987; Evertson et al., 1985).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✗	✓
<p>This paper is the single most elusive paper that we tried to retrieve. Given the multiple citings of this paper, we were determined to find it but never could. The paper was written in the very early days of Texas alternative certification and presented at an AERA conference, but the AERA had no record of it. It took us considerable time to find the authors, (partly because the author's name was listed as "David" Gomez in numerous citations though in fact the author is not David but Deborie Gomez). We realized the problem when we found a reference to a "Grobe" writing education research in California who was married to someone named Gomez, who had been employed in Texas alternative certification office. The authors no longer had a copy of the paper, but they summarized their findings as follows (telephone conversations with Kate Walsh, October 4, 2001):</p> <p>On the positive effects from certified teachers in student achievement in language arts: Gomez and Grobe both separately stated that they had reservations about this finding, that the data was not robust nor was it educationally significant, that other variables came in to play that cast considerable doubt on the finding.</p> <p>On their overall conclusion: Gomez states "We were trying to say that we could see really quality teaching, maturity, diversity, very low attrition [in the alternative certification group]. Our overall theme was that this [alternative certification] was a good and valid way to train teachers.</p> <p>Grobe stated: The significant part of [our findings] was that there was not any difference between the groups; that was the strength of it."</p> <p>Repeated requests to those citing Gomez and Grobe, made by numerous researchers, went unanswered or by responses that they too have no longer have a copy of the paper.</p>	Yes	✗	?
Presents no student achievement measure, only teachers' ratings by their supervisors. This manuscript was never published. The study was conducted on Teach for America teachers in the first year of the organization's existence.	Yes	✗	✗
None of the studies cited by Greenberg looked at student achievement as a measure (Belsoe, Cox and Burnham, 1967; Copley, 1975; Turner, 1975; Beery 1960). They all used supervisory ratings as the measure of teacher effectiveness, a measure which has been widely acknowledged as unreliable, depending upon the construct of the instrument.	Yes	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Greenwald, R., Hedges, L., and Laine, R. 1996	<i>The Effect of School Resources on Student Achievement; and, Interpreting research on school resources and student achievement: A rejoinder to Hanushek.</i> Review of Educational Research, 66(3): 361-396	Teacher's verbal ability has the greatest effect on student achievement of any teacher characteristics, followed by teacher experience and a teacher's possession of a master's degree.	Significant meta-analysis of 60 studies, looking at how school resources can affect student achievement. Unlike Hanushek, these researchers believe that some school resources (teacher ability, education, and experience) are strongly related to student achievement. Using their analysis of the most effective way to spend \$500, Darling-Hammond (2000, page 10) claims it supports putting more school resources into teacher education (defined as master's degrees).
Greenwald, R., Hedges, L., and Laine, R. 1994	<i>Does money matter? A meta-analysis of studies of the effects of differential school inputs on students outcomes.</i> Educational Researcher 23(3): 5-14	--	This meta-analysis found per pupil expenditure and teacher experience had significant positive median effects on student outcomes. Other variables, class size, teacher salaries, administrative inputs were mixed. The effects for teacher education (master's degrees) were negative.
Grissmer, D., Flanagan, A., Kawata, J., Williamson, S. 2000	<i>Improving student achievement: What NAEP state test scores tell us. Santa Monica: The RAND Corporation</i>	Teacher experience and master's degrees do not improve student achievement	Master's degrees (the majority of which are in education, not subject matter) have little effect on student achievement. They concluded that the current compensation system, which encourages the acquiring of higher degrees "is arguably one of the least-efficient expenditures in education" (page 105).
Grossman, P. 1989	<i>Learning to teach without teacher education.</i> Teachers College Record, 91: 191-207	The notion that on-the-job experience is the most effective preparation for new teachers is challenged.	Case study of three new teachers, all of whom entered through alternative routes. Wilson et al. cite this study for finding that secondary teachers with no pedagogical preparation were limited in their ability to engage high school students in the subject matter and that those new teachers taught as they had been taught in high school and college. This is one of four studies (out of five reviewed) that Wilson et al. found showing that certified teachers are stronger than noncertified teachers. [See also Darling Hammond, 1999; Fetler, 1999; Hawk et al., 1985.] Darling-Hammond et al. also cite it for distinguishing the difficulties of alternatively trained teachers.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>We found this paper to be inordinately obtuse, allowing advocates such as Darling-Hammond to reach conclusions about it that just were not there and which, when pressed by us, one of the authors admitted had been the case (see Hedges and Greenwald, 1997). The findings, however poorly articulated, reported massive effects from <u>teacher's verbal ability</u>, an effect which is then barely alluded to in the discussion. Instead, the authors enter into a nonsensical analysis of how to best spend \$500 on school resources, with the clear implication that \$500 spent on teacher education, a variable which showed almost no effect, was a good idea. Since \$500 doesn't necessarily buy higher teacher ability, the strongest variable was ignored.</p> <p>The authors identified 12 studies on teacher ability reporting significant positive effects on student achievement and only 1 study showing a negative effect. (Nine of the 11 remaining studies in this area also had a positive effect, but these effects were insignificant.) On teacher experience, 20 out of 22 studies had a significant positive effect on student achievement (but another 46 studies yielded insignificant effects, mostly positive). On teacher education (whether or not teachers have masters' degrees), the results are far less conclusive. Seven studies showed positive effects contrasted with six negative effects, a margin of one. There were an additional 32 studies that yielded insignificant effects, and nearly half (16) were negative.</p>	Yes	✓+	Na
--	No	✓+	Na
--	No	✓	✓
<p>This study follows only three new teachers, all of whom came from nontraditional backgrounds, so it does not compare their experience with teachers who were traditionally prepared. Given the type of study it is, lacking sufficient sample and a control group, it is inappropriate for Wilson et al. to have used it in a tally of studies to prove that certified teachers are more effective than uncertified teachers.</p>	Yes	✓+	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Grossman, P. 1990	The making of a teacher: Teacher knowledge and teacher education. <i>New York, NY: Teachers College Press</i>	Education majors rank higher than liberal arts graduates on supervisor's ratings.	Ferguson and Womack note that Grossman report that education majors rate higher on classroom management, introducing and concluding lessons, communication skills, pedagogical content knowledge, and ability to relate to students' needs.
Guyton, E., and Farokhi, E. 1987	<i>Relationships among Academic performance, Basic Skills, Subject Matter Knowledge and Teaching skills of Teacher Education Graduates.</i> Journal of Teacher Education, 38: 37-42	Teacher's college GPA correlates with teacher's performance on a basic skills test and a teacher certification test, but none of these measurements correlate with their supervisors' ratings.	Study looked at performance of 273 new teachers from Georgia State University in order to test the assumption that successful academic performance assures good teaching. The authors used three different measures of academic performance for the graduates of the teacher education program: college GPAs, a test of basic skills taken during college and a teacher subject matter test taken after college. All of these measures were correlated with the teacher's performance on an evaluation instrument that consisted of 14 dimensions of teacher performance, administered in the first year of teaching. The researchers found that neither the basic skills test nor the subject matter test predicted the teacher's performance on this assessment; but that the college GPA did, in fact, correlate. Darling-Hammond (2000 and restated in 2001) cites this article as one of ten studies that support her assertion that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (p.22; see also Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Monk, 1994; Perkes, 1967.) Wilson et al. cite this study as 1 of 6 (out of 7 studies they reviewed) that showed a positive effect on student achievement from subject matter training (see also Darling-Hammond, 1999; Goldhaber and Brewer, 2000; Hawk et al., 1983; Monk, 1994; Rowan et al., 1997). They also note that this study is 1 of 3 showing that education coursework is a better predictor of teaching performance than measures related to subject matter knowledge (see also Ferguson and Womack, 1993; Monk, 1994).
Haberman, M, 1984	<i>An evaluation of the rationale for required teacher education: Beginning teachers with or without teacher preparation. Prepared for the National Commission on Excellence in Teacher Education (Minneapolis, MN)</i>	Knowledge of subject matter is necessary but insufficient; teacher education should be improved rather than circumvented.	This paper proposes that extensive knowledge of subject matter is necessary but not sufficient condition for effective teaching and that teacher education is a legitimate professional preparation which should be improved rather than circumvented. Darling Hammond cites this study in reference to her statement that fully prepared and certified teachers are generally more highly rated and more successful with students than teachers without full preparation.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Supervisors' ratings are not reliable predictors of student achievement; it depends on the construct of the ratings instrument. The study did not control for poverty.	Yes	✓	Na
<p>This is a prime example of a weak study which does not tell us very much. At best, the only thing this study indicates is that students who get good grades in a college school of education also do well on the job, as measured by their supervisors' evaluations. There is no comparison group and no measure of student achievement in this study.</p> <p>The study draws all sorts of conclusions about relationships of teacher's knowledge of basic skills, teacher's subject matter knowledge and their college GPA with their performance as a teacher, but the number of teachers in each one of these subsets varies dramatically, with no real explanation of the variation by the researchers. For example, the researchers point to a strong relationship between teachers' subject matter knowledge and their college GPA using data from 411 teachers, and then find that teachers' subject matter knowledge does not correlate with their teaching performance using data from only 232 teachers. What happened to 179 teachers? How do we know that their loss was random? It is incumbent upon the researchers to explain such phenomena.</p> <p>The teacher evaluation that was used to assess these new teachers classroom performance consisted of an elaborate assessment process involving three trained observers, but not one of its 14 components measured reflected or referred to gains in student achievement. Also, the range of the teachers' GPAs and scores on the basic skills and subject matter tests is not reported but would be well worth knowing. The range may have been quite narrow, or at least skewed toward the lower end of ability, given that only teachers graduating from the college of education from a single institution were studied, an institution that has relatively low entry requirements.</p>	4	✓+	×
<p>Haberman cites eight studies that support the value of teacher preparation, six of which are dissertations (Lupone, 1961; Beery, 1962; Gray, 1962; Hall, 1964; Gerlock, 1964; Bledsoe et al., 1967; Matte, 1971, and Copley, 1975). Only one looks at pupil achievement as the measure instead of supervisory ratings and none control for poverty. Haberman says on page 60: <i>"There is little data to connect teacher preparation with pupil achievement scores."</i></p> <p>This too is an unpublished paper, which should discount its consideration.</p>	Yes	×	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Hall, H.O. 1962	<i>Effectiveness of fully certified and provisionally certified first year teachers in teaching certain fundamental skills. Doctoral dissertation, University of Florida</i>	--	Cited by Evertson et al. and Bledsoe et al., dissertation that evaluated teacher effectiveness of 38 beginning elementary teachers in Florida using student achievement on the Stanford Achievement as the measure. Bledsoe reports that Hall concluded that fully certified teachers promoted greater achievement except in arithmetic computation. Evertson et al. cite this study as one of three studies (out of four) providing evidence that student achievement is tied to teacher certification (see also Taylor, 1957; Denton and Lacina, 1984; Hall, 1962).
Hall, H.O. 1964	<i>Professional preparation and teacher effectiveness. Journal of Teacher Education, 15</i>	Teachers' education courses positively affect student achievement on a standardized measure.	Cited by Haberman, a study of first-year elementary teachers in Florida found that student achievement gains were significantly related to teachers' hours of education courses, except in arithmetic computations.
Haney, W., Madaus, G., Kreitzer, A. 1986	<i>Charms talismanic: Testing teachers for the improvement of American education. In EZ Rothkopf (Ed.), Review of Research in Education 14:169-238, Washington, D.C.: American Educational Research Association</i>	The NTE is a poor predictor of teacher effectiveness.	This paper does not present original data on the NTE, but it is a well done analysis of problems using the NTE to predict teacher quality, as well as a history and review of the literature on the NTE. Darling-Hammond (1999) claims this article is one of five showing no relationship between NTE subject matter tests and teacher performance "as measured by student outcomes or supervisory ratings" (page 6).
Hansen, J., Feldhusen, J. 1994	<i>Comparisons of trained and untrained teachers of gifted students. Gifted Child Quarterly, 38(3): 115-122 Summer, 1994</i>	Teachers who are trained in gifted education demonstrate greater teaching skills and develop more positive class climates than untrained teachers.	Study of 82 certified teachers, 54 of whom were taking graduate credits in gifted education. The study found that on an evaluation by trained observers, the teachers who received the specialized training in gifted education received higher ratings from their observers. Darling-Hammond (1992, 1999, 2001) cites this study (though citing it as a 1988 dissertation) as one of six studies (this study was in the field of gifted education) that typically show that teachers who have more formal preparation for teaching <i>have higher ratings and greater student learning gains</i> (see Hice, 1970; LuPone, 1961; McNeil, 1974; Roupp et al., 1979; Erikson and Barr, 1985).
Hanushek, E. 1996	<i>A more complete picture of school resources policies. Review of Educational Research 66:397-409</i>	Lack of resources is not the largest problem facing schools; more fundamental reforms are needed.	Hanushek reviews the same 187 studies as Greenwald, Hedges, and Laine but uses a different approach. He finds no strong evidence that teacher-student ratios, teacher education or teacher experience have the expected positive effect on student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
This aged unpublished dissertation is irretrievable. However, it is presumably the same study Hall published in 1964.	Yes	✗	✗
The sample size of 38 teachers, combined both certified and uncertified, is far too small. The study did not control for poverty.	Yes	✓+	✗
<p>Not one of the five studies that Darling-Hammond cites, including this one, reported a negative relationship with the NTE subject matter tests and student achievement(<i>see also</i> Ayers et Qualls,1979; Andrews et al., 1980; Quirk et al., 1973; Summers and Wolfe, 1977; in fact, Summers and Wolfe found a largely positive relationship). She repeats this error, again, in Darling-Hammond (2000), citing this article in support of statement that <i>"tests of subject matter knowledge have shown little relationship to teaching performance, while measures of subject matter preparation that examine course taking have shown a stronger relationship to teaching performance"</i> (see Andrews et al., 1980; Ayers et Qualls, 1979; Hawk et al.; Monk. 1994; Quirk et al, 1973).</p> <p>Any statements that this paper makes regarding the NTE as a predictor of teacher quality are derived from other studies. Haney et al. rely principally on the research summarized in Quirk et al., 1973; Sheehan and Marcus, 1978; and Ayers and Qualls, 1979. None of the research in any of these three studies supports the notion that there is a negative effect between NTE subject speciality tests and student achievement. I checked with one of the authors (email with George Madaus on March 28, 2001) who said that he had never written a paper himself nor had he seen any research that reported a negative relationship between subject speciality tests and student achievement.</p>	Yes	✓+	Na
<p>The study is not evidence of certification's value but the value of specialized professional development. The study did not measure the effect from the coursework required for teacher certification, because <i>all</i> of the teachers in the study were certified. The researchers were advocating the need for a specialized graduate course in gifted education for teachers of gifted children. They note that high intelligence and strong background knowledge are key for a teacher instructing gifted children (page 115).</p> <p>No student achievement measure was used.</p>	Yes	✗	✓
Hanushek reviews the same 187 studies as Greenwald, Hedges and Laine, but uses a different approach. He finds no strong evidence that teacher-student ratios, teacher education or teacher experience have the expected positive effect on student achievement.	No	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Hanushek, E. 1970	<i>The production of education, teacher quality, and efficiency. In Do Teachers Make a Difference? Washington, D.C.: HEW, 79-99.</i>	--	Summers and Wolfe report that Hanushek finds teacher experience does not affect student achievement in this study.
Hanushek, E. 1971	<i>Teacher characteristics and gains in student achievement: Estimation using micro-data. The American Economic Review 61 (2): 280-288</i>	The effect on student achievement of teacher's verbal ability and general ability is highly significant.	Study of over 1000 second and third grade students and their teachers. Darling-Hammond cites this as one three studies supporting the effect of verbal ability on student achievement. The test that Hanushek used was called "Quick Word Test: Level 2," a test which was considered to be superior to the one used by Coleman in <i>Equality of Educational Opportunity</i> . (Some critics thought Coleman's test was too easy.)
Hanushek, E. 1972	<i>Education and Race: An analysis of the educational production process. Lexington, Mass: D. C. Heath</i>	Selectivity of teacher's college relates to test scores.	Ferguson cites this study for indicating a relationship between college training and test scores.
Hanushek, E. 1986	<i>The economics of schooling: production and efficiency in the public schools. Journal of Economic Literature XXIV: 1141-1178</i>	Quality of teacher matters. Teacher education, as measured by master's degree, does not matter. There is no strong evidence that teacher experience has a positive effect on student achievement.	Of the 106 studies reviewed by Hanushek examining the relationship between teacher education (master's degrees) and student performance, only 11 revealed statistically significant relationships. Of these 11, six showed a positive correlation and five a negative correlation.
Hanushek, E. 1989	<i>The impact of differential expenditures on school performance. Educational Researcher 18 (4):45-62</i>	Teacher salaries and education are not related to student achievement.	Teacher experience was related more consistently to gains in student achievement than were measures of teacher education.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓	✓
Hanushek viewed the verbal test as probably filling two roles: first, it is a measure of communicative ability; second, (as the authors of the test point out), it can be taken as a quick measure of overall intelligence or general ability. He notes important policy implications surrounding the verbal test measure of teacher quality. <i>"By interchanging teachers at the top and bottom of the verbal ability scale, achievement changes by .2 to .4 grade levels. This is very significant. ..."</i> (page 286). Hanushek also finds that graduate coursework in education does not affect student achievement. Experience does not affect student achievement. A teacher's recent educational experience has a significant effect on student achievement.	No	✓+	✓
--	No	✓	✓
While Hanushek finds no compelling evidence that a teacher having a master's degree leads to greater student achievement, Hanushek is emphatic on the impact of teacher quality. Teachers matter, he says, "this conclusion is very firm" (page 1159). Hanushek notes that Coleman's inability to capture the dramatic differences in effectiveness from both teachers and schools may have been a reflection of the difficulty in explicitly measuring the characteristics. He notes that the effect of teacher experience is "hardly overwhelming." Greenwald, Hedges and Laine examine the same set of studies. They use different methodology and reach conflicting findings.	No	✓+	Na
--	No	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Hanushek, E. 1992	<i>The trade-off between child quantity and quality.</i> Journal of Political Economy 100: 84-117	Teacher quality has a highly significant effect on student achievement.	Study of low income families in Gary, Indiana over a four-year period of roughly 1000 students in grades 2-6. Teacher experience matters. Teacher's general ability, as measured by a word test, affects student achievement in reading but not in vocabulary. Teacher's master's degree does not affect student achievement. The difference between a good teacher and a bad teacher can be a full grade level of achievement in a school year.
Hanushek, E. 1996b	<i>School resources and achievement in Maryland.</i> Maryland State Department of Education	Baltimore City school students perform worse than would be expected, given the city's population and resources.	Hanushek reviews the lack of evidence supporting district investments in class size reductions and raising salaries to reward teachers for advanced degrees. Mixed returns are gained from teacher experience. This article presents evidence (presumably for the court case Bradford et al. v. Maryland State Board of Education et al.) that Baltimore City would not benefit from additional resources as much as it could benefit from better school management.
Hanushek, E., Gomes-Neto, J., and Harbison, R. 1992	<i>Self financing educational investments: The quality imperative in developing countries.</i> Typescript: University of Rochester	Teacher knowledge of subject matter has positive effects on student achievement.	This study reports positive and substantively important relationships between measures of teacher knowledge of subject matter and performance of students, according to Monk.
Hanushek, E., Kain, J., Rivkin, S. 1998	<i>Teachers, schools and academic achievement.</i> NBER Working Paper No.6691; in press.	The most significant variable affecting student achievement is teacher quality. Teacher education as measured by master's degrees does not affect student achievement.	Study in Texas of one half million students, tracking two cohorts of students through upper elementary grades, permitting the identification of the importance of specific teachers. Differences in teacher quality swamp all other school inputs (p30), accounting for at least 7.5% of the total variation in student achievement (with the authors believing that the true percentage is considerably larger). Of the measures examined, no common attribute could predict what teacher was going to be successful. Teacher education and teacher experience, after teachers have one or two years of experience, did not predict effectiveness.
Hanushek, E., Rivkin, S., Taylor, L. 1976	<i>Aggregation and the estimated effects of school resources.</i> Review of Economics and Statistics, 78(4): 611-627	Studies which aggregate the data at the state level produce distorted, inflated findings.	Using state-level aggregations inserts a bias into the findings that inflates the factors concerning school input variables or resources. The results do not support the competing hypothesis that aggregation is beneficial because it reduces biases from measurement error. These results are completely consistent with the findings of production function studies. Positive school resource effects on achievement are much more likely to be found when estimation involves state-level data (p105).
Harnisch, D.L. 1987	<i>Characteristics associated with effective public high schools.</i> Journal of Educational Research 80: 233-41	Teachers' masters degrees do not affect student achievement.	Study of students and teachers in over 800 high schools, finding that after prior student achievement is controlled for that a teacher's possession of an advanced degree does not effect student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Hanushek's well earned reputation for reporting on the lack of much effect from school expenditures on student achievement is qualified by his concession here to the impact of teacher quality on student achievement--which Hanushek justifiably does not consider a school expenditure (a bad teacher costs every bit as much as a good teacher). As for the impact of verbal ability on student achievement, Hanushek equivocates a bit. On page 1164 he notes, " <i>The closest thing to a consistent finding among the studies is that "smarter" teachers who perform well on verbal ability tests do better in the classroom. Even for that the evidence is not very strong. There appears to be no strong or systematic relationship between school expenditures and student performance.</i> "	No	✓+	✓
--	No	×	✓
Study was done of Brazilian teachers and students. Can Hanushek's findings be generalized to the US? Hanushek does not believe the results are relevant. A discussion of this study, which was not published, can be found in <i>Educational Performance of the Poor: Lessons from Rural Northeast Brazil</i> (with Ralph W. Harbison). New York: Oxford University Press, 1992.	No	×	✓
--	No	✓+	✓
This study explains why Darling-Hammond's 1999 NAEP analysis--where data are aggregated at the state-level--is so problematic. When one fails to measure key policy differences within states such as wage rate, unemployment rate, percent of unionized workers, college completion, teacher salaries, property value, poverty rate, one runs the risk of "omitted variables bias." In other words a researcher who does not account for all of the variables (and doing so at the state level when looking at teacher quality is not really practical) is quite likely to draw conclusions that are inaccurate and generally inflated on the positive side.	No	✓+	Na
--	No	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Hawk, P., Coble, C., and Swanson, M. 1985	<i>Certification: it does matter.</i> Journal of Teacher Education, May/June	Teacher certification in the teacher's field affects student achievement.	A study of 36 teachers. Certified math teachers produce better results than certified out-of-field teachers. Wilson et al. cite this study as 1 of 4 (out of 5 reviewed) showing that certified teachers are stronger than noncertified teachers [see also Darling-Hammond, 1999; Fetler, 1999; Grossman, 1989].
Hawkins, E., Stancavage, F., Dossey, J. 1998	<i>School policies and practices affecting instruction in mathematics: Findings from the NAEP.</i> Washington, D.C.: US Department of Education, Office of Educational Research and Improvement	Knowledge of subject matter affects student achievement.	This study used the 1996 8th grade NAEP scores to show that students whose teachers held an undergraduate or graduate math degree had higher scores on a student achievement measure than those whose teachers majored in education or some other field.
Hedges, L., and Greenwald, R. 1996	<i>Have times changed? The revelation between school resources and student performance.</i> In G. Burtless (Ed.) Does Money Matter? The effect of school resources on student achievement and adult success. Washington, D.C.: Brookings Institution Press, 74-82	Teacher's verbal ability correlates with student achievement; teacher's masters degrees positively affect student achievement.	Hedges and Greenwald debate Hanushek's meta-analysis of school resources effect on student achievement. Most notably, their own analysis finds that a teacher having a master's degree positively affects student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>The study would have had more to add to this debate if it had compared <i>certified in-field teachers</i> against <i>noncertified teachers but who had majored in the subject area</i>. Both Wilson et al. and Darling-Hammond's conclusions that this study proves that certification makes a difference are puzzling in that the study confirms the obvious point that training in one's subject matter, the only variable that distinguishes a certified in-field teacher from a certified out-of-field teacher, is important.</p> <p>The sample size and the description of the teachers studied are problematic and never adequately explained. From the information we have, we can deduce that there are no more than 18 schools in perhaps one school district in North Carolina. The study does not appear to have controlled for teacher experience. Given the small number and lack of information on the background of the teachers, it is hard to say whether these results would generalize beyond one or two school districts in North Carolina in the early 1980's.</p>	Yes	✓+	✓
--	No	✓	✓
<p>In an email correspondence, February 26, 2001, with Dr. Hedges, he says the following: "<i>Given the studies that have been done (which I find generally unimpressive): teacher ability (which was generally measured as teacher verbal ability) seems to show the strongest and most replicable effect on achievement. Teacher experience seems to show a stronger relation than does teacher education.</i>"</p>	No	✓	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Henke, R., Choy, S., Chen, X., Geis, S., and Alt, M. 1997	<i>America's teachers: Profile of a profession, 1993-94.</i> NCES Report (97-460), Washington, DC: US Department of Education, National Center for Education Statistics	Teacher qualifications differ in poor and affluent schools.	According to Borman's interpretation of this study, the authors found that teachers in high poverty schools were less qualified, reporting fewer experienced teachers, fewer certified teachers, and with fewer teachers holding master's degrees.
Hice, J. 1970	<i>The relationship between teacher characteristics and first-grade achievement.</i> Dissertation Abstracts International, 31 (08) 4036A	Experienced teachers have higher first grade reading achievement; courses in methodology in reading helped to raise student achievement.	Dissertation explored 40 first grade teachers' coursework in reading methods and compared it to their student achievement in reading. Ashton and Crocker cite this study as one of 4 studies (out of a total of 7 studies) that reported a positive effect from education coursework on student achievement. Darling-Hammond (1999) cites this dissertation as one of three studies that typically show that elementary teachers who have more formal preparation in teaching have higher ratings and greater student learning gains (see also LuPone, 1961; and McNeil, 1974) and again in 2001, cites it as one of six showing that education coursework impacts student achievement and teachers' ratings.
Hirsch, E., Koppich, J., Knapp, M.	<i>State Action to Improve Teaching.</i> Center for the Study of Teaching and Policy	States are undertaking a variety of disparate measures to improve teaching quality.	This is a review of what states are doing to improve teacher quality.
Houston, W., Marshall, F., and McDavid, T. 1993	<i>Problems of traditionally prepared and alternatively certified first year teachers.</i> Education and Urban Society, 26: 79-89.	The greater number of problems reported by new alternatively certified teachers compared to new traditionally certified teachers disappears by the end of the first school year.	Study of 231 teachers in Houston which found that while alternatively trained teachers reported experiencing more problems teaching in the beginning of the school year, these problems disappeared after eight months.
Howe, R. 1964	<i>The relationship of learning outcomes to selected teacher factors and teaching methods in tenth grade biology classes in Oregon.</i> Dissertation Abstracts International, 25 (1) 190	Teacher's knowledge of subject matters affects student achievement.	Study looked at 51 teachers in 10th grade biology. With one exception the classes that ranked in the top third of each outcome were all taught by instructors who had taken at least 30 credit hours in college biology and 40 credit hours in all science areas. Ashton and Crocker cite this dissertation as one of five studies out of 13 that showed the effect of subject matter coursework on student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Borman points out an important problem with this research. The authors made a fundamental error by mixing elementary and high schools in the study. The poverty rate in poor high schools tends to be underreported because the poverty rate is dependent on students' self reporting, something fewer high school students are willing to do because of the stigma attached. The problem is compounded by the fact that teachers at the high school level tend to have somewhat stronger qualifications than elementary teachers.	Yes	✓	✓
Ashton and Crocker and Darling-Hammond's conclusions that reading methodology should improve achievement, though certainly logical, accept <i>prima facie</i> the finding of this dissertation that the boys were not affected a teacher's background. why is the lack of effect on boys not troubling? This finding should at least prompt a review of the statistics and indeed the dissertation is full of statistical error. The only measure approaching significance for the boys was something called "affiliation motivation," using an baffling instrument that Hice had adopted from a measure used on secondary school teachers. The questions resemble those found on some self-help tests seen in pop culture magazines. The small sample size of 40 teachers also indicates this study should be looked at with reservation. As a dissertation, we have no assurances that it was properly reviewed. None of the three studies Darling Hammond cites as support have much, if any, value.	Yes	✗	✗
The Maryland department of education gave us this brief as proof of the research to support teacher certification, but this article does not contain any reference to any research and, in fact, applauds those states that focus on outputs rather than inputs.	Yes	✗	Na
--	Yes	✓+	✓
This study has a chicken and egg problem: teachers who are considered strong tend to be assigned to higher ability students.	No	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Hurst, D. 1967	<i>The relationship between certain teacher-related variables and student achievement in third grade arithmetic.</i> Dissertation Abstracts International, 28, 4935A	--	Study of 55 third grade teachers. This dissertation found no significant relationship between credit hours earned in math methodology courses in mathematics and students' mathematics achievement scores on the Metropolitan Achievement Test. Ashton and Crocker cite this dissertation as one of the three studies (out of a total of seven studies) they reviewed that did not find a relationship between teacher education coursework and student achievement.
Ingersoll, R 1998	<i>The problem of out-of-field teaching.</i> Phi Delta Kappan June 1998: 773-776	There is an alarming number of underqualified teachers in American high schools.	Using a massive data base from NCES, the Schools and Staffing Survey, Ingersoll found a significant problem with the American teaching force. A large percentage of teachers lack even a minor in the field in which they are teaching. The field of physical sciences revealed the most underqualified teachers; 41% of the students taking these courses are not taught by a teacher with even a minor. History and math were also especially problematic. Low income public schools have higher levels of out of field teaching than do schools in more affluent communities.
Ingersoll, R. 1997	<i>The status of teaching as a profession: 1990-91.</i> Washington, DC: US Department of Education, National Center for Education Statistics	Teacher qualifications are slightly more stringent in poor schools than more affluent schools.	High poverty schools had slightly more stringent hiring requirements than did low-poverty schools, with more of these schools requiring full certification, graduation from a state-approved teacher program, a minor or major in the teaching field, and passage of the licensure exam. Mentoring programs were available in about the same percentages at both high and low poverty schools, but teachers' decision-making influence was less in high poverty schools.
Jelmsberg 1996	<i>College-based teacher education versus state-sponsored alternative programs.</i> Journal of Teacher Education	--	Survey of 372 New Hampshire alternatively trained and certified elementary and secondary school teachers. Darling-Hammond (2001) cites this study as one of six that provides evidence that principals, supervisors, and colleagues tend to rate recruits from alternative certified programs less highly on their instructional skills (see also Lenk, 1989; Feiman-Nemser and Parker, 1990; Gomez and Grobe, 1990; Mitchell, 1987; and Texas Education Agency, 1993).
Jordan, H.R., Mendro, R., and Weerasinghe, D. 1997	<i>Teacher effects on longitudinal student achievement: A preliminary report on research on teacher effectiveness.</i>	Teacher effectiveness has a remarkable effect on student achievement.	Dallas study of 4th graders assigned highly effective or highly ineffective teachers for three consecutive years. Reading scores for the students assigned the highly effective teachers went from 59th percentile up to 76th percentile by end of sixth grade. Children assigned ineffective teachers went from 60th percentile down to the 42nd percentile. This is an incredible gap of 35% and hugely significant, if accurate. Even more striking results were found in mathematics, with a gap of 50 percentile points at the end of three years. Darling-Hammond (1999) cites this study as one of three finding differential teacher effectiveness to be a strong determinant of differences in student learning, far outweighing the effects of differences in class size and heterogeneity.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Age, lack of requisite controls, small sample size are problematic. It was not published, which discounts its value.	No	✗	✗
<p>When discussing Ingersoll's research, it is important to distinguish between an out-of-field teacher and an uncertified teacher. An out-of-field teacher is usually still certified.</p> <p>Ingersoll has some cogent insight into teacher turnover. Ingersoll argues that the demand for new teachers occurs, primarily, because teachers leave their jobs at far higher rates than do those in many other occupations. Teacher turnover appears to have little to do with a graying teaching force. In contrast, the high rates of teacher turnover that plague schools are far more often a result of two related causes: teachers dissatisfied with teaching and teachers who pursue another career (see Ingersoll, R., <i>Teacher Supply, Teacher Quality, and Teacher Turnover</i>).</p>	No	✗	✓
Interesting insights into the problem at high poverty schools.	Yes	✓	✓
Findings are based on survey responses (with a 40% return). Also used surveys of principals to assess effectiveness for which there was no stated correlation with student achievement.	Yes	✓+	✗
The work apparently never was published, as have none of the three studies cited by Darling-Hammond. An unpublished work, no matter how striking or convincing the results, has not met the standards needed for consideration. Education Trust also does not provide citation for the study. William Sanders cites it as a paper represented at the National Evaluation Institute, Indianapolis, IN.	No	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Kain, J. and Singleton, K. 1996	<i>Equality of educational opportunity revisited.</i> New England Economic Review, May-June:87-111	Teacher's verbal and written ability and experience effect student achievement.	Challenges the findings of the Coleman Report, by analyzing some of the same data set as did Ferguson's Texas study, but this study included a lot of K-6 teachers who had not taken the TECAT. (The authors had to come up with a way to assign TECAT scores to 49 percent of the sample.) The analysis is done at the <i>classroom</i> level, a more accurate level than Ferguson's <i>school district</i> level analysis. Schools with higher percentage of blacks and hispanics had higher percentage of inexperienced teachers, lower TCAT scores, more teachers with 20 plus years, fewer years of post graduate education, and higher class sizes. However, Kain is careful to distinguish between the qualities that more often characterize teachers serving poor children and which of these qualities is responsible for lower student achievement.
Kennedy, M. 1990	<i>A survey of recent literature on teachers' subject matter knowledge.</i> ERIC Clearinghouse on Teacher Education	Subject area coursework is important, as is subject area methodology coursework.	Darling-Hammond cites this paper as one of three, suggesting the importance of methodology coursework in a teacher's subject area (see Wilson et al., 1987 and Shulman, 1986).
Kennedy, M. 1991	<i>Some surprising findings on how teachers learn to teach.</i> Educational Leadership, 49: 14-17	Teachers with majors in their subject area do not apply their knowledge better than a teacher who has not majored in a subject area. Mentors are not necessarily helpful.	Ferguson and Womack cite this large study of 700 teachers and teacher candidates at the National Center for Research on Teacher Learning which revealed that majoring in an academic subject provided no assurance that teachers were prepared to be "effective classroom instructors."
Kiesling, H 1984	<i>Assignment practices and the relationship of instructional time to the reading performance of elementary school children.</i> Economics of Education Review 3(4): 341-50	Teachers' master's degrees have a negative effect on student achievement.	--
Knoblock, G. 1986	<i>Continuing professional education for teachers and its relationship to teacher effectiveness.</i> Dissertation Abstracts International 46(02), 3325A	--	Darling Hammond cites this as one of three studies showing that students will achieve at higher levels and are less likely to drop out when taught by teachers with certification in their teaching field, by those with master's degrees, and by those enrolled in graduate studies.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>Kain and Singleton point out that they studied 4,500 elementary schools over 5 years, compared to Coleman's 3,155. As do other researchers, Kain and Singleton believe that Coleman's measures may have been too crude to reveal the findings that they came up with, showing considerably more effects from school resources.</p> <p>Kain noted in an email to us, dated July 24, 2001, that "<i>none of the widely used proxies for teacher quality seem to have large or consistent impact on individual student achievement. There is little, if any evidence that having an advanced degree matters. The problem is presumably with the kinds of advanced degrees obtained by many teachers and their quality.</i>"</p>	No	✓+	✓
<p>Kennedy discusses in some detail the importance of teacher's content knowledge and also refers to subject-related pedagogy; but her discussion is not supported by any research that links subject-related pedagogy to student achievement.</p>	Yes	×	Na
<p>Kennedy does not judge effective classroom teaching by looking at any measure of student achievement, but through a teacher survey that she designed to assess if a teacher can teach in a manner that is judged appropriate.</p>	Yes	×	×
<p>Kiesling's findings are consistent with other research.</p>	No	✓+	✓
<p>Because of flawed methodology, this dissertation should not be used for supporting any finding. Darling- Hammond acknowledges that that it and the other two papers she cites for support of her assertion about drop-out rates (see Sanders, Skonie-Hardie and Phelps; Council on School Performance) did not control for poverty, language background or other school resources. Because of these glaring omissions, any evidence from this paper should be discounted, even presented under a caveat.</p>	Yes	×	×

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Koppich, J., Knapp, M 1998	<i>Federal research investment and the improvement of teaching 1980-1997. Center for the Study of Teaching and Policy</i>	The Federal Government has funded many reform efforts to improve teacher education.	--
Larson 2000	<i>The role of teacher background and preparation in students' algebra success.</i>	Teachers' master's degrees do not increase student achievement.	This study of algebra scores found that teachers with advanced degrees (not disaggregated as to type of degree) were not significantly more effective in producing greater student gains in algebra than teachers with only bachelor's degrees.
Lawrenz, F. 1975	<i>The relationship between teacher characteristics and student achievement and attitude. Research Paper No. 8 ERIC: ED 161 679</i>	--	Studied 236 secondary science teachers and found no relationship between science methods coursework and student achievement. Ashton and Crocker cite this study as one of the three studies (out of a total of seven studies) they reviewed that did not find a relationship between teacher education coursework and student achievement.
Lenk, H. 1989	<i>Teacher certification and the economics of information. Educational Evaluation and Policy Analysis, 2(4): 5-18</i>	--	Darling-Hammond (2001) cites this study as one of six providing evidence that principals, supervisors, and colleagues tend to rate recruits from alternative certified programs "less highly on their instructional skills" [page 25; see also Feiman-Nemser and Parker, 1990; Jelmberg, 1995; Gomez and Grobe 1990, Mitchell, 1987, Texas Education Agency, 1993].
Levin, H 1976	<i>Concepts of economic efficiency and educational production. In Education as an Industry, ed Froomkin, J., Jamison, D., Radner, R. Cambridge, MA: Ballinger</i>	Teacher's verbal ability yielded four times as much output per dollar as additional teacher experience.	Study of some 600 sixth graders. Monk cites Levin for evidence that teacher intelligence, as measured by attributes like verbal ability, are positively related to student achievement (p136).
Link, C and Ratledge, E. 1979	<i>Student perceptions, I.Q. and achievement. Journal of Human Resources 14:98-111</i>	Teacher education and experience do not affect student achievement.	Link and Ratledge track teacher education and experience variables to the classroom level, producing findings which are more likely to be true than some other studies which aggregate at a higher level.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✗	Na
Most teachers' advanced degrees are not in the subject matter but in education. This paper has not been published.	No	✗	✓
This study, like Hurst, contrasts with some of Monk's 1994 findings. It does not appear to have been published, a significant problem that discounts its value.	No	✗	?
The evidence that Darling-Hammond cites is framed ambiguously and is not a student achievement measure. Supervisors' ratings are not a reliable measure of student achievement.	Yes	✓+	✗
Levin cautions that his work is exploratory only and should not be misinterpreted as a consideration for policy change.	No	✓	✓
--	No	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Lins 1946	<i>The prediction of teaching efficiency. Journal of teaching in physical education 2(2):1-86</i>	NTE scores correlate with student achievement.	Lins found a positive association between NTE and student achievement but Quirk et al. dismiss the finding in their literature review, because it studied a small group of 27 teachers. Evertson et al. also cite Lins for finding a positive relationship between teachers' NTE scores and student achievement, not noting the problems that caused Quirk et al. to dismiss it.
Lippman, L, Burns, S., McArthur, E. 1996	<i>Urban Schools: The challenge of location and poverty. Washington, DC: US Department of Education, National Center for Education Statistics</i>	Teacher qualifications in poor and affluent schools do <i>not</i> differ. Teacher experience <i>does</i> differ from poor to affluent schools.	Study found no statistically significant variation across schools of varying poverty levels on measures of certification, highest degree earned, and number of courses taken by teachers in their primary and secondary fields. The only difference was for teacher's years of experience.
Los Angeles County Office of Education 1999	<i>Teacher quality and early reading achievement in Los Angeles county public schools. Trends: Policy Issues facing Los Angeles County Public Schools, 6(2), 1-3</i>	Teacher experience matters; increasing the number of uncertified teachers in a school has a negative impact on early reading scores.	Using Stanford 9 achievement tests scores for second and third graders from 1000 elementary schools in LA County, this study found that years of teaching experience (average for at each school) had a positive impact on achievement. It also found that increasing the density of untrained teachers had a negative impact on early reading scores. Darling-Hammond et al. 2001 cite this paper as one of four that " <i>found positive school- or district-level effects on student achievement of teacher certification status and teachers' scores on certification tests that measure knowledge of teaching as well as subject matter</i> " (page 23; see also Ferguson, 1991; Fetler, 1999; Strauss and Sawyer, 1986).
Lovelace, T; Martin, C. 1984	<i>The revised NTE as a predictor of teachers' performance in public school classrooms. ED251416 University of Southwestern Louisiana, Lafayette</i>	The NTE is a poor predictor of teacher effectiveness.	Study of 90 student teachers enrolled in schools of education at 7 major state universities. Evertson et al. report that this study found no relationship between the student teachers' scores on the NTE and their teacher performance as measured by student outcomes or supervisory ratings.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Study is too old and sample size is too small to be of value. Publication is not listed in any index.	No	✗	✗
--	No	✓	✓
<p>The researcher compared fully certified teachers with a group not just consisting of alternatively trained, but included emergency credentialed and teachers with waivers. Teachers with waivers need not meet any standard or pass any test of their knowledge.</p> <p>The remaining three studies cited by Darling-Hammond et al. also do not provide the claimed evidence:</p> <p><u>Ferguson</u>: the effect on achievement scores on a standardized test for elementary-age students from the teachers' scores on the TECAT, an exceedingly simple test with a 97% pass rate, that Ferguson termed a test of verbal ability.</p> <p><u>Fetler</u>: the effect on achievement scores on a mathematics achievement test for high school students from teacher certification status: fully certified or emergency certified. Alternatively-certified teachers were included in the fully certified group. Emergency certified met no standards of quality.</p> <p><u>Strauss and Sawyer</u>: the effect on achievement scores on a high school competency exam from their teachers performance on the NTE. Strauss and Sawyer did not look at which teachers were certified and there is no evidence that NTE performance correlates with (2000).</p>	Yes	✗	✓
<p>The measure used to discern if the NTE was a reliable predictor of teacher effectiveness were the supervisory ratings of <u>student teachers</u>, and did not use a student achievement measure.</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
LuPone, L. 1961	<i>A comparison of provisionally certified and permanently certified elementary school teachers in selected school districts in New York State.</i> Journal of Educational Research, 55: 53-63	Certified elementary teachers have higher ratings in their teacher evaluations.	This dissertation compares provisionally and professionally certified elementary teachers on the basis of seven dimensions of teacher competence as evaluated by their principals. The professionally certified teachers were found to be significantly superior at the .01 level of confidence in five of the seven areas. Darling-Hammond (1999) cites this study as one of three studies that typically show that elementary teachers who have more formal preparation for teaching have higher ratings and greater student learning gains (see also Hice, 1970; and McNeil, 1974). Darling-Hammond et al. cite it again in 2001 for similar findings.
Lutz, F., and Hutton 1989	<i>Alternative teacher certification: Its policy implications for classroom and personnel practice.</i> Educational Evaluation and Policy Analysis, 11(3): 237-254	Teachers entering alternative certification routes exhibit both strengths and weaknesses compared to traditionally trained teachers.	Study of 99 alternative certification teachers compared to 52 traditionally trained first-year teachers. Found that the alternatively trained teachers had higher GPAs, stronger evaluations from their mentors (91% performing equal or better to average first year teacher), higher scores on the statewide test for teacher subject matter knowledge, but traditionally trained teachers intended to stay in teaching longer and got some higher ratings in certain areas, including reading, from their principals. Darling-Hammond cites this study for its findings about a higher attrition rate and lower job satisfaction for alternatively trained teachers.
Maguire, J. 1966	<i>Factors in undergraduate teacher education related to success in teaching. Doctoral dissertation, Florida State University</i>	--	Evertson et al. cite this dissertation as one of four studies showing there is "no or negative relationship between teacher knowledge and student achievement as measured by teachers' GPA and standardized tests" (see also Eisenberg, 1977; Byrne, 1983; and Siegel, 1969).
Massey, H., and Vineyard, E. 1958	<i>Relationship between scholarship and first year teaching success.</i> Journal of Teacher Education, 9: 297-301	--	Evertson et al. cite this study for showing that GPA correlates with principals' ratings, that verbal ability correlates with principals' ratings, that teacher's intelligence is important, that teacher's knowledge of subject matter slightly affects student achievement.
McDiarmid, G.W., & Wilson, S 1991	<i>An exploration of the subject matter knowledge of alternate route teachers: Can we assume they know their subject?</i> Journal of Teacher Education, 42: 93-103	Prospective teachers have limited understanding of mathematics.	Study of 55 college students, Wilson et al cite this study as one of eleven studies showing that subject matter preparation that prospective teachers currently receive is inadequate for teaching higher subject-matter standards by anyone's definition. Ashton interprets the study as follows: "the degree in mathematics was inadequate preparation for the critical teaching task of transforming mathematics knowledge into effective instruction" (page 21).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
None of the three studies Darling-Hammond cites as support have much, if any, value. This 1961 study did not use student achievement as a measure and it is too old to have much relevance to any discussion of alternatively certified teachers today. The other two studies that Darling-Hammond cites (Hice, a dissertation, and McNeil) studied groups of insufficient sizes, 40 and 19 respectively, making any generalizable conclusions unlikely, and, in any case, offer other evidence that conflicts with Darling-Hammond's assertions.	Yes	✓+	×
Darling-Hammond ignores the unqualified authors' endorsement of the merits of alternative routes to teaching, which they assert: "on virtually every indicator...the AC interns did as well as first-year teachers were doing" (page 252). There is no mention from Darling-Hammond how favorably they compared on academic and job performance standards.	Yes	✓+	✓
Three of the four Evertson et al. citations were never published, including this one, and the fourth, Eisenberg, while published, suffers from methodological flaws and found that teachers' subject matter knowledge (as measured by coursework) did, in fact, matter.	Yes	×	×
Study is too old.	No	✓+	×
The authors establish their finding by "questionnaires and surveys" and did not look at any measure of student achievement in mathematics. Too, Wilson et al. firmly establish that teachers' understanding of mathematics, no matter how they were prepared, seems problematic, especially for teachers who graduate from schools of education.	Yes	✓+	×

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
McGuckin, R; Winkler, D.	<i>University requirements and resource allocation in the determination of undergraduate achievement. ED096928; Washington, D.C.:National Institute of Education</i>	The removal of general education courses requirements results in a higher retention rate of undergraduate students.	A study of nearly 1,000 undergraduates, half of whom were given the option to not take the usual set of required general education courses. The findings generally support a move towards more student choice, indicating that students in the experimental group had a higher retention rate and received more university resources, measured in dollars, than did students in the control group.
McLaughlin, M., and Marsh, D. 1978	<i>Staff development and school change. Teachers College Record, 80(1): 69-94</i>	Verbal ability of teachers correlates with student achievement.	To test verbal ability, the researchers used a vocabulary test, "Quick Word Test," consisting of a 50-question, multiple-choice test. The authors note that it had high reliability and correlated highly with more complex measures of intelligence. Evertson et al. cite this study for showing that teacher's verbal ability affects verbal achievement of students.
McNeil, J. 1974	<i>Who gets better results with young children--experienced teachers or novices. Elementary School Journal, 74: 447-451</i>	Experienced teachers produce higher student gains than inexperienced teachers who have just begun teacher training.	This study involved 19 teachers and 19 untrained individuals. Ashton and Crocker describe this study as having been undertaken to disprove Pophams' unsettling results which had found that untrained individuals could produce in short-term lessons higher student gains than experienced, trained teachers. Ashton and Crocker cite this study as one of 4 studies (out of a total of 7 studies) that reported a positive effect from education coursework on student achievement. Darling-Hammond (1999) cites this study as one of 3 and again in 2001 as 1 of 6 studies that typically show that teachers who have more formal preparation for teaching have higher ratings and greater student learning gains (see also LuPone, 1961;Hice, 1970; Roupp et al, 1979; Hansen, 1988; Erikson and Barr, 1985).
Miller, J., McKenna, M., and McKenna, B. 1998	<i>A comparison of alternatively and traditionally prepared teachers. Journal of Teacher Education 49(3): 165-176</i>	There are no significant differences in achievement for students of alternatively trained teachers and students of traditionally trained teachers.	Well-designed study matching 41 alternatively trained teachers with 41 traditionally trained teachers in the same school, the findings of which were extensively debated by Goldhaber and Brewer (2001) and Darling-Hammond (2001). The alternatively trained teachers were part of a single alternative certification program, thereby eliminating variance between alternative certification programs. Darling-Hammond et al. quote from Miller et al. that their studies "provide no solace for those who believe that anyone with a bachelor's degree can be placed in a classroom and expect to be equally succesful as those having completed traditional education programs."
Mitchell, N. 1987	<i>Interim evaluation report of the alternative certification program. REA87-027-2, Dallas: TX: DISD Department of Planning, Evaluation, and Testing</i>	--	Darling-Hammond et al. (2001) cite this study as one of six providing evidence that principals, supervisors, and colleagues tend to rate recruits from alternative certified programs "less highly on their instructional skills" [page 25; see also Feiman-Nemser and Parker, 1990; Jelmberg, 1995; Lenk, 1989; Gomez and Grobe 1990, Texas Education Agency, 1993].

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✗	✓
Though the data collection on verbal ability seemed sound enough, the researchers are far more impressed by their finding from an essentially meaningless exercise that gaged "a teacher's sense of efficacy," which they pronounced to powerfully related not just to student achievement but to a number of other measures. They measured a teacher's sense of efficacy by teachers' reactions to two questions: "1)when it comes down to it, a teacher can't really do much because most of a student's motivation depends on home environment; and 2) if I try really hard I can get through to even the most difficult or unmotivated student." Only the most inept teacher would have failed to identify the "efficacious" response.	Yes	✓+	✗
This study is of little value for several reasons. The sample size of this study is too small. It is impossible to know if experience or preparation contributed to the teachers' success since McNeil compared experienced teachers with novice, untrained teachers. Instead of a validated achievement test--either criterion referenced or norm referenced--McNeil designed "specific instructional objectives" for the teachers to achieve. The author acknowledges his own bias, noting that " <i>it is reassuring to those [who train teachers] that experienced teachers are more effective.</i> " The other two studies that Darling-Hammond cites involve LuPone's 1961 study, which is too old. Hice's study includes too small of a sample size and offers other evidence to the contrary.	Yes	✓+	✗
Miller et al. note that carefully constructed AC programs that consist of "extensive mentoring components, post-graduation training, regular inservice classes and ongoing university supervision" are the reasons these alternatively trained teachers were successful.	Yes	✓+	✓
Darling-Hammond's language masks the lack of student achievement evidence in these studies, that alternatively certified teachers are generally as highly rated as traditionally certified teachers and produce similar achievement data from their students. Supervisors' ratings are not a reliable measure of student achievement nor do such studies generally control for poverty.	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Monk, D. 1992	<i>Education productivity research: an update and assessment of its role in education finance reform.</i> Education, Evaluation and Policy Analysis, 14(4): 307-322	The education production function applied by economists to see what variables of schools and students make a difference is a powerful tool and should not be dismissed because research is not showing the value of school resources.	Researchers have had difficulty over the years showing that conventional measures of teacher preparation contribute to the performance of schools, or more specifically to the performance gains of pupils within schools.
Monk, D. 1994	<i>Subject area preparation of secondary mathematics and science teachers and student achievement.</i> Economics of Education Review, 12(2): 125-145	Teachers' subject matter coursework and courses in subject methodology both affect student achievement, but there is a ceiling to the effect of subject matter coursework after a certain number of courses. Master's degree outside teacher's subject matter have a negative effect.	Study looking at NAEP science and math achievement for roughly 3,000 students, correlated with over 1,000 teacher surveys. It found that the amount of teacher coursework in the subject area is somewhat, but not hugely, important for student achievement. There is a curvilinear or "threshold" effect, meaning that there are diminishing returns from teacher's coursework on student achievement after the teacher has taken four to six courses in the subject. Darling Hammond (2000) cites this study, and nine others, to support her statement that "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (page 22). Of the 10 studies, only this one provide unequivocal support for Darling Hammond's statement as it relates to student achievement. [See also Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; and Perkes, 1967.] Monk finds that, in some subjects, teacher's methods courses related to the teacher's subject area had "more powerful effects than additional preparation in the content area" (page 142). Wilson et al. cite this study as 1 of 6 studies (out of 7 reviewed) that showed a positive effect on student achievement from subject matter training as well as 1 of 3 they found that showed education coursework can have more value than subject matter training.
Monk, D., and King, J. 1994	<i>Multi-level teacher resource effects on pupil performance in secondary mathematics and science.</i> Choices and Consequences, Ronald G. Ehrneberg (ed.). Ithaca, NY: ILR Press	Teachers' coursework in subject matter shows some small positive effects on student achievement.	Study used same data set--but with improved methods--as the Monk 1994 study. It looked at science and mathematics teachers at the secondary level and compared their coursework background to their students' performance on the NAEP. Darling-Hammond cites this study for showing little significant effect, positive or negative, from teachers' subject matter coursework.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
---	No	✓+	Na
<p>Sound study with Monk making some important and insightful points, that <i>"simple accumulation of credits with no regard to the subject being taught does not have a positive effect on student achievement"</i> (page 142) and <i>"it is risky to generalize about the effects of teacher subject matter knowledge."</i> Monk was critical of his own use of degree levels and undifferentiated credit counts self-reported by teachers to measure teacher knowledge, terming them <i>"gross measures."</i> He views his subsequent analysis of the same data (Monk and King, p38) as producing more reliable findings.</p> <p>After finding that coursework in pedagogy had a more powerful effects (in math and biology, but not in physical sciences) than additional preparation in the content area, Monk concludes, <i>"if we believe this result, it would appear that a good grasp of one's subject area is a necessary but not a sufficient condition for effective teaching"</i> (p142).</p> <p>In one of the more interesting analyses, Monk discusses the reasons why the number of life science courses a teacher took had a negative effect on student performance in contrast to the significant positive effect that teachers' physical science coursework had. Monk theorizes that most teachers take biology coursework to fulfill their science requirements and that it is brighter teachers who elect to take the physical science coursework. The significant effect from physical science coursework, theorizes Monk, is a reflection of the higher intelligence of this teacher pool.</p>	Yes	✓+	✓
<p>In this study teachers self report the coursework they have taken; authors believe that using self-reported coursework is problematic for gauging a teacher's knowledge of subject matter.</p>	Yes	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Murnane, R. and Olsen 1989	<i>The effects of salaries and opportunity costs on duration in teaching: evidence from Michigan.</i> Review of Economics and Statistics, 11: 347	--	Higher teacher salaries increase the number of years that teachers remain in the profession.
Murnane, R. 1975	<i>The impact of school resources on the learning of inner city children.</i> Cambridge, MA: Ballinger	Teacher quality has an effect on student achievement. Teacher's race can have an effect on student achievement. Supervisor's evaluations can correlate with student achievement. Teacher experience matters to some extent.	A study done in New Haven in 1970-72 looking at issues of racial matching between teacher and students. It found that black teachers with less than six years experience were more effective at raising black children's reading and math scores than white teachers. The effects were less strong as black teachers gained experience. Evertson cites Murnane showing that principals rate higher teachers whose students achieved greater growth in academic achievement.
Murnane, R. 1983	<i>Understanding the sources of teaching' competence: Choices, skills and the limits of training.</i> Teachers College Record 84(3)	Teacher's verbal ability contributes foremost to teacher competence.	Excellent and brief overview of the research on teaching competence, noting that the most significant evidence was teacher's intellectual ability. This characteristic is followed by some teacher experience, "on-the-job" training and with very little evidence that formal teacher training, most notably master's degrees, makes any real difference at all.
Murnane, R. 1985	<i>Do effective teachers have common characteristics: Interpreting the quantitative research evidence. Paper presented at the National Research Council Conference on Teacher Quality in Science and Mathematics, Washington, D.C.</i>	Not Retrievable	Darling-Hammond (1999) cites extensively this paper for its statements that teachers with education degrees when compared to teachers with degrees in subject matter measure similar teacher performance (page 7)); that teacher certification restricts the flow of new people into teaching; and for defining verbal ability as a more "sensitive measure of teachers' abilities to convey ideas in clear and convincing ways" (page 6).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓+	✓
--	No	✓	✓
--	No	✓+	Na
<p>Darling-Hammond's statement that teachers with and without education degrees measure similar performance is a startling concession! Her interpretation of Murnane's verbal ability measure is problematic because Murnane's written record supports a view of verbal ability as a measure of <i>cognitive ability</i>, a view consistent with other researchers, not just good speaking skills. All of the tests of verbal ability have been written tests.</p> <p>We were not able to verify any of Darling-Hammond's interpretations of this paper, because it is not published anywhere, and Murnane no longer had a copy of it.</p>	Yes	✗	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Murnane, R. 1997	<i>Understanding teacher attrition.</i> Harvard Education Review, 57(2)	It may be a wise strategy to attract individuals to teaching with the expectation that they will not spend their entire career in teaching.	--
Murnane, R., and Phillips, B. 1978	<i>Effective teachers of inner city children: Who they are and what they do.</i> Princeton, NJ: Mathematica Policy Research	Teacher quality effects significantly student achievement.	A study of nearly 700 low-income African American children in elementary grades. The authors examined teacher's race, sex, prestige of college, master's degree, verbal ability, experience, along with her teaching behaviors. Teacher experience mattered, but the authors consider this variable as a reflection of differences in the abilities of teachers who entered the profession at different times. Teachers' behaviors, specifically the use of direct instruction strategies, are effective with poor children's achievement.
Murnane, R., and Phillips, B. 1981	<i>What do effective teachers of inner-city children have in common.</i> Social Science Research, 10: 83-100	Teacher's verbal ability affects student achievement; teachers' master's degrees do not affect student achievement.	Teacher scores on word tests affected elementary students' reading score gains but not vocabulary score gains.
Murnane, R., and Phillips, B. 1981	<i>Learning by doing, vintage and selection: Three pieces of the puzzle relating teaching experience and teaching performance.</i> Economics of Education Review, 1 (4): 453-465	Teacher experience is a problematic instrument for measuring teacher effectiveness, but there is indication of a relationship to student achievement.	This study looks at an urban school district over a period of 40 years matching students with teachers. The authors provide useful insight into why it is so hard to discern if teacher experience affects student achievement. They define three ways that teacher ability may be influenced by the variable known as experience: 1) the traditional way that teachers learn by teaching; that is, the more years they teach, the better they become; 2) the need for teachers rises and falls; therefore the teacher's ability is influenced by the period in which she is hired and 3) the highly capable teachers may leave the classroom to become an administrator, thereby skewing the benefits gained by experience. Murnane finds that experience affects student achievement much more if these latter two variables are accounted for.
National Center for Education Statistics 1992	1990 Science Report Card. Washington, DC: U.S. Department of Education	None of the following characteristics of teachers correlate with student achievement: teacher's experience, teacher's certification type or level, teacher's master's degree, or teacher's coursework in the subject matter.	Study examining national-level performance of students on the NAEP for the 1990 Science Report Card. Ferguson and Womack single out one teacher characteristic for not affecting student achievement: teacher's coursework in subject matter.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓+	NA
Murnane and Phillips are two of many researchers to confirm the relationship between teacher's verbal ability and student achievement. They declared the lack of effects from teacher's verbal ability in this particular study to be spurious because, it turned out, many of the teachers had asked their classroom aids to complete the test.	No	✓	✓
--	No	✓+	✓
--	No	✓+	✓
As we have seen, it is problematic to extrapolate findings at the state level; it is even more problematic to do so at the national level, as this report does. Because of this aggregation, which teacher characteristics may or may not affect student achievement cannot be stated with any degree of confidence. They do not point out the fact that the Science Report Card did not find any teacher characteristic, including whether the teacher was certified, to have an effect on student achievement.	Yes	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
National Center for Education Statistics 1994	<i>Data compendium for the NAEP 1992 reading assessment of the nation and the states: 1992 NAEP trial state assessment. Washington, DC: U.S. Department of Education</i>	Professional coursework, teacher's possession of masters degrees, and certification have a modest impact on student achievement in reading.	A study examining state-level performance of students on the NAEP compared to teacher characteristics. Darling-Hammond claims this study shows a modest relationship between students' performance on reading assessments and whether their teachers were fully certified, had master's degrees, and had coursework in whole language instruction.
National Commission on Teaching and America's Future 1996	<i>What matters most: Teaching for America's future. New York: NCTAF</i>	The teaching profession suffers from inadequate training.	NCATF has 13 recommendations for improving the teaching profession, including a proposal that all teacher education programs must meet professional standards or be closed; that every state should establish professional boards; that states and districts should set goals and incentives for National Board Certification; that teachers should be tested on their subject matter knowledge and teaching skill and knowledge.
New York City Board of Education 2000	<i>Flash Research Report #2. Unpublished paper from the Division of Assessment and Accountability, October 10, 2000</i>	Certification of teachers affects student achievement.	This study looked at low performing schools in New York City and found a positive correlation between an increase in the percentage of certified teachers and gains in performance on reading and mathematics achievement tests of students.
Olsen, D.G. 1975	<i>The quality of prospective teachers: Education vs. noneducation graduates. Journal of Teacher Education, 36(5): 56-59</i>	Graduates of teacher training programs in the same college are as academically able as graduates not in the teacher training program.	A study of 1,507 graduates from University of Wisconsin-Parkside, 107 of whom were education majors, the rest not. The researcher found no differences in their academic performance in college between the two groups. Darling-Hammond (1992) uses this study to support her statement that fully prepared and certified teachers are "generally more highly rated and more successful with students than teachers without full preparation" (page 130).
Osborn, C. 1970	<i>A study of the qualifications of Mississippi high school biology teachers and the relationship of student achievement. Dissertation Abstracts International, 31(08), 1121A</i>	--	Ashton and Crocker cite this dissertation as one that failed to find a significant relationship between teachers' preparation in biology and their students' performance on the Nelson biology test.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Assumptions made about this report are problematic. It is not appropriate to reach conclusions about the importance of individual teacher characteristics when aggregating as high as the state level, especially when key control variables such as family backgrounds and class sizes are not included. A study should look at a more disaggregated level (ideally classroom or school) to reach meaningful conclusions; otherwise there is too much "noise" or too many variables not examined. Effects are distorted.	Yes	✗	✗
The most important point about NCATF's treatise is that it does not ever mention the overarching importance of a teacher's verbal ability and what should be done to encourage and develop stronger verbal ability in prospective teachers.	Yes	✗	Na
This study does not control for teacher experience. Experienced teachers were compared with inexperienced teachers. This design makes it impossible to discern the impact on student achievement provided by the teacher's becoming certified, isolated from his or her experience.	No	✗	✗
This study did not look at how any of the graduates performed as teachers, as Darling-Hammond's stated. It is a comparison study of how well individuals who are training to be teachers perform in college compared to those who are not training to be teachers. All of the participants attended the same "commuter college", an institution which has noncompetitive entry standards.	Yes	✓+	✗
This is an unpublished dissertation.	Yes	✗	?

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Perkes, V. 1967	<i>Junior high school science teacher preparation, teaching behavior, and student achievement.</i> Journal of Research in Science Teaching	Teachers' coursework in both subject and subject methodology affects various measures of student achievement. Teachers' GPA in major affects student achievement. How recently teachers took science courses affects student achievement.	A study looking at the education background of 32 junior high science teachers and their students' performance on two types of tests, a science achievement test and a test of higher order science skills. The students of teachers who had more <i>science methods</i> coursework scored above others on the test of higher order skills. The students of teachers who took less scored higher on the science achievement test. Darling-Hammond says this study "found that teachers' coursework credits in science were not significantly related to students' learning, but coursework in science education was significantly related to students' achievement on tasks requiring problem solving and applications of science knowledge." She also cites this article as one of 10 studies that support her assertion: "knowledge about teaching and learning shows even stronger relationships to teaching effectiveness than subject matter knowledge" (2000; page 22). [See also Begle, 1979; Begle and Geeslin, 1972; Denton and Lacina, 1984; Druva and Anderson, 1983; Evertson et al., 1985; Ferguson and Womack, 1993; Guyton and Farokhi, 1987; and Monk, 1994.] Ashton and Crocker cite this study as one of 4 studies (out of a total of 7 studies) that reported a positive effect from education coursework on student achievement and also cite this study as one of 9 that show that teacher knowledge of subject matter does not affect student achievement.
Piper, M., and O'Sullivan, P. 1981	<i>The National Teacher Examination: Can it predict classroom performance.</i> Phi Delta Kappan, 62: 401	--	Evertson et al. cite this study for showing that principals' ratings correlate with teachers' scores on the NTE.
Popham, W. 1971	<i>Performance tests of teaching proficiency: Rationale, development, and validation.</i> American Educational Research Journal, 9 (1): 105-117	Teacher preparation does not affect student achievement.	Well known study that pitted complete novices against experienced teachers to teach two-week sessions on auto mechanics, electronics or social studies. There were no significant differences in the two groups on a test given to the students after the two-week unit was taught. Ashton and Crocker cite this study as one of the three studies (out of a total of seven studies) they reviewed that did not find a relationship between teacher education coursework and student achievement.
Pugach, M., and Rath, J. 1983	<i>Testing teachers: Analysis and recommendations.</i> Journal of Teacher Education, 34 (1):37-43.	Teacher NTE scores do not correlate with student achievement.	Both Guyton and Farokhi and Evertson et al. cite this article as evidence that the NTE does not correlate with student achievement.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>The authors are a bit too hasty about reporting the lack of relationship between a teacher's subject matter knowledge and student achievement. They overlook the implications from two other variables, teacher's GPA in science courses and how recently the teacher took science content courses, both of which also offer measures of teacher's knowledge of subject matter. These two variables had a much <i>stronger</i> relationship to student achievement than whether or not the teacher took science methods coursework.</p> <p>It should be noted, also, that the students of the teachers who did <i>not</i> take methods courses scored higher on the achievement test, one of the two tests given. Though one could interpret the results as a toss up, Ashton and Crocker (along with Darling-Hammond) believe that the achievement test is not as important as the higher order skills test. Consequently, they place this study in the "positive" column to support teacher preparation, due to a subjective decision on their part.</p> <p>In any case, the study is meaningless on any front: the sample of 32 teachers is too small, it is old, and it did not control for either students' prior science knowledge or poverty.</p>	Yes	✓+	×
<p>Even principal ratings' should control for classroom poverty.</p>	Yes	×	×
<p>The study is problematic because certified teachers sat in the room during the student teachers' instruction. Also, the researcher did not control for teacher experience.</p>	No	✓+	×
<p>Pugach and Rath do not present any new findings about the NTE; and they are restating the research of Summers and Wolfe, 1977; Quirk et al., 1973; and Soar et al., 1983 to support their views that states should not use teacher licensing exams as a way to achieve teacher quality.</p>	Yes	✓+	Na

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Quirk, T., Witten, B., and Weinberg, S. 1973	<i>Review of studies of the concurrent and predictive validity of the National Teacher Examinations.</i> Review of Educational Research, 43: 89-114	GPA and ACT scores correlate with NTE scores. Teacher evaluations have low correlations with NTE and GPA. Supervisors' ratings are unreliable measures of teacher effectiveness.	Meta-analysis of studies in 1940's, 50's, and 60's looking at relationships between NTE and a variety of measures of teacher's performance: teacher's undergraduate GPA, practice teaching grades, ratings by student teachers' supervisors, ratings by teacher' supervisors. Authors note that "on the job ratings are notoriously unreliable and their reputation is well deserved" (page 108). Darling-Hammond (1999) cites this meta-analysis as one of five studies showing there is no consistent relationship between subject matter knowledge (using teacher scores on the NTE subject speciality tests) and teacher performance as measured by "student outcomes or supervisory ratings." Soar et al. 1983 also misinterpret this study, noting that it reported negative effects.
Raymond, M., Fletcher, S., Luque, J.	<i>Teach for America: An evaluation of teacher differences and student outcomes in Houston, Texas.</i> CREDO, The Hoover Institution, Stanford University www.rochester.edu/credo ; August 2001	There are no significant differences in achievement for students of Teach for America teachers and students of traditionally trained teachers.	This study of Teach for America teachers in Texas found that 1) on average the impact of having a TFA teacher was always positive; 2) the differences between the average TFA teacher and the average non-TFA teacher, while always positive, are generally not statistically significant; 3) TFA teachers as a group show less variation in quality than teachers entering from different routes.
Rothman, A. 1969	<i>Teacher characteristics and student learning.</i> Journal of Research in Science Teaching, 6(4): 340-348.	Teacher's knowledge of subject matter affects student achievement.	This study was designed by Rothman to address the problems of an earlier study, this time using a larger group of teachers (51) who were randomly selected. Teacher background, credits in physics and mathematics were all significantly related to measures of student achievement.
Rothman, A., Welch, W., and Walbert, H. 1969	<i>Physics teacher characteristics and student learning.</i> Journal of Research in Science Teaching, 6: 59-63	Teacher's experience, training, and knowledge of subject matter do not significantly affect student achievement.	Study of 35 male physics teachers who volunteered to teach a new course designed by the Harvard Physics Project. Their students' achievement showed no significant relationship to the teacher's experience, training, or knowledge of physics.
Roupp, R., Travers, J., Glantz, F. & Coelen, C 1979	<i>Children at the Center: Summary findings and their implications.</i> Cambridge, MA: AbT Associates	--	This study focused on early childhood education and is one of the six cited by Darling-Hammond (2001, 1999 and 1992) as showing that teachers who have more formal preparation for teaching have higher ratings and greater student learning gains (see Hice, 1970; LuPone, 1961; McNeil, 1974; Hansen, 1988; Erikson and Barr, 1985).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Concerning the NTE, the authors do not reach the conclusions as implied by Darling-Hammond and Soar et al.. In fact, Quirk et al., 1973 find only one study (Lins,1946) that even looked at the correlation of NTE and student achievement. That study actually found a positive correlation. Quirk et al. rightly dismiss the results because of an extremely small sample size of 17 teachers. However, only one of these five studies (see also Andrews et al., Ayers and Qualls, 1979; Haney et al., 1986; and Summers and Wolfe, 1977) offers any insight into the relationship of NTE speciality tests to student achievement; and its findings are largely positive (see Summers and Wolfe).	Yes	✓+	Na
--	No	×	✓
--	No	✓+	✓
Study is problematic for two reasons: it was not a random sample of teachers because all of the teachers volunteered to teach the Harvard course (same problem as Begle had in 1977),and the sample size is too small to have much value.	Yes	✓+	×
The study used ratings of teachers, not academic gains, to assess performance.	Yes	✓	×

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Rouse, W. 1968	<i>A study of the correlation between the academic preparation of teachers of mathematics and the mathematics achievement of their students. Unpublished doctoral dissertation, Michigan State University, East Lansing</i>	--	According to Ashton and Crocker's interpretation, this dissertation examined elementary students' performance on arithmetic achievement at different grades and found a low negative correlation between the amount of college mathematics preparation and student scores.
Rowan, B., Chiang, F., Miller, R. 1997	<i>Using research on employees' performance to study the effects of teachers on students' achievement. Sociology of Education, 70(October): 256-284</i>	Teacher's knowledge of subject matter affects student achievement and is especially important in schools with high percentages of low achieving students.	Study of roughly 5,400 students (10th grade) from the 1998 NELS files that found that teachers' knowledge of subject matter has direct effects on students' achievement in mathematics. Wilson et al. cite this study as 1 of 6 studies (out of a total of 7) that showed a small positive relationship between teachers majoring in mathematics and student achievement in mathematics [see also Darling-Hammond, 1999; Goldhaber and Brewer, 2000; Guyton and Farokhi, 1987; Hawk et al., 1985; Monk, 1994].
Sanders, W. and Rivers, J. 1996	<i>Cumulative and residual effects of teachers on future student academic achievement. Research Progress Report. Knoxville: University of Tennessee Value-Added Research and Assessment Center</i>	Teacher effectiveness has a strong effect on student achievement	A study of teachers in mathematics in grades 3, 4, and 5 found that students assigned to ineffective teachers continue to show the effects of such teachers even when these students are assigned to very effective teachers in subsequent years. Further, ineffective teachers were ineffective with all students, regardless of the prior level of achievement. More black students than would be expected were assigned to the least effective teachers. Darling-Hammond (1999) cites this study as one of three that identified differential teacher effectiveness as a strong determinant of differences in student learning, "far outweighing the effects of differences in class size and heterogeneity" (see also Wright et al., Jordan et al.).
Sanders, W., and Horn, S. 1998	<i>Research findings from the Tennessee Value-Added assessment System Database: Implications for Educational Evaluation and research. Journal of Personnel Evaluation in Education, 12(3): 247-256</i>	The teacher is the major determinant of student academic progress	Teacher effects on student achievement have been found to be both additive and cumulative with little evidence that subsequent effective teachers can offset the effects of ineffective ones. For grades 3-8, student gains have been found to be unrelated to race, poverty, or mean achievement level of the school.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
The dissertation was not published.	Yes	✗	✗
Wilson et al.'s attribution of the effect size as "small" is contrasted with the authors' own interpretation, who contend that this factor is "substantively important" in schools with high percentages of low achieving students. Rowan et al. report that having a teacher who is knowledgeable in mathematics can allow students to make up half the disadvantage of attending a low achieving school and if a teacher has a degree in mathematics, a student could make up one third of the disadvantage of attending a low achieving school. The authors use an extremely crude proxy for teacher's knowledge of mathematics: a one-item quiz. A correct response from the teacher did, however, correlate with having a degree in mathematics.	No	✓+	✓
Unfortunately, this work was never published and its statistical methodology is so new that it has not been scrutinized adequately. It is important to understand that Sanders measures the effect of teachers as a <i>residual</i> effect: after controlling for all of the known variables, whatever effect is left is considered to be the effect of the teacher.	No	✗	✓
see Sanders and Rivers.	No	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Sanders, S., Skonie-Hardin, S., and Phelps, W. 1994	<i>The effects of teacher educational attainment on student educational attainment in four regions of Virginia: Implications for administrators. Paper presented at the annual meeting of the Mid-South Educational Research Association</i>	--	Darling Hammond cites this as one of three studies showing that students will achieve at higher levels and are less likely to drop out when taught by teachers with certification in their teaching field, by those with master's degrees, and by those enrolled in graduate studies.
Sandlin, Young, and Karge 1992	<i>Regularly and alternatively credentialed beginning teachers: comparison and contrast of their development. Action in Teacher Education; no further information provided</i>	The greater number of problems reported by new alternatively certified teachers compared to new traditionally certified teachers disappears by the end of the first school year.	Study of 124 alternatively- and traditionally-trained teachers from California State University which showed that initially the alternatively trained teachers were rated lower on 5/16 items by the evaluator but by the end of the year there were no significant differences.
Schalock, D. 1979	<i>Research on teacher selection. In D.C. Berliner (Ed.), Review of Research in Education, 7. Washington, DC: American Educational Research Association</i>	Research on teacher effectiveness has little to contribute to decisions about who should enter teaching.	Darling-Hammond (1999) cites Schalock and the Soar et al. 1983 review, stating that neither study supports the relationship between "teacher's measured intelligence" and student achievement" (page 6).
Sharp, C. 1966	<i>A study of certain teacher characteristics and behavior in high school biology. Dissertation Abstracts International, 1207A-1208A</i>	--	Ashton and Crocker cite this dissertation for failing to show a significant relationship between teacher's knowledge of subject matter and student achievement in biology.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
In her 1999 paper, Darling Hammond acknowledges omissions that she did not acknowledge when referring to these same studies in a 1992 paper: this study and the other two she cites for support of this study (see Council for School Performance, Knoblock) did <i>not</i> control for poverty, language background, class size or other school resources. As such, these studies should not be cited as evidence of anything even with this caveat. Not one of these three studies was published.	Yes	✗	✗
Similar findings to Houston et al, but again, no measure of student achievement was used.	Yes	✗	✗
When we talked to the author to obtain this study, he wondered why anyone would still be interested in it as it is "OLD, OLD!!" Most of Schalock's (as well as Soar et al. 1983) citations in this paper are from work done in the 1940s lacking critical controls, some of which showed some small, positive correlations between measures of intellectual ability and effectiveness, but results were hardly conclusive. He points out rightly the real problem in the research in this area. Even though intelligence should be a likely predictor of success, higher correlations are not revealed because teachers are relatively homogenous as to intellectual ability. With such a truncated range of ability, high correlations are not likely to be found (page 12). Much of the research that might provide some insight looks at students who are attending the same colleges. This approach does not offer the variance that would be more telling. More recent research such as Summers and Wolfe, 1977; Ferguson, 1991; Ferguson and Womack, 1996; Murnane, 1983; Hanushek, 1971; Strauss and Sawyer, 1986 suggest that intelligence (measured by SAT, verbal ability tests and college selectivity) are indeed substantially important.	Yes	✓+	Na
This dissertation was not published and most likely lacked requisite controls.	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Sheehan, D., and Marcus, M. 1978	<i>Teacher performance on the NTE and student mathematics and vocabulary achievement. The Journal of Educational Research, 71: 134-136</i>	Teachers' NTE scores correlate with student achievement, if race is not considered.	Study of 119 first grade teachers in a large urban school district, finding that NTE scores accounted for 2 to 3 percent of the variance of teacher effectiveness. Evertson et al. cite this study as one of two that they found (the other is Lins, 1947) that showed a significant correlation between NTE and student achievement.
Shen 1997	<i>Has the alternative certification policy materialized its promise? Educational Evaluation and Policy Analysis</i>	--	Survey research of nearly 15,000 teachers, including 1,100 alternatively trained teachers that looked at the backgrounds of the teachers and how they compared, but did not examine any measure of teacher effectiveness, only measures relating to race, gender, work background, degree status, retention, intentions to stay in teaching.
Shim, C.P. 1965	<i>A study of four teacher characteristics on the achievement of elementary school pupils. Journal of Educational Research, 59: 33-34.</i>	There is no evidence to support the idea that an elementary school teacher who was a superior student in college, has a degree, is fully certified or has many years of experience is more effective.	This study looked at 89 elementary school teachers in Howard County, Maryland schools in 1961-62 and found that the students taught by the uncertified teachers scored higher on the California Achievement Tests. Also found that students with teachers who had <i>lower</i> college GPAs scored higher than students whose teachers had higher college GPAs. Evertson et al. cite this as study as the only one of four studies they reviewed that provided evidence showing student achievement is not tied to teacher certification.
Shulman, L.S. 1986	<i>Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2): 4-14</i>	Teacher education programs should not confine their activity to the content-free domains of pedagogy and supervision.	An excellent and thought-provoking vision of what teachers should know. Shulman discusses the vapid nature of what teachers are now required to learn and outlines a structure for addressing a teacher's transition from "expert student to novice teacher." He distinguishes three types of knowledge that teachers should learn: 1) subject matter content knowledge that is " <i>at least equal to that of the mere subject matter major</i> "; 2) pedagogical content knowledge (knowledge that embodies the aspects of content most germane to its teachability); and, 3) curricular knowledge, the " <i>pharmacopeia from which the teacher draws those tools of teaching that present or exemplify particular content, and remediate or evaluate the adequacy of student accomplishments.</i> " Shulman also calls for the development of a good professional teacher's exam, much tougher than the current examination for teachers, that " <i>could distinguish between a biology major and a biology teacher.</i> " Darling-Hammond (1992) cites this study as one of three, suggesting the importance of methodology coursework in a teacher's subject area (see also Wilson, Shulman and Richert, 1987; and Kennedy, 1990).
Siegel, W. 1969	<i>A study of the relationship between selected undergraduate academic achievement and teaching success. Doctoral dissertation; Washington State University.</i>	--	Evertson et al. cite this study as one of four showing there is "no or negative relationship between teacher knowledge and student achievement as measured by GPA and standardized tests."

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>Sheehan and Marcus note on page 134 that the positive effect from the NTE ceased to be significant after teacher's race was considered with the implication by them that the finding was no longer as firm. Since NTE performance and race correlate with one another, it would have been mathematically impossible to avoid this result. In effect, they are trying to attribute the effect to a single variable when other variables are similarly correlated, an implausible exercise.</p> <p>On the other hand, the researchers do not control for student poverty which they should have done.</p>	No	✓+	✗
--	Yes	✓+	✓
<p>The article is troublingly short (two pages), bypasses a lot of important discussion and methodology, and consequently, it is difficult to consider in full.</p>	No	✓+	✓
<p>Shulman's view of what teachers need to know, a view which includes strong pedagogical knowledge of content matter, is quite compelling. What he envisions teacher candidates acquiring, material which would tested on a professional teachers' exam portrayed as rigorous and worthwhile, bears no relationship to the current, largely vacuous, intellectually-vapid undergraduate teacher preparation that now occurs and of which he too emphatically dismisses. In fact, it is hard to see his vision of the need to acquire professional teaching knowledge as any more compatible with current schools of education than our own view that would have teacher candidates bypass them altogether if they choose to do so.</p> <p>As good a read as this study is, it does not, nor do any of the three studies cited by Darling Hammond, present any research about the effectiveness of subject matter methodology coursework. Monk and King's study does, however, provide such research.</p>	Yes	✓+	Na
<p>Three of the four studies cited by Evertson et al. were never published, including this one, along with Byrne (1983) and Maguire (1966); the fourth study, Eisenberg (1977), both had some methodological flaws and found that teachers' subject matter knowledge was indeed important. Siegel used GPA as a measure of teacher's subject matter knowledge. That measure is an insufficient measure of subject matter knowledge.</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Skipper, C., and Quantz, C. 1987	<i>Changes in educational attitudes of education and arts and science students during four years of college.</i> Journal of Teacher Education, 38(3): 39-44	--	Ferguson and Womack cite this study for finding that teacher certification affects other measures of classroom performance in addition to student achievement. Darling-Hammond et al. 2001 cite this study for finding that "well prepared teachers are better able to use teaching strategies that respond to student needs and learning styles and that encourage higher order learning" (page 25; see also Perkes, 1967 and Hansen, 1988).
Smail, R. 1959	<i>Relationships between pupil mean-gain in arithmetic and certain attributes of teachers.</i> Unpublished doctoral dissertation, University of Denver	Elementary teachers' possession of college degree does not effect student achievement.	This study looked at 97 teachers with two years of college education and compared them to those who had four years of education. It found no difference in the math scores of these students, all of whom were in grades 4,5,6.
Soar, R., Medley, D., and Coker, H. 1983	<i>Teacher evaluation: A critique of currently used methods.</i> Phi Delta Kappan, 65 (4): 239-246	Supervisors' ratings do not correlate reliably with student achievement; much depends on the construct of the ratings' instrument. Teacher's general intelligence does not correlate with student achievement.	From what they term a "handful" of studies, the authors review the relationship between teacher effectiveness and student achievement. Written in or before 1950, these studies focused on teacher's intelligence using an IQ measure and produced "highly variable results" (page 240). Darling Hammond (1999) cites this article as one of two finding no relationship between teacher's measured intelligence and student achievement (page 6; see also Schalock).
Strauss, R., and Sawyer, E. 1986	<i>Some new evidence on teacher and student competencies.</i> Economics of Education Review (5) 41	Verbal ability is an indicator of teacher quality. NTE scores correlate with student achievement.	Study of student achievement in 145 school districts in North Carolina in the late 1970s, controls for SES, race, district resources, pupil-teacher ratios and students' plans to attend college, and found that a 1% increase in teachers' NTE scores was associated with a 3-5% decline in the failure rate of their students on an exam. Darling-Hammond likens this research to Ferguson's work in Texas (1991), finding similarly strong influences of teacher quality. Ferguson faults this study for only including a few demographic controls, but cites it, nevertheless, for its evidence that teachers who have attended better colleges or scored higher on standardized examinations (in this case the NTE) are more successful at helping their students score higher. Darling-Hammond et al. (2001) cite this study as one of four that link certification status with student achievement (see also Fetler, 1999; Los Angeles County Board of Education, 1999; and Ferguson, 1991).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
No matter how important other measures may seem likely to be, they are irrelevant if students are not learning: the purpose of school. If these measures are as important as implied, they should have a direct impact on student achievement.	Yes	✓+	✗
While few would suggest that a bachelor's degree should not be a prerequisite to teaching, the findings may have some relevance when deciding what elementary teachers need to know to be effective teachers.	Yes	✗	✗
This review is of little value, especially more than 50 years after any of the research was done. The authors make broad generalizations that cannot be investigated. They do not cite the studies they examined or even indicate how many studies there were, other than referring to a "number" of a "handful," all done before 1950 and which did not control for poverty. To continue to cite in 1999 this old study, as does Darling- Hammond, ignores more recent findings. This article is one of many examples we found of how the methodology and design of the original educational research is lost (e.g., how was teacher intelligence measured? how was teacher performance measured?), but conclusions survive. Soar et al., 1983, also make a broad statement about the lack of effect on student achievement from NTE scores, using Quirk, Witten and Weinberg, 1973 as the support; but here too they misread Quirk's study, drawing erroneous conclusions.	Yes	✗	Na
Strauss and Sawyer do not examine certification status, only teacher's score on the NTE. It has not been shown that NTE scores correlate with teacher certification status; in fact, the evidence indicates to the contrary (see Wenglinsky, 2000). Strauss and Sawyer use an average NTE score for all of the teachers in each of the schools districts and a median achievement score for all students in each district. This level of aggregation may bias the findings.	Yes	✓+	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Summers, A., and Wolfe, B. 1975;1977	<i>Which school resources help learning? Efficiency and equity in Philadelphia public schools;</i> or <i>Do schools make a difference?</i> Business Review, <i>Federal Reserve Bank of Philadelphia;</i> or <i>The American Economic Review</i> , 67 (4): 639-652	The selectivity of a teacher's college affects student achievement, especially for students who are poor. The general education portion of the NTE correlates negatively with student achievement, but the NTE subject matter tests do correlate with student achievement. Teacher's possession of a master's degree does not affect student achievement. Teacher experience can have some effect. Teacher's race has no effect.	Two versions of a high quality study (one of the best, if not the best we examined) examining 1970-71 pupil files for 6th graders in 103 elementary schools, 8th graders from 42 junior highs, and 12th graders from 5 high schools, using random selection. Darling-Hammond cites this study as one of five (see also: Andrews et al, 1980; Ayers and Qualls, 1979; Haney et al. 1986; and Quirk et al., 1973) that found no relationship between NTE subject speciality tests and teacher performance, "as measured by student outcomes or supervisory ratings."
Taylor, J. and Dale, R. 1971	<i>A survey of teachers in the first year of service.</i> Bristol: University of Bristol, Institute of Education	--	Darling-Hammond cites this study as one of three that suggest that the typical problems of beginning teachers decrease for those who have had adequate preparation prior to entry (see also Glassberg, 1980 and Adams et al., 1980).
Taylor, T. 1957	<i>A study to determine the relationships between growth in interest and achievement of high school science students and science teacher attitudes, preparation and experience.</i> Unpublished doctoral dissertation, North Texas State College	--	Dissertation looking at background of 83 science teachers. Ashton and Crocker responsibly note that the author could find no isolated correlation between teacher credits in education coursework and student achievement, but then cite this study as one of 4 studies (out of a total of 7 studies) that reported a positive effect from education coursework on student achievement. Evertson et al. cite this study as one of three studies (out of four) providing evidence that student achievement is tied to teacher certification (see Hall, 1962; Denton and Lacina, 1984). Darling-Hammond cites this as one of three (see Druva and Anderson, 1983, and Davis, 1964) that support the relationship between student achievement and education coursework.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>This is an excellent study that, among other things, walks the lay reader through the changes that can occur in research findings, depending on how the data is aggregated. When the researcher is able to match scores of individual students with the backgrounds of their individual teachers, the effect sizes and results change dramatically from studies that are only able to aggregate the data by reporting an average student and teacher score for an entire school, school district or, in the worst case, state-level. While the surprising majority of the studies that we looked at did not match individual students to teachers, after seeing how Summers and Wolfe's findings would have changed had they not done so, we were left with a heavy dose of skepticism regarding any study that does not.</p> <p>Summers and Wolfe's findings are still fresh 30 years later and, indeed, seem almost prescient in terms of how they interpret class size, "value-added" achievement gains, and identify inputs that help the disadvantaged child. One of the more interesting conclusions of this study is not mentioned by Evertson and Darling-Hammond. Authors found that <i>"teachers who received a BA from higher rated colleges were associated with students whose learning rate was greater. And it was students from lower income families who benefitted most "</i> (page 644).</p> <p>Despite her claim, not one of the studies cited by Darling-Hammond found a negative relationship with student achievement and teachers' scores on the NTE subject speciality test. In fact, Summers and Wolfe found that the NTE subject speciality portions had a largely positive effect on student achievement in the 8th and 12th grades. The highly negative effect that Darling-Hammond refers to re Summers and Wolfe is found in the teacher scores on the NTE Core Battery, a test of basic skills and pedagogy, for 6th grade teachers. (Darling-Hammond is on record for insisting that there is a relationship between the basic skills/pedaogogy portion of the NTE; here the results do not support her theory.) As for the NTE subject speciality scores, the authors report that a 10 percent increase on teacher NTE score led to a 0.8 month increase in student achievement for eighth graders. For twelfth graders, a 10 percent increase had no effect on below-average students; for average and above students, student achievement improved by 1.1 to 2.7 percentile points for each 10 percent increase.</p>	Yes*	✓+	✓
<p>It is not clear if this paper has been published; it has no relevance to American preparation of teachers because it is a British study which has a different system for training teachers.</p>	Yes	✗	✗
<p>Classic example of advocacy pseudo-science; and in this case from an outdated dissertation. Even though Taylor findings indicated the importance of subject matter, he does not seem to like the results and figures out how to manipulate the findings to report the importance of education coursework. He bundles education coursework with three other variables: teacher experience, attitude, and undergraduate science credits! This logical fallacy makes no more sense than insisting that brown hair is an important teacher attribute because teachers who happen to have brown hair and credits in science are effective. Evertson, Hawley and Zlotnick claimed that this study proved that teacher certification affects student achievement; Ashton and Crocker are more honest about the problems with Taylor's conclusions. Unfortunately, Darling-Hammond perpetuates Evertson, Hawley and Zlotnick's misread in 2000.</p>	Yes	✗	✗

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Texas Education Agency 1993	<i>Teach for America visiting team report. Austin: Texas State Board of Education Meeting Minutes, Appendix B</i>	--	Darling-Hammond (2001) cites this study as one of six providing evidence that principals, supervisors, and colleagues tend to rate recruits from alternative certified programs "less highly on their instructional skills" [page 25; see also Feiman-Nemser and Parker, 1990; Jelmberg, 1995; Lenk, 1989; Gomez and Grobe 1990, and Mitchell, 1987.]
Thacker, J. 1965	<i>A study of the relationship between principals' estimates of teaching efficiency and scores on NTE, academic averages, and supervisors' estimates of potential. Unpublished doctoral dissertation, University of North Carolina, Chapel Hill</i>	Supervisors' ratings of student teachers do not correlate with subsequent ratings by principals and other administrators of the same individuals as new teachers. Supervisor's ratings do not correlate with teachers' NTE scores.	Evertson et al. cite this dissertation for showing the lack of any clear pattern of relationships of the following: supervisors' observations of student teachers, supervisors' evaluations of new teachers and other variables measuring teacher effectiveness.
Thoman, J. 1978	<i>The relationships between teacher knowledge of science, preparation in science, teaching experience, and fifth-grade achievement in science. Dissertation Abstracts International, 40(05), 2578A.</i>	Teacher's knowledge of subject matter is not paramount.	This dissertation is cited by Ashton and Crocker for finding no significant correlation between the number of college credits teachers took in science and their students' test performance.
Vance, V. and Schlechty, P. 1982	<i>The distribution of academic ability in the teaching force: Policy implications. Phi Delta Kappan, 64:22-27</i>	Teaching attracts and retains a disproportionately high percentage of those with low measured academic ability; public schools, not higher education, should train teachers.	Controversial article that led to considerable criticism aimed at the authors because it brought to light some serious problems with the teaching profession, such as the revelation that 40 to 50 percent of first-year teachers leave teaching after seven years. This estimate, according to the author, indicates how unattractive the teaching profession is.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Not only was this report never published, but it is an appendix to board minutes. A comprehensive review of Teach for America teachers in Texas (Credo, 2001) found that Teach for America teachers in Houston produced higher student achievement results than traditionally trained new teachers, but that the results were significantly higher.	Yes	✗	✗
This is an unpublished dissertation.	No	✗	✗
The sample size of 29 teachers is too small to be of any scientific value.	No	✗	✗
--	No	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Veenman, S. 1984	<i>The perceived problems of beginning teachers.</i> Review of Educational Research, 54: 143-178.	Beginning teachers around the world face similar classroom management problems.	This is an international review of 83 studies by a researcher in the Netherlands, concerning the problems of beginning teachers. Both Darling-Hammond (1992) and Ferguson and Womack (1993) cite this article using identical statements that " <i>teacher training programs which emphasize subject matter at the expense of professional education coursework are less effective for preparing novices to teach.</i> "
Vernon, P. 1965	<i>Personality factors in teacher training selection.</i> British Journal of Educational Psychology, 35: 140-149	Teachers are relatively homogenous apropos intellectual ability	Individual teachers rarely fall below average in intelligence; and as a group, tend to score between 100 and 120 on most measures of intellectual ability. With such a truncated range of ability, high correlations are not likely to be found.
Walberg, H. 1986	<i>Synthesis of research on teaching.</i> In Handbook of Research on Teaching (ed.) Wittrock, M.C., 214-229. New York: MacMillan	--	Researchers have had difficulty over the years showing that conventional measures of teacher preparation contribute to the performance of schools; or, more specifically, to the performance gains of pupils within schools.
Walberg, H. 1990	<i>Productive teaching and instruction: assessing the knowledge base.</i> Phi Delta Kappan, February: 470-478	Reviews multitude of teaching techniques and their relative effectiveness.	Walberg, a psychologist, presents a laundry list of effective strategies across the disciplines that are grounded in psychological research. Monk cites this study for showing that researchers have had difficulty over the years proving that conventional measures of teacher preparation contribute to the performance of schools; or, to the performance gains of pupils within schools. Unfortunately, Walberg does not fully address this topic saying only that "microteaching" and in-service education can be effective.
Wenglinsky 2000	<i>Teaching the teachers: Different settings, different results.</i> Princeton: NJ: Educational Testing Service	On average, teachers have higher scores on the certification test if they graduate from institutions which devote a relatively lower proportion of their budget and enroll fewer education majors or minors.	ETS found that teachers did better on certification tests if they attended institutions which 1) devoted less of their budget and enrolled fewer education majors and minors; 2) were private rather than public; 3) had a relatively high proportion of traditional students (full time, 24 years or younger) and 4) had an ethnically diverse faculty.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
Given that this is an international study, Veenman did not try to characterize disparate international teacher training programs for emphasizing too much academic coursework. He notes that all beginning teachers appear to have problems no matter how or where they are trained. Though the language of the review is somewhat obtuse, we could find no evidence that allows Darling-Hammond or Ferguson and Womack to make this claim. Other than an expression of opinion by the author on page 167 taking exception to the criticism of teacher training programs, the review does not provide any evidence that teacher training programs emphasizing subject matter preparation suit teachers poorly.	Yes	✓+	Na
--	No	✓+	Na
--	No	✓+	Na
--	No	✗	Na
This study makes any attempt to link teacher scores on certification tests and their preservice preparation a problematic assertion.	No	✓	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Wilson, S., Floden, R., Ferrini-Mundy, J. 2001	<i>Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations. University of Washington: Center for the Study of Teaching and Policy</i>	The field of education research does not lack exhortations about what teacher preparation <i>should</i> look like, there is much left to learn.	Review of the research surrounding teacher preparation, with a admirable attempt to ignore the old, substandard research that others in the field continue to promulgate. Of 313 studies on teacher preparation that they reviewed, only 57 were deemed worthy of inclusion by the authors, dismissing any that were not published in a scientific journal or that were not published within the past two decades (a criteria which we though excluded some worthy studies, but the attempt at standards is laudable, nevertheless). Excluding the studies they allowed which were "interpretative studies" (i.e. case studies lacking control group, random sample), Wilson et al. accepted only EIGHT studies that examined the issues of teacher preparation that we also examined, and only SIX of these present any evidence to support teacher certification. They are: Darling Hammond, 2000 Ferguson and Womack, 1993 Goldhaber and Brewer, 2000, but no evidence to support teacher certification. Guyton and Farokhi, 1987 Hawk, Coble and Swanson, 1985 Monk, 1994 Rowan, Chiang and Miller, 1987, but no evidence to support teacher certification. Fetler, 1999
Wilson, S.M., Shulman, L.S., and Richert, A.E. 1987	<i>150 different ways of knowing: Representation of knowledge in teaching. In J. Calderhead (Ed.), Exploring Teacher Thinking, 104-124. London: Cassel</i>	Teachers must possess a specialized understanding of their subject matter, one which permits them to foster understanding in most of their students.	Wilson, Shulman and Richert describe their effort to examine the role that teachers' subject matter knowledge plays in teaching, with special interest in the nature of pedagogical content knowledge. Darling-Hammond cites this study as one of three, suggesting the importance of methodology coursework in a teacher's subject area (see Shulman and Kennedy).
Winkler, D. 1972	<i>The production of human capital: A study of minority achievement. Doctoral dissertation, University of California, Berkeley</i>	--	Teachers who have attended better colleges or scored higher on standardized examinations are more successful at helping their students to score higher, according to Ferguson's citation of this study; teacher's verbal ability effects verbal achievement of students, according to Evertson et al.'s interpretation of this study.

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
<p>Wilson et al. found at best five studies, compared to the 100 studies claimed by NCATE or the 200 studies claimed by NCATF to support certification.</p> <p>Despite the effort to look only at solid research, it is puzzling that some studies were still included, especially Ferguson and Womack.</p> <p>Wilson et al.'s effort is most seriously flawed because the authors inappropriately employ a technique usually reserved for meta-analyses, where they present the number of studies that supported a particular teacher effect and compare it with the number of studies that did not. Wilson et al. chose to include case studies, termed "interpretive" studies of one, two, or three individuals, lacking random grouping and important controls, which should have precluded their inclusion in any attempt to "tally" the evidence.</p>	Yes	✗	Na
<p>Certainly the authors advocate strongly for the specialized knowledge of subject matter needed by teachers, but they do not present any practical methods for shortcutting the acquisition of this knowledge, currently acquired by experience, by successfully imparting it to teacher candidates in a preservice education program.</p>	Yes	✗	Na
--	No	✗	✓

Review of Research on Teacher Certification

Author Year	Title and Source	(Relevant) Principal Finding	Study Description / Why This Study Was Cited by Others
Winkler, D. 1975	<i>Educational Achievement and School Peer Composition.</i> Journal of Human Resources, 10: 189-204	Schools which have a higher proportion of teachers who have graduated from prestigious colleges and which report comparably higher teacher salaries (reflecting experience and advanced schooling) are found to have greater gains in student achievement than schools which do not.	Study of roughly 800 black and white high school students in a single large urban school district in California. Winkler's findings on college selectivity were true equally for both black and white students but teacher salary made a bigger difference for white student achievement than for black. Winkler views college selectivity as a proxy for verbal ability.
Wise, A. 1998	<i>ETS Study Shows NCATE Makes a Difference.</i> Newsletter, National Council for Accreditation of Teacher Education (NCATE) 8 (2)	Individuals who graduate from NCATE-accredited teacher training pass the teacher exam at a higher rate than teachers who do not.	The pass rate for NCATE graduates on the PRAXIS 2 was 91%; for non-NCATE graduates the rate was 83%.
Wise, A. 1999	<i>Effective Teachers or Warm Bodies.</i> Newsletter, National Council for Accreditation of Teacher Education (NCATE) 9 (1)	Teacher certification matters	Wise cites the existence of 100 studies that prove qualified teachers outperform those with little or no preparation.
Wright, S.P., Horn, S.P., and Sanders, W. 1997	<i>Teacher and classroom context effects on student achievement: Implications for teacher evaluation.</i> Journal of Personnel Evaluation in Education, 11(1): 57-67	Teacher effectiveness has a strong effect on student achievement	Darling-Hammond (1999) cites this study as one of three that find differential teacher effectiveness a strong determinant of differences in student learning, far outweighing the effects of differences in class size and heterogeneity (page 5).

Review of Research on Teacher Certification

Problems Found with the Study or with Claims about the Study	Cited to Justify Certification	Rigor of Review	Critical Controls Used
--	No	✓+	✓
Wise fails to point out that the average SAT scores at NCATE-accredited teacher training institutions is significantly lower than than the average SAT scores from college graduates who attend non-NCATE schools. At NCATE schools, the SAT average in math is 503; and the verbal 517. At non-NCATE schools, the SAT average in math is 512; and the verbal 528. Because the link between verbal ability, which is measured on the SAT verbal test, and teacher quality is well established, this gives pause to any decision to favor NCATE graduates over non-NCATE graduates. In addition, Wise fails to point out that the study was seriously flawed, assigning 14 percent of the test takers to NCATE institutions. These individuals, however, were not enrolled in the teacher training colleges at these institutions; they were non-education majors at those institutions.	Yes	×	Na
The studies to which Wise refers are not identified by NCATE. It is unlikely that Wise refers to any studies not cited elsewhere by such advocates as Darling-Hammond; therefore we presume that we have examined here all of the studies to which he is referring.	Yes	×	Na
Two of the three studies cited by Darling-Hammond were never published: Sanders and Rivers(1996); Jordan et al.(1997).	No	✓+	✓