WHEN SHOULD WE REWARD DEGREES FOR TEACHERS?

The authors provide evidence that teachers can have an impact on student outcomes, and they show that student achievement in math and science can be improved by requiring teacher training in those subject areas.

MOST public school systems reward teachers who obtain advanced degrees with a considerable increase in their base pay. Salary schedules typically provide a pay premium averaging 11% for a master's degree, 14% for an education specialist's degree, and 17% for a doctorate over what a teacher would earn with a bachelor's degree only.1 Some school systems even require their teachers to obtain an advanced degree after a specified number of years of teaching in the district. The emphasis on teachers' having or obtaining advanced degrees raises important questions. Do advanced degrees enhance a teacher's productivity and, if so, by how much?

These questions get at the more general issue of how educational resources are allocated in a school and whether educational dollars are being spent efficiently. Surprisingly little is known about this issue because no broad consensus has emerged as to which educational resources have a significant impact on student outcomes. Most economists' and sociologists' studies of the impact of schools on teachers conclude that individual traits and factors related to family background explain the vast majority of variation in student test scores.

Much of the early evidence on the effects of such educational inputs as per-pupil spending, teacher experience, and teacher degree level has been mixed.2 However, more recent studies, using detailed measures of teacher ability and qualifications, have found positive results. David Monk and Jennifer King report that teacher subject-mastery preparation in mathematics and science has a positive impact on student achievement in those subjects, and measures of the selectivity of teachers colleges (which may be proxies for teacher ability) have also been shown to be positively related to student achievement.3 In this article we will review our own recent empirical work, which helps shed some light on the relationship between teacher degrees and student outcomes.

Data and New Empirical Evidence

The data in our analyses were drawn from the first two waves of the National Education Longitudinal Study

of 1988 (NELS). The NELS database is nationally representative, contains a comprehensive set of educational variables, and, unlike most other data, links students to specific classes and teachers. This is an important characteristic of the survey because it eliminates problems that may arise from using data aggregated at the school or district level. This linkage allows us to investigate in detail the effect of subject-specific teacher degree levels on student achievement, since we know the characteristics of each teacher (his or her race/ethnicity, degree level, experience, certification, and so on) who taught students in the 10th grade. Our sample consisted of public school students only: 5,113 in math, 4,357 in science, 6,196 in English, and 2,943 in history. The teacher and class data in NELS are organized by school/subject, so that separate information is available about the teachers in each of the four subject areas sampled.

 Virtually all teachers in public schools have at least an undergraduate degree. However, as illustrated in Figure 1, which shows the percentage of teachers in our sample who have various types of degrees, fewer teachers have degrees specific to the subject they teach. This is consistent with recent findings reported by the National Commission on Teaching and America's Future. In our sample only 68% to 76% of teachers (depending on the subject) have at least a bachelor's degree in their subject area. A lower proportion of math and science teachers than of English and history teachers have bachelor's degrees in their subject areas. And although about half of all teachers have at least a master's degree, less than a quarter have advanced degrees in their subject area.

 Students were tested in both the eighth and 10th grades in one or more of the following subjects: mathematics, science, reading/writing, and history. The data therefore permit the estimation of "education production functions" that control for previous knowledge. In the education production-function methodology, student achievement in the 10th grade is modeled as a function of eighth-grade achievement, student and family background variables (e.g., parental income and education and the student's race/ethnicity), and school variables (e.g., class size and teacher experience). The results of the achievement models can be used to answer the question of how different schooling characteristics, such as class size or the degree level of teachers, affect student achievement, holding all other family and school characteristics constant. For instance, we can predict by how much, on average, students' test scores would rise (or fall) if a given teacher with a bachelor's degree were replaced by a teacher with a master's degree who had otherwise identical observable characteristics.

 We estimated the 10th-grade educational achievement in each of four subject areas as a function of four sets of explanatory variables: individual and family background variables, school-level variables, teacher variables, and class-level variables. Consistent with most prior research, we found that individual and family background variables, such as parental education, explained up to 75% of 10th-grade achievement.

 Few of the school, teacher, or class coefficients are statistically significant in the expected direction. For instance, more years of teaching experience are not associated with higher student test scores. The results for teacher certification are similar, in that we find the coefficient on teacher certification to be statistically insignificant (except in English, where teacher certification is significant and negative). These findings probably seem counterintuitive to many readers, but they are quite consistent with the large body of academic literature that shows little relationship between school-level resources and individual student achievement.

 The next step in our analysis was to include information on subject-specific: teacher degrees and certification in our models. These variables allow us to distinguish between teachers who have a major (bachelor's or master's degree) in the subject they are teaching, teachers who are certified in the subject they are teaching, and those who do not have subject-specific training in the subject they teach.

 It turns out that in our sample the use of subject-specific information about teachers is critical in interpreting the effects of teacher characteristics on student achievement. General measures of teacher qualifications were not found to influence student outcomes. We found no evidence that a teacher with an advanced degree in a subject other than the one he or she teaches was any more effective than a teacher without an advanced degree. This is striking given that, in most school systems, teachers receive a substantial bump in salary with an advanced degree, regardless of whether it is in their subject or not. However, in two subjects, math and science, subject-specific training for teachers was found to have a statistically significant impact on student test scores.

What Do These New Findings Tell Us?

The predicted magnitude of the effect of teacher training on student achievement is relatively small. In science, the mean 10th-grade test score was about 22 with a standard deviation of 7.5. Having a science teacher with a bachelor's degree in his or her subject is predicted to add about 7 points to the average science student's score relative to what the student would have received had the teacher not had a bachelor's degree in science. Thus a science-specific bachelor's degree is worth about one-tenth of a standard deviation improvement on the 10th-grade science test.

Figure 2 shows the predicted improvement in the subject in which teacher training was found to be most important; math. The vertical bars represent the predicted scores for the average math student on the 10th-grade mathematics test, given teachers with different degrees.

Again, the improvement is relatively small. The difference in predicted scores for a student whose teacher has a bachelor's degree (not in math) and one whose teacher has both a bachelor's degree and a master's degree in math is about 1.4 points. This is only about one-tenth of a standard deviation on the 10th-grade mathematics test.12

So what do these results tell us? To the extent that school districts wish to maximize test performance, these data suggest that only advanced degrees that are specific to the subject in which the teachers teach should be rewarded. They also suggest, more generally, that incentives that reward professional development ought to be narrowly tailored to training specific to the subject taught by the teacher.

Many readers may be surprised that empirical evidence does not consistently show teacher qualifications to "mater." However, there is still controversy in academic circles about the precise nature of the relationship between educational resources and student outcomes. This is not all that surprising, given the complicated nature of the schooling process and the limited availability of experimental data that might more clearly illustrate how schools and teachers affect students.

In our analyses, we shed some light on the impact of teacher degree level on student test scores. We find the subject-specific training of teachers in math and science to have a small but significant positive impact on achievement. We also find that subtle differences in the way researchers specify their statistical models can result in very different interpretations of whether teachers affect student outcomes.

Our findings are important for two reasons. First, they provide additional evidence that teachers can have an impact on student outcomes. Second, they show that student achievement in math and science can be improved by requiring teacher training in those subject areas.

GRAPH: Figure 1. Percentage of Teacher Degrees by Subject Taught

GRAPH: Figure 2. Tenth-Grade Math Test Scores, by Math Teacher Degree

ILLUSTRATIONS


5. For a detailed discussion of this and other technical issues, see Goldhaber and Brewer, "Why Don't Schools and Teachers Seem to Matter?"


7. The tests were carefully designed by the Educational Testing Service to assess both the level and gain in knowledge in each subject area. While all students took the same test in the eighth grade, tests of varying difficulty were given to students in the 10th grade, depending on their eighth-grade scores, in order to guard against "ceiling" and "floor" effects. The tests were given a common score using Item Response Theory (IRT).


9. The individual and family background variables include gender, race/ethnicity, parental education, family structure, family income, and eighth-grade test score. School variables include urbanicity, dichotomous variables identifying region, school size, the percentage of students at the school who are white, the percentage of students at the school who are from single-parent families, and the percentage of teachers at the school who is at least a master's degree. Teacher variables include gender, race/ethnicity, years of experience at the secondary level, whether the teacher is certified, and the teacher's degree level. Class-level variables include class size and percentage of minority students in the class.

10. Although the race, ethnicity, and gender of teachers appear to have an impact on student scores in math and science, we do not explore this issue here. For a more


11. We found no evidence that subject-specific degrees have an effect on student achievement in English or history. It is possible that the positive findings for teacher degrees in math and science do not reflect the training that teachers have in those subjects but simply that math and science degrees serve as proxies for teacher ability. To test this hypothesis, we re-estimated all models, including whether a teacher has a math or science degree, in the English and history regressions. If math and science degrees serve as proxies for teacher quality, then we would expect the coefficients on these variables to be significant and positive in all the subject areas, including English and history. This is not the case. Neither the math nor the science degree-level variable is statistically significant in the English and history regressions. This result clearly suggests that, in math and science, it is the subject-specific training of the teacher that is the important factor in determining 10th-grade achievement.

12. The standard deviation on the 10th-grade mathematics test is 13.63.

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Teacher Preparation Research

In a February 2001 report for the U.S. Department of Education summarizing teacher preparation research, Michigan State University scholars concluded that "overall, the research base concerning teacher preparation is pretty thin." However, studies do show "a positive connection between teachers' preparation in their subject matter and their performance and impact in the classroom." The studies also "reinforce the view that the pedagogical aspects of teacher preparation matter" and demonstrate that, "in field experiences with focused, well-structured activities, significant learning can occur." The report, titled "Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations," also found that a traditional route to becoming a teacher "have been successful in recruiting a more diverse pool of teachers; have a mixed record in attracting the 'best and brightest'... (and) vary in ability to prepare teachers for the exigencies of classroom life."

The State of Teacher Preparation

In a 1998 survey of 3,500 teachers prepared for the U.S. Department of Education, four out of five teachers said they felt unprepared to teach. More than a third said they either didn't have a degree in the subject they taught or didn't spend enough time training for the subject they taught. Thirty-eight percent had bachelor's or master's degrees in a specific field, 37 percent had majored in general education, and 18 percent had degrees in such subjects as math education. A 1993-94 survey came up with similar results.

A 1996 Council for Basic Education survey provided some context for the conclusion that many teachers feel unprepared when they take their first teaching job: "Teacher education programs spend too little time preparing in the content area." Our practices are now watered-down in the content area so that preservice teachers feel good." "It is ridiculous to expect elementary teachers to teach science or math on [the basis of] one course in each of these discipline." Teachers described education methods and theory as "the shabbiest psychobabble imaginable," "an abject waste of time," "watered-down courses," and "simpleistic, make-work, seat-time." Sixty-two percent of the teachers advocated more time in the classroom, and most of the survey comments had to do with the need for more school-based experiences accompanied with on-site supervision from university professors.

Teachers' Influence

In 1998 study, William Sanders, director of the Value-Added Research and Assessment Center at the University of Tennessee at Knoxville, found that a good teacher has a greater impact on student achievement than such variables of ethnicity and poverty, which often have been considered overpowering barriers to academic success. Sanders determined the effectiveness of a teacher by a complex statistical model that measures the "value" a teacher adds to his or her students based on test scores. Sanders, who conducted the study, "Cumulative and Residual Effects of Teachers on Future Student Academic Achievement," with June C.
Rivers, has said flatly: "The single biggest factor affecting academic growth of any population of youngsters is the effectiveness of the individual classroom teacher." Students whose initial achievement levels are comparable have "vastly different academic outcomes as a result of the sequence of teachers to which they are assigned." The difference can be as much as 50 percentile points on standardized tests.

In a 1998 survey conducted by pollster Louis Harris for Recruiting New Teachers, Inc., nine out of 10 Americans said they believed the best way to raise student achievement was to put a qualified teacher in every classroom. Teacher quality was second only to school safety as the most important ingredient in improving education, according to the survey. Teacher quality ranked above salaries, tests, vouchers, privatization, and school uniforms. Ninety-two percent of those surveyed said excellent teachers need to be "well-trained and knowledgeable about how to teach effectively," and 91 percent said they need to be "thoroughly educated in the subjects they will teach."

Field Experience

A 2000 survey of teachers and school administrators by Public Agenda found that teachers are generally satisfied with what is taught in terms of content, but they want more practical experience in managing a classroom, making learning exciting, and ensuring that students actually learn. In the survey titled, "A Sense of Calling," 56 percent of those polled said the balance was too much in favor of theory over the practical challenges of teaching. Only 30 percent of teachers said they had received sufficient amount of experience in front of real classrooms while in teacher preparation programs.

A 1998 study by University of Texas researcher C. E. Flemer of 1,929 Texas elementary teachers found that teacher candidates who receive more field experience remain in teaching longer. Half the candidates had graduated from a traditional teacher preparation program that saved classroom practice for the end of the program, and half had graduated from programs with more field-based opportunities early on. Three years after they started teaching, 12 percent of those in more traditional programs had left the profession compared to 4.8 percent of those from the field-based programs.

In a 1996 survey of 600 top U.S. teachers by the Council for Basic Education, 62 percent of teachers advocated more time in the classroom while still a student. In their comments, the teachers said what would have been most valuable to them was time to both observe and participate in teaching with on-site supervision from university professors as well as from the classroom.

Subject Matter Knowledge

In a 2000 study called "Teaching the Teachers," Educational Testing Service researcher Harold Wenglinsky drew on data from 39,140 prospective teachers who took the Praxis II examinations for teacher licensure, which are currently used in 34 states. He compared individual scores on the test to information about the 152 colleges and universities attended by the test-takers. One of the findings was that prospective teachers in institutions with high proportions of education majors and minors perform less well than prospective teachers in institutions with less emphasis on educational theory, child development, and teaching methods. Wenglinsky wrote of the "need to place greater emphasis on preparation in content areas and less on preparation in professional knowledge."

A 1999 study by Dan Goldhaber and Dominic Brewer found that math students with teachers holding bachelor's or master's degrees in mathematics did better on math tests than those students with teachers who lacked such expertise in math. The researchers used data from the National Educational Longitudinal Study (NELS) of 1988, a national survey of about 24,000 eighth-grade students conducted in the spring of 1988. Some of those students were surveyed again in 1990 and 1992, and they also took one or more subject-based tests.

In a 1994 Cornell University study, David Monk, currently dean of the College of Education at Penn State, studied a sample of 2,829 students and their teachers and found that both subject matter and knowledge of teaching theory affected student achievement in math and science. While having a major in math in college had little bearing on the performance of the teacher's students, the number of undergraduate courses in the teacher's background — up to about five — had a positive impact on pupil performance. Monk also found that courses in both science and math teaching theories and methods had a positive impact on student achievement.

Five-Year Programs
In a 2000 report entitled, "Soiving the Dilemmas of Teacher Supply, Demand, and Standard," published by the National Commission on Teaching and America's Future, Stanford University Professor Linda Darling-Hammond found that teachers trained in a five-year program say in the profession longer than their counterparts who've gone through a shorter program. According to her research, 60 percent of individuals who enter teaching through what Darling-Hammond described as "back-door" routes leave the profession by their third year of teaching. In comparison, 30 percent of all traditionally trained teachers leave the profession by the third year, and just 10 to 15 percent of teachers prepared in extended five-year programs leave the profession by the third year.

In a 1990 study reported in the "Journal of Teacher Education," Michael Andrew, professor of education at the University of New Hampshire, found that graduates of five-year teaching programs had a higher retention rate (74 percent compared to 56 percent) than that of students in four-year education programs. Of more than 300 students surveyed, 82 percent of students in five-year programs said they would choose teaching as a career again compared to 56 percent of four-year students.

**Technology**

The 2000 Campus Computing Project survey found that education schools on college and university campuses were among the least technologically sophisticated among departments. Chief technology officers gave their education departments low marks in use of Internet and Web sources, and use of technology for instruction, and about average in preparing students with the technology skills needed over the next decade. Colleges and universities generally do not have a strategic plan for electronic commerce, distance education, campus portal services, or financing information technology.

A 1999 Milken Family Foundation study, "Will New Teachers Be Ready to Teach in a Digital Age?" found a large gap between what K-12 students need to know about technology and what teacher education schools are teaching. Conducted by the International Society for Technology in Education (ISTE), the survey of leaders at 416 teacher-preparation institutions confirmed findings of earlier studies that education school technology programs have not been able to keep up with the rapid increases and changes in technology infrastructure in schools. The reason for the failure, the study found, has little to do with the availability of technology. Most schools report having "adequate" hardware and software. But both in the university classroom and in K-12 classrooms used for practice-teaching, most students neither routinely use technology nor receive advice and guidance on its use by their university instructors or classroom mentors. The study also found that stand-alone courses on technology did not translate into skill in incorporating technology into daily teaching.

A 1994 study by University of Michigan researcher James Kulik analyzing 100 individual research studies found that students taught with computer-based instruction scored 14 percentile points more on achievement tests than students without computer-based instruction. Kulik also found that students learned faster and had a more positive attitude towards school when computers were used to teach them.

The following Web sites appeared in this article:

- Council for Basic Education: www.c-bee.org/
- Recruiting New Teachers, Inc.: www.mnt.org/channel/clearinghouse/
- "A Sense of Calling": www.publicagenda.org/specials/teachers/teachers.htm
- "Teaching the Teachers": www.ets.org/research/pic/rt.pdf
- Educational Testing Service: www.ets.org
- study: www.edexcellence.net/better/techs/09.htm

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Several exemplary teacher education programs are examined in the first volume of (2000),

which highlight teaching and career-long process

with meaningful experiences and realistic settings that

encourage high-quality teacher preparation programs

and contribute to the leadership role of teacher educators and

influence the future of education. The focus is on high-quality programs that are rigorous and

prepare teachers to be effective and successful in their roles.

There is substantial evidence that teacher preparation is a critical factor in the success of students.
recently...
Selected readings on teacher preparation:

- Effective feedback (2010) [1995 Farn], and\n- School-based induction, mentors, and teacher education programs (2000) [1995 Farn], and\n- Teacher education and performance feedback (2002) [1995 Farn], and
- Professional practice scholar, a group of professional practice schools with a shared vision with the University of Chicago, to provide the teachers for

Suggested Website Resources for NCTAF Summit 3: High Quality Teacher Preparation Programs

American Association of State Colleges and Universities
- Christa McAuliffe Award for Excellence in Teacher Education
  http://www.aacra.org/programs/mcauliffe/default.htm

American Association of Universities
- AAU Resolution on Teacher Education
  http://www.uaa.edu/education/TeacherEDRes.html

American Council on Education
PRESNET (Presidents’ Network for the Education of Teachers)
- “To Touch the Future: Transforming the Way Teachers are Taught – An Action Agenda for College and University Presidents”
  http://www.aacenet.edu/resources/presnet/what-presidents-can-do.cfm

American Educational Research Association
- “Sticks, Stones, and Ideology: The Discourse of Reform in Teacher Education”
  http://www.aera.net/pubs/er/pdf/vol30_08/AERA300803.pdf

Carnegie Corporation
- “Teachers For a New Era”
  http://carnegie.org/sub/program/teachers_ececsaum.html

Center for the Study of Teaching and Policy
- “Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations”

Center on Reinventing Public Education
- “Can Teacher Quality Be Effectively Assessed?”

Education Commission of the States
- Chairman’s Initiative on Teaching Quality

Education Trust
- Reports on teacher quality
  http://www2.edtrust.org/EdTrust/Product/Catalog/browse2.html?q

National Commission on Teaching and America’s Future
Summit 3: High Quality Teacher Preparation
Page 1
RAND Corporation
- “Evaluating Value-Added Models for Teacher Accountability”
  http://www.rand.org/publications/MGMG158/

National Commission on Teaching and America’s Future
- “Investing in Teaching Quality: A Toolkit for Campus Leaders”
  http://www.nctaf.org/article/index.php?g=0&c=2&sc=0&asc=0&g=16&narr=
- “Studies of Excellence in Teacher Education” (three volumes; Edited by Linda Darling-Hammond, 2000)
  http://www.nctaf.org/article/index.php?g=0&c=4&sc=16&narr=&a=234&nave=

National Council for Accreditation of Teacher Education
- Unit Standards; Program Standards, and Standards for Professional Development Schools
  http://www.ncate.org/standards_sids.htm

National Institute for Work and Learning
- Teachers for a New Era Virtual Library
  http://www.nwivl.org/nwe_vl.html

The Teaching Commission
- “Teaching at Risk: A Call to Action”
Teacher Preparation Research:  
Current Knowledge, Gaps,  
and Recommendations  
A Research Report  
prepared for the  
U.S. Department of Education  
by the Center for the Study of Teaching and Policy  
in collaboration with Michigan State University  
Suzanne M. Wilson  
Robert E. Fiedler  
Joan Ferrini-Mundy  
Michigan State University  
February 2001  
(Document R-01-3)  
Center for the Study of Teaching and Policy  
UNIVERSITY OF WASHINGTON
**EXECUTIVE SUMMARY**

All children in the United States—no matter where they live or who they are—deserve qualified teachers. Yet many do not have them. Why?

There are serious disagreements about what it means for teachers to be well qualified and about what it takes to prepare teachers well. Opinions and exhortations about these questions abound, and decisions about teacher preparation are made on a variety of bases. The purpose of this report is to summarize what rigorous, peer-reviewed research does and can tell us about key issues in teacher preparation. Questions about subject matter and pedagogical preparation, clinical training, policy influences, and alternative certification have been examined through research, and the results can provide directions as we work to improve teacher preparation nationally.

Across the country, teachers are prepared in more than 1,300 large and small, public and private colleges and universities, as well as through alternative programs offered by districts and states. Program designs and teacher preparation vary widely. Although the population of U.S. school-age children is becoming increasingly diverse, our pool of potential teachers is not, furthering the need to prepare teachers to work with students different from themselves. The challenges in improving teacher education programs and practices in the U.S. are enormous, and a qualified teaching force is an unquestionable necessity. Research can help us make these improvements and build this qualified teaching force.

We examined more than 300 published research reports about teacher preparation and found 57 that met our criteria for inclusion in this summary. Reducing the complex findings of research studies to simple conclusions is risky business, and so our report is full of caveats. Individual studies cannot tell us definitively how to proceed with the improvement of teacher preparation—and only sometimes can the accumulated work in an area give clear direction for future action. Nonetheless, in this review we have found individual studies that identify important areas to be pursued and some collections of work that point toward how we can improve. The knowledge available from research, though uneven in some areas, lays promising groundwork for rigorous research to come.

**What Answers Does Research Give To Critical Questions About Teacher Preparation?**

This summary is organized around five major questions that address key aspects of teacher preparation. Overall, the research base concerning teacher preparation is relatively thin. The studies we found, however, suggest that good research can be done, but that it will take the development of more refined databases, measures, and methods, as well as complementary research designs that collect both qualitative and quantitative data.

**Question 1: What kinds of subject matter preparation, and how much of it, do prospective teachers need?**

It is no surprise that research shows a positive connection between teachers' preparation in their subject matter and their performance and impact in the classroom. Subject-specific methods courses in education are useful too. But, contrary to the popular belief that "more subject matter study is always better," there is some indication from research that teachers can acquire subject matter knowledge from various sources, including subject-specific academic coursework and study in an academic major. However, there is little definitive research on the kinds or amount of subject matter preparation; much more research needs to be done before strong conclusions can be drawn.
Some researchers have found serious problems with the typical subject matter knowledge of preservice teachers, even of those who have completed majors in academic disciplines. In mathematics, preservice teachers' knowledge of procedures and rules is often sound, while their knowledge of concepts and their reasoning skills may be weak. Lacking such deep understanding of fundamental aspects of the subject matter can impede good teaching, especially given the high standards called for in current reforms. Research suggests that changes in teachers' subject matter preparation may be needed, and that the solution is more complicated than simply requiring a major or more subject matter courses.

Question 2: What kinds of pedagogical preparation, and how much of it, do prospective teachers need?

By "pedagogical preparation" we mean the various courses that teachers take in such areas as instructional methods, learning theories, foundations of education, and classroom management. The content and arrangement of such courses in programs of teacher education varies widely. Studies that have looked across several of the pedagogical parts of teacher preparation programs reinforce the view that the pedagogical aspects of teacher preparation matter, both for their effects on teaching practice and for their ultimate impact on student achievement. Some evidence suggests that coursework in content methods matter for teacher effectiveness. But since many studies use a weak proxy for pedagogical preparation—possession of a teaching credential—the results give little insight into which aspects of pedagogical preparation are most critical.

Question 3: What kinds, timing, and amount of clinical training ("student teaching") best equip prospective teachers for classroom practice?

Experienced and newly certified teachers alike see clinical experiences as a powerful—sometimes the single most powerful—element of teacher preparation. Research documents significant shifts in attitude among teacher candidates who work under close supervision in real classrooms with children. Whether that power enhances the quality of a teacher's preparation seems to depend on the specific intent and characteristics of the field experience. Field experiences are sometimes intended to show what the job of teaching is like, sometimes to help teachers learn about classroom management, and sometimes to give practical opportunities to apply concepts encountered in university coursework. Some are offered early in the program, others later. Duration, supervision arrangements, and settings vary dramatically.

Research shows that field experiences too often are disconnected from, or not well coordinated with, the university-based components of teacher education. Sometimes the field experiences are limited to mechanical aspects of teaching. Finding placements is challenging, and identifying schools that share educational perspectives with teacher education programs can be an issue. The norms of the schools in which prospective teachers are placed are crucial to shaping the experience. Yet research shows some promising practices can be developed: prospective teachers' conceptions of the teaching and learning of a subject matter can be transformed through their observations and analysis of what goes on in real classrooms. Stereotypical views can shift when student teachers work in classrooms that enable this to happen. In field experiences with focused, well-structured activities, more significant learning can occur. Cooperating teachers have a powerful influence on the nature of the student teaching experience.
Question 4: What policies and strategies have been used successfully by states, universities, school districts, and other organizations to improve and sustain the quality of preservice teacher education?

Too few research studies have been conducted to make confident conclusions about the effects of policies on the quality of preservice teacher education. The studies we examined suggest a basis for examining questions about revised certification systems, state approval mechanisms, and national accreditation and their desired effects on the preparation of teachers. In addition, research-based examinations of accountability systems, collaborative partnerships with K-12 schools, involvement of arts and science faculty as part of program policy, and school district incentives all might hold promise for the improvement of teacher-education program quality.

Question 5: What are the components and characteristics of high-quality alternative certification programs?

Until the early 1990s, most people who wanted to teach in the public schools needed to complete an undergraduate program of teacher preparation. By 1993, 40 states had created postbaccalaureate alternate routes into teaching, as a way of reducing shortages in critical areas such as mathematics and science, attracting non-traditional entrants, and finding staff for urban and rural schools. Recent data suggest that most states now have alternative routes firmly in place, although these differ dramatically in their designs.

Research indicates that alternative route programs have been successful in recruiting a more diverse pool of teachers. However, the research shows that alternative routes have a mixed record in attracting the “best and brightest,” challenging one rationale for the existence of alternative routes. The small number of interpretive studies available suggests that background in subject matter alone is not enough to prepare new teachers for the exigencies of contemporary classrooms. Alternative routes that have high standards for entry and require substantial pedagogical training, mentoring, and evaluation may be quite similar to traditional college-based teacher education and tend to be successful in their production of qualified teachers.

Future research will need to include more detailed descriptions of the various alternative route program structures and content before conclusions can be drawn about characteristics that make for quality programs. Research that compares the characteristics and performance of traditionally and alternatively prepared teachers over time will help clarify the complex issues around alternative programs.

Where Should Teacher Preparation Research Head?

The research we examined provides a starting point for efforts to better understand what would make for good teacher preparation. Most studies to date have looked at particular programs, courses, and students in single institutions. We now need to undertake studies that are designed to look across institutions, so that more general conclusions can be reached. As a beginning, studies that describe what goes on in the courses and programs of the more than 1,300 institutions that prepare teachers would be useful.
We need more studies that relate specific parts of teachers' preparation (subject matter, pedagogy, clinical experiences) to the effects on their teaching practice and perhaps on student achievement. Studies that compare the relative importance of specific parts of teacher preparation could be useful to those designing and revising teacher education programs.

We recommend that future studies be designed to include more sensitive measures that describe specific features of program content and quality. Research programs should include comparisons among plausible alternatives. The interplay between research about particular contexts and research that seeks general conclusions across programs needs to be stronger. Teacher preparation research must be explicit about connections to the improvement of student achievement and about the contexts in which graduates of teacher preparation are working. Future research should also include longitudinal studies that examine the impact of teacher preparation over time, as well as the connections between teacher preparation, induction programs, and professional development opportunities.

Our review also suggests several potentially fruitful domains for future research. The subject matter preparation of teachers needs more attention, with close looks at both content and quality and at differences across subject areas. We do not yet know enough about the effects of close, long-term connections between K-12 schools and teacher preparation programs. Research could help us see how policies that are designed to influence teacher education actually affect program components and what prospective teachers learn. And, we need to know more about the effects of "education methods" and "education foundations" courses.

Strategic investment in research initiatives might also move us toward answers to the key questions more quickly. The educational research community has great interest in careful examination of local programs. Through funding for multi-site research programs, these individual efforts can be assembled into more powerful and crosscutting approaches to understanding teacher education. A small number of coordinated, large-scale studies could help provide a clearer picture of the national situation and increase the potential for linking features of teacher preparation programs with outcome data such as scores on teacher examinations. And, key for policymakers will be studies that help us learn about the conditions under which teacher education accountability systems lead to increases in teacher quality.

The potential of research to lead the ongoing reform and improvement of teacher education in the United States is enormous. By building on what we have done, and by conducting rigorous studies of important questions, the research community can do its part to ensure that a well-qualified teacher is available for every child, in every classroom.
Fourth, as will become clear, the research base concerning teacher preparation is limited. We are, of course, not the first scholars to make this observation. The lack of depth of research on teacher preparation poses challenges for a review. With a limited number of studies, we cannot discuss trends. Yet descriptions of individual studies do speak to larger themes. In this report, we aim for a middle ground, offering summaries of some of the existing research, along with strategically selected studies that we describe in more depth to illustrate the complexities of answering each focal question. Specifics about the particular studies cited are available in Appendix B.

We conclude this introduction with an important and pressing need. As the population of U.S. school-age children becomes increasingly more diverse, our pool of potential teachers remains less so. We need to consider policies that increase the diversity of the teacher pool, and we need to prepare all teachers to teach children whose backgrounds are different than their own. Researchers have had little opportunity to investigate the implications of this shift in students and their teachers, and while a question concerning the preparation of teachers to teach diverse students was not a focal one in this review, we argue (in our recommendations for future research) that it ought to be central in the next generation of research on teacher preparation.

EXISTING RESEARCH ON TEACHER PREPARATION

Question 1. What kind of subject matter preparation, and how much of it, do prospective teachers need? Are there differences by grade level and subject area?

Findings

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

We found seven studies related to Question 1 that met our selection criteria. Four concerned mathematics and science teachers; one concerned secondary teachers without specifying subject matters; one concerned elementary and middle school 38


mathematics and reading teachers; another studied program graduates who had taken subject matter knowledge tests. One study involved 36 teachers; the others had sample sizes ranging from 200 to 3,000 to 65,000 teachers. Measures of teacher subject matter knowledge ranged from self-reports of majoring in a relevant subject matter to the number of courses taken to National Teacher Examination (NTE) scores. (Brief descriptions of the studies mentioned in this report are available in Appendix B.)

✓ Consistent with common belief, several studies showed a positive connection between teachers’ subject matter preparation and both higher student achievement and higher teacher performance on evaluations, particularly in mathematics, science, and reading. In another study, however, researchers found that NTS scores and grade point averages (GPAs) in the major accounted for only small proportions of the variance in teaching performance of prospective secondary teachers (by contrast, education coursework accounted for 48 percent and 39 percent of the variance when performance was rated by education supervisors and subject matter specialists, respectively). In another study, the researcher found that states with a higher proportion of well-qualified teachers (full certification and a major in their field) had higher mathematics and reading test scores in grades four and eight. The same study found a negative relationship between a state’s proportion of teachers with less than a minor in the field that they teach and student achievement.

✓ Undermining the view that the ideal preparation is a subject matter major, three relevant studies had complex and inconsistent results. One study found a positive relationship between teachers’ degree in mathematics and their students’ test scores but did not find this relationship in science. Using the same data set, other researchers found a positive relationship between student achievement in mathematics and teachers’ majors in mathematics, but the effect size was quite small. The third study found no effect of having a full mathematics major, though having coursework in mathematics did matter. Is the same study, there was a significant positive relationship between teachers’ coursework in the physical sciences and student achievement gains for high school sophomores and juniors. Teachers’ undergraduate coursework in the life sciences had no discernible impact on student performance.

✓ Contrary to the belief that “more is better,” when it comes to subject matter courses, one study found that subject matter study beyond four to six courses had little effect on student achievement. The same study found different relationships between amounts of preparation for life science teachers and physical sciences teachers and the effects their preparation had on student performance.

20 Ferguson and Wison, 1993.
Several studies addressed the question of the relative merits of studying subject matter in the context of teaching (for example, subject matter methods courses) versus studying it as a distinct course (for example, majoring in a subject matter).

Several studies found that education coursework, including subject-specific methods courses, is useful. One study found education coursework to be a better predictor of teaching performance than GPA in the major or National Teachers Examination Specialty score. In another study, the researcher found that courses in undergraduate mathematics education contributed more to student gains than courses in undergraduate mathematics. However, other researchers found that having a degree in education had no impact on student science test scores.

Consider one study that illustrates the complexity of studying prospective teachers' subject matter preparation. In this study, the researcher found positive relationships between teachers' subject matter preparation and student achievement. However, there was evidence of a "threshold effect"—that is, there was minimal additional effect of teachers' study of mathematics beyond five undergraduate mathematics courses on pupil mathematics performance. Having a mathematics major had no bearing on student performance. The results were different in science. While there was no impact on student achievement with teacher undergraduate coursework in life sciences, there was a strikingly positive relationship between undergraduate coursework in physical sciences and student achievement. Again, there appeared to be a threshold effect. After having taken four courses in physical sciences, there was a payoff in terms of student progress.

It is also important to note that the researcher found positive effects of mathematics education courses. Courses in undergraduate mathematics education contributed more to student achievement gains than did undergraduate mathematics courses. There was a similar relationship between coursework in science education and student achievement. After exploring a number of interaction effects, the researcher concludes that it is "risky" to make any generalizations about the significance of teacher subject matter knowledge.

While there is no definitive research that helps us understand this confusing finding, several possible explanations bear further investigation, including the possibility that a teacher needs to understand subject matter from a pedagogical perspective. Lee Shulman has called this form of professional teaching knowledge "pedagogical content knowledge." We should be cautious here, however, in making strong claims, for "pedagogical content knowledge" remains more hypothesis than fact. We will return to this issue when considering related research concerning Question 2.

The research base tells us relatively little about differences across the subject areas or grade levels for which prospective teachers are preparing.

The results in these few studies showed some differences between mathematics and science, as well as differences among areas of science as noted above. No conclusions can be drawn about other subject.

38 Coldham and Brewer, 2000.
areas, because the only subject-specific research we found was in mathematics, science, and reading.

√ There is very little information that sheds light on variations across grade levels because studies did not generally investigate grade-level differences.

In addition to the seven studies of the effects of subject-matter preparation, we found 31 studies concerning the typical subject-specific knowledge and beliefs of preservice teachers, at both the elementary and secondary levels.28 Research such as this bears indirectly on what teachers should know, for it helps illuminate the challenges faced in teacher preparation by pointing out what teachers do not know about the subject matter they will teach.

Three studies were based on one large-scale investigation that involved preservice teachers at universities across the country.29 The other studies were interpretive, with samples ranging from one teacher to more than 100. Two studies made comparisons between elementary and secondary teacher education candidates in mathematics,30 and another looked at the growth of a student's understanding during a mathematics pedagogy course.31 One study looked at the variations in historical knowledge of social studies teachers.32

Although limited in number and scope, the studies suggest that the subject matter preparation that prospective teachers currently receive is inadequate for teaching toward high subject-matter standards, by anyone's definition. It appears that prospective teachers may have mastered basic skills, but they lack the deeper conceptual understanding that is necessary when responding to student questions and extending lessons beyond the basics. The research suggests that the limited knowledge of prospective teachers is acquired in coursework across a prospective teacher's K-12 and university experience—in high school, in general (liberal) education undergraduate requirements, and in relevant university subject-matter departments.

√ In mathematics, both prospective elementary and high school teachers had relatively sound procedural, or rule-dominated knowledge of basic mathematics, especially in arithmetic but had difficulty when pushed to explain why an algorithm or procedure works. This was true of both education majors and mathematics majors.33

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29 Ball, 1990a, 1990b; McDiarmid and Wilson, 1991.

30 Ball, 1990a and 1990b.


Recent interpretive research suggests that prospective teachers arrive in teacher education courses with limited subject matter knowledge. Several studies, as well as much of the public policy discussion, suggest that subject matter knowledge matters, yet—given the current research base—the question of "how much?" goes unanswered.

Weaknesses

All research is not created equal. Even published research continues to be scrutinized and debated. The research reviewed here is no different. Three weaknesses of the research regarding the subject matter preparation of prospective teachers are important to note.

First, as we have already said, the proxies for subject matter knowledge used in most current research are unsatisfying. Given the wide variation in what constitutes a "course" or a "major" across U.S. institutions of higher education, large-scale studies that investigate teacher knowledge are limited in how much they can tell us using such measures. We need more refined databases that include more accurate and sophisticated measures of teacher knowledge. Several studies used mathematics items to measure teacher knowledge. Future research needs to explore the development of those and other measures of teachers' subject matter knowledge.

The same is true of measures of teacher effectiveness. The studies vary in how they measured teacher effectiveness, using measures as wide-ranging as student achievement on standardized tests, supervisors' ratings, teacher self-reports, and independent observations. All of these measures have limitations. Student achievement is affected by many factors, not simply teacher preparation. Furthermore,

36 See, for example, the exchange of Dale Ballon and Michael Podgursky, "Reforming Teacher Preparation and Licensing: What Is the Evidence?" (Teachers College Record, 102(1): pp. 9-27, 2000) and Linda Darling-Hammond, "Reforming Teacher Preparation and Licensing: Debating the Evidence" (Teachers College Record, Volume 102, pp. 29-56, 2000).
37 Ball, 1990a, 1990b; Berk, Eisenhart et al., 1992; McDermott & Wilson, 1991; Rowan, Chiang, and Miller, 1997, and Simon, 1993. Many of the mathematics items were originally developed by Deborah L. Ball and her colleagues in the National Center for Research on Teacher Education. See Mary M. Kennedy, Deborah L. Ball, & G. WilliamhamMcDermott, A Study Package For Examining And Tracking Changes In Teachers' Knowledge (National Center for Research on Teacher Learning, College of Education, Michigan State University, East Lansing, MI, 1993).
student achievement measures are often not well aligned with the curriculum and limited in how well they measure complex knowledge and understanding. Controlling for these variables poses considerable challenges to researchers.65

Measures of teacher behavior are also flawed. Supervisors’ ratings, which were used in one study, and teachers’ self-report, used in another study, are highly unreliable measures.66 We included these studies, flawed as they are, because they are suggestive of the range of methodologies available to researchers interested in teachers’ subject matter knowledge. Future research, we would hope, would aim to use more stable, sophisticated, and reliable measures.

Gaps

There remains much to discover about the subject matter preparation of teachers.

✓ We need to know more about how much subject matter knowledge, and of what type, prospective teachers need in order to ensure student learning.

✓ We need to know more about what course requirements are necessary to ensure the acquisition of that subject matter knowledge. In particular, we need to know more about the efficacy of combining subject matter learning with pedagogical preparation.

✓ We need to know more about the nature and quality of subject matter preparation, including the impact on teacher learning of various instructional methods in high quality, undergraduate and graduate discipline-based education.

Currently, there is little documentation and critique of teaching in higher education. This means that we know next to nothing about high-quality teaching in the subject matter courses that are part of the preparation of teachers. Several reports issued by the National Research Council suggest that there is concern for the quality of undergraduate teaching more generally in mathematics and the sciences. Specifically, there is concern about the steady diet of lecture-based teaching reported in many undergraduate mathematics and science classes.67

✓ We need to know more about the content of subject-specific pedagogy classes across those institutions and about the instructional practices and curricula used in those courses.

✓ In addition to more research in mathematics and science, we need research on the subject matter preparation of teachers in other disciplines. Elementary teachers are responsible for teaching all subjects, and the nature of their subject matter preparation needs to be considered carefully. The subject matter preparation for teaching middle and high school English and history, as well as other subject areas, needs to be investigated with equal enthusiasm and rigor.

✓ Research about the nature and depth of subject matter preparation and its relationship to teaching practice needs to take into account differences in the subjects, including such things as student

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65 See, for example, the complex analyses of Goldhaber and Bowen, 2000; and Monk, 1994.
characteristics as well as school and university contexts. In particular, research needs to attend to the differences in how directly academic disciplines connect with school subjects.

**Question 2. What kinds of pedagogical preparation, and how much of it, do prospective teachers need? Are there differences by grade level and by subject area?**

**Findings**

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

Conducting research about pedagogical preparation is complicated. One complication is that "pedagogical preparation" means many things. Prospective teachers take courses in instructional methods; sometimes those courses are subject-specific; sometimes they are generic. They also take courses in learning theories, educational measurement and testing, and in educational psychology, sociology, and history. Teacher education programs also offer courses in responding to diverse student populations, creating assessments, and managing classrooms. Furthermore, these courses are offered in different sequences across programs.

Compounding the problem is the fact that pedagogical preparation varies considerably across institutions. We found a number of studies in which researchers examined what prospective teachers learned in specific teacher education courses— instructional methods, for example, or educational psychology. Course content varies, as does sequencing, so that even when courses share the same title, they can be qualitatively different. This makes it nearly impossible to generalize across research studies that focus on a particular teacher preparation class.

For this report, then, we focused on research that explores the impact of pedagogical preparation across several components of a teacher preparation program. Our logic was that, even if individual courses might vary, there is more chance that overall teacher preparation programs might be somewhat comparable. We found two types of relevant research: research on certification and research on the value-added of education coursework.

**Research Computing Certified and Uncertified Teachers**—One way to examine the overall effects of pedagogical preparation is to compare certified teachers with their uncertified colleagues. We found five studies that shed light on this contrast: three large scale studies, one study of 18 pairs of teachers who were matched on having students of the "same general ability," and one interpretive study. Sample sizes ranged from three to 36 to over 2,000.

One study found that the students of certified mathematics teachers scored higher on standardized mathematics tests than those of uncertified teachers, and that certified teachers also scored higher on...

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New No Child Left Behind Flexibility: Highly Qualified Teachers

Fact Sheet

Under No Child Left Behind, our nation made a commitment to ensuring every student has a great teacher. These new policies will help us keep that promise so that every child can reach his or her potential.

-U.S. Secretary of Education Real Page

States are now preparing to meet the 2005-06 deadline for ensuring all of their teachers are highly qualified. Ahead of that deadline, the Department is providing three new areas of flexibility for teachers to demonstrate that they are highly qualified. This flexibility will benefit teachers, local and state administrators, and most importantly—students.

NEW FLEXIBILITY

I. Rural Teachers

Approximately one-third—or almost 5,000—of all school districts in the United States are considered rural. As Department officials have traveled the country listening to teachers and state and district officials, they have frequently heard that the highly qualified teacher provisions of the No Child Left Behind law don’t adequately accommodate the special challenges faced by teachers in small, rural districts. Often, the teachers in these areas are required to teach more than one academic subject. This new flexibility is designed to recognize this challenge and provide additional time for these teachers to prove that they are highly qualified.

Under this new policy, teachers in eligible, rural districts who are highly qualified in at least one subject will have three years to become highly qualified in the additional subjects they teach. They must also be provided professional development, intense supervision or structured mentoring to become highly qualified in those additional subjects.

II. Science Teachers

Science teachers, like rural teachers, are often needed to teach in more than one field of science. Some states allow such science teachers to be certified under a general science certification, while others require a subject-specific certification (such as physics, biology or chemistry). In science, where demand for teachers is so high, the Department is using additional flexibility for teachers to demonstrate that they are highly qualified.

Now, states may determine—based on their current certification requirements—to allow science teachers to demonstrate that they are highly qualified either in “breadth field” science or individual fields of science (such as physics, biology or chemistry).

III. Current Multi-subject Teachers

Current teachers do not have to return to school or take a test in every subject to demonstrate that they meet highly qualified requirements. No Child Left Behind allows states to create an alternative method (Highly Effective, Uniform State Standards of Evaluation or HOUSSE) for teachers not new to the field—in which state—to certify they know the subject they teach. But, for multi-subject teachers, this alternate process could become unnecessarily protected and repetitive as they go through the HOUSSE process for each subject.

Under the new guidelines, states may streamline this evaluation process by developing a method for current, multi-subject teachers to demonstrate through one process that they are highly qualified in each of their subjects and maintain the same high standards in subject matter mastery.

EXISTING FLEXIBILITY

A common theme emerged from frequent meetings, visits and listening sessions with teachers and state and local officials across the country: States haven’t been taking full advantage of flexibility (in requirements and in funding) already at their disposal through No Child Left Behind. Outlined below are some of these untapped areas:

I. HOUSSE for Current Teachers


2/9/2005
No Child Left Behind does not require current teachers to return to school or get a degree in every subject they teach to demonstrate that they are highly qualified. The law allows them to provide an alternate method (Houses) for experienced teachers to demonstrate subject-matter competency that recognizes, among other things, the experience, expertise, and professional training garnered over time in the profession.

II. Middle School Teacher Requirements

Importantly, states have the authority to define which grades constitute elementary and middle school. States may determine, by reviewing the degree of technicality of the subject matter being taught and the rigor of knowledge needed by the teacher, whether demonstrating competency as an elementary or as a middle school teacher is appropriate. In addition, states may approve rigorous content-area assessments that are developed specifically for middle school teachers aligned with middle school content and academic standards.

III. Testing Flexibility

NCLB provides flexibility in developing assessments for teachers to demonstrate subject-matter competency. States may tailor teacher tests to the subjects and level of knowledge needed for effective instruction.

IV. Special Education Teachers

The highly qualified teacher requirements apply only to teachers providing direct instruction in core academic subjects. Special educators who do not directly instruct students in core academic subjects or who provide only consultation to highly qualified teachers in adapting curricula, using behavioral supports and interventions, or selecting appropriate accommodations, do not need to demonstrate subject-matter competency in those subjects.

Congress, in the context of the Individuals with Disabilities Education Act (IDEA) reauthorization, is considering modifying how the highly qualified teacher provisions of NCLB apply to special education teachers. The Department looks forward to working with Congress in addressing this need.

TERMS TO KNOW: HIGHLY QUALIFIED TEACHERS

- Highly Qualified Teachers: To be deemed highly qualified, teachers must have: 1) a bachelor's degree, 2) state certification or license, and 3) prove that they know each subject they teach.

- State Requirements: NCLB requires states to 1) measure the extent to which all students have highly qualified teachers, particularly minority and disadvantaged students, 2) adopt goals and plans to ensure all teachers are highly qualified and, 3) publicly report plans and progress in meeting teacher quality goals.

- Demonstration of Competency: Teachers (in middle and high school) must prove that they know the subject they teach with: 1) a major in the subject they teach, 2) credits equivalent to a major in the subject, 3) passage of a state-developed test, 4) HOUSES (for current teachers only, see below), 5) an advanced certification from the state, or 6) a graduate degree.

- High, Objective, Uniform State Standard of Evaluation (HOUSES): NCLB allows states to develop an additional way for current teachers to demonstrate subject-matter competency and meet highly qualified teacher requirements. Proof may consist of a combination of teaching experience, professional development, and knowledge in the subject garnered over time in the profession.

Standards for Science Teacher Preparation

National Science Teachers Association

Revised 2003
NSTA Standards for Science Teacher Preparation

Standard 1: Content

Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they:

a. Understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.

b. Understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards.

c. Understand and can successfully convey to students important personal and technological applications of science in their fields of licensure.

d. Understand research and can successfully design, conduct, report and evaluate investigations in science.

e. Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.

Discussion

The desirability of a strong content background for science teachers is widely recognized and generally accepted, even while it is generally recognized within the professional community that science content expertise alone is not sufficient to define a good teacher. In this standard, content is operationally defined to include the knowledge and skills that are learned, or should be learned, in the course of the teacher’s science curriculum. This includes important scientific concepts and relationships, applications of science in technological contexts, mathematical skills and applications, and methods and processes of conducting true scientific investigations. Other knowledge and skills such as those specifically identified in standards related to the nature of science, issues, and community might also be addressed in science content preparation, but are delineated into separate clusters for emphasis.

The National Science Education Standards and Benchmarks for Science Literacy (American Association for the Advancement of Science [AAAS], 1993) strongly emphasize all of the dimensions of preparation called for in this cluster of standards. The previous version of these standards did not contain specific recommendations on content, except those carried over from the curriculum standards that preceded them. This set of standards contains specific recommendations for content preparation.

They are based upon discipline-specific recommendations of the American Association of Physics Teachers, the American Chemical Society, the National Association of Biology Teachers.
and the National Earth Science Teachers Association. Their recommendations were integrated by the NSTA task force with those of the NSES as a basis for the recommendations in this document.

Because an increasing number of states and most members of the science education community have accepted the NSES as a framework document, the NSTA standards and recommendations for teacher preparation are intended as a framework for the preparation of teachers to work effectively in school systems with a science curriculum based on the NSES or professional standards with similar goals.

The rationales for three of the five content standards (subject matter, unifying concepts, and technology/applications [standards 1-3]) have been discussed at length in the NSES. Knowledge of research within the content discipline is required as the basis for conducting instruction through inquiry and engaging students in effective inquiry, as required by standards in the Inquiry cluster. Requirements for mathematics are based on the need for candidates, as teachers, to lead students in the use of mathematics to solve problems and to process, present, and interpret data.

The recommendations distinguish between the needs of elementary generalists, elementary-middle level general science teachers, and secondary science teachers in the four traditional disciplines. For the secondary level, core competencies are identified that should be required of any candidate licensed to teach in that discipline. Advanced competencies are identified for specialists in the discipline. Recommendations for multi-field licensure programs and composite teaching fields are also provided.

Applications in Programs

Until recently, the science core for many teachers consisted largely of lecture and validation labs (Boyer, 1987; Dunkin & Barnes, 1986; Smith & Anderson, 1984), with little attention given to undergraduate research experiences or applications of science in technological contexts. Consequently, teacher candidates with majors in the field frequently could not effectively interrelate concepts in their disciplines (Lederman, Gess-Newsome & Latz, 1994; Mason, 1992).

While these standards are intended as the framework for a performance-based teacher preparation program, there is a strong argument to be made that they, along with preparation standards under the nature of science, inquiry, and issues clusters, outline much of what should be known by any undergraduate science major.

Regardless of where preparation occurs, the science teacher education program has responsibility for demonstrating that candidates are prepared in relation to these standards and to the content recommendations. However, NSTA does not require gateway performance data for the recommendations as it does for each of the standards. The recommendations are presented as a basis for decision-making on course requirements and content in the program and to outline desired content-related competencies that graduates should demonstrate prior to licensure.

Graduate and Postbaccalaureate programs that do not control the content preparation of their candidates may need to prepare an admissions checklist and require deficiency work to ensure that candidates from other programs have the knowledge and skills required to meet these...
7. Transition elements and coordination compounds.
10. Functional and polyfunctional group chemistry.
11. Environmental and atmospheric chemistry.
12. Fundamental processes of investigating in chemistry.
13. Applications of chemistry in personal and community health and environmental quality.

C.3.b. Advanced Competencies. In addition to the core competencies, teachers of chemistry as a primary field should also be prepared to effectively lead students to understand:

14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter.
15. Superconductors and principles of metallurgy.
16. Advanced concepts of chemical kinetics, and thermodynamics.
17. Lewis adducts and coordination compounds.
18. Solutions, colloids, and colligative properties.
19. Major biological compounds and natural products.
20. Solvent system concepts including non-aqueous solvents.
21. Chemical reactivity and molecular structure including electronic and steric effects.
22. Organic synthesis and organic reaction mechanisms.
23. Energy flow through chemical systems.
24. Issues related to chemistry including ground water pollution, disposal of plastics, and development of alternative fuels.
25. Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the evolution of theories in chemistry.
26. How to design, conduct, and report research in chemistry.
27. Applications of chemistry and chemical technology in society, business, industry, and health fields.

C.3.c. Supporting Competencies. All teachers of chemistry should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of chemistry including:

28. Biology, including molecular biology, bioenergetics, and ecology.
29. Earth science, including geochemistry, cycles of matter, and energetics of Earth systems.
30. Physics, including energy, stellar evolution, properties and functions of waves, motions and forces, electricity, and magnetism.
31. Mathematical and statistical concepts and skills including statistics and the use of differential equations and calculus.

C.4. Recommendations for Teachers of the Earth and Space Sciences

C.4.a. Core Competencies. All teachers of the Earth and space sciences should be prepared to lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand:

1. Characteristics of land, atmosphere, and ocean systems on Earth.
2. Properties, measurement, and classification of Earth materials.
3. Changes in the Earth including land formation and erosion.
4. Geochemical cycles including biotic and abiotic systems.
5. Energy flow and transformation in Earth systems.
6. Hydrological features of the Earth.
7. Patterns and changes in the atmosphere, weather, and climate.
10. Fundamental processes of investigating in the Earth and space sciences.
11. Sources and limits of natural resources.
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.

C.4.b. Advanced Competencies. In addition to the core competencies, teachers of the Earth and space sciences as a primary field should be prepared to effectively lead students to understand:

14. Oceans and their relationship to changes in atmosphere and climate.
15. Hydrological cycles and problems of distribution and use of water.
16. Dating of the Earth and other objects in the universe.
17. Structures and interactions of energy and matter in the universe.
18. Impact of changes in the Earth on the evolution and distribution of living things.
19. Issues related to changes in Earth systems such as global climate change, mine subsidence, and channeling of waterways.
20. Historical development and perspectives in the Earth and space sciences, including contributions of significant figures and underrepresented groups, and the evolution of theories in these fields.

21. How to design, conduct, and report research in the Earth and space sciences.

22. Applications of the Earth and space sciences and related technologies in society, business, industry, and health fields.

C.4.c. Supporting Competencies. All teachers of Earth and space sciences should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of Earth and space sciences including concepts of:

23. Biology, including evolution, ecology, population dynamics, and the flow of energy and materials through Earth systems.

24. Chemistry, including broad concepts and basic laboratory techniques of inorganic and organic chemistry, physical chemistry, and biochemistry.

25. Physics, including electricity, forces and motion, energy, magnetism, thermodynamics, optics, and sound; as well as basic quantum theory.

26. Mathematics, including statistics and probability.

C.5. Recommendations for Teachers of Physics

C.5.a. Core Competencies. All teachers of physics should be prepared to lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand:

1. Energy, work, and power.

2. Motion, major forces, and momentum.

3. Newtonian principles and laws including engineering applications.

4. Conservation of mass, momentum, energy, and charge.

5. Physical properties of matter.

6. Kinetic-molecular motion and atomic models.

7. Radioactivity, nuclear reactors, fission, and fusion.

8. Wave theory, sound, light, the electromagnetic spectrum and optics.

9. Electricity and magnetism.


11. Applications of physics in environmental quality and to personal and community health.

C.5.b. Advanced Competencies. In addition to the core competencies, teachers of physics as a
primary field should be prepared to effectively lead students to understand:
12. Thermodynamics and relationships between energy and matter.
13. Nuclear physics including matter-energy duality and reactivity.
14. Angular rotation and momentum, centripetal forces, and vector analysis.
15. Quantum mechanics, space-time relationships, and special relativity.
16. Models of nuclear and subatomic structures and behavior.
17. Light behavior, including wave-particle duality and models.
18. Electrical phenomena including electric fields, vector analysis, energy, potential, capacitance, and inductance.
19. Issues related to physics such as disposal of nuclear waste, light pollution, shielding communication systems and weapons development.
20. Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and evolution of theories in physics.
21. How to design, conduct, and report research in physics.
22. Applications of physics and engineering in society, business, industry, and health fields.

C.5.c. Supporting Competencies: All teachers of physics should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of physics including concepts of:
24. Chemistry, including organization of matter and energy, electrochemistry, thermodynamics, and bonding.
25. Earth sciences or astronomy related to structure of the universe, energy, and interactions of matter.
26. Mathematical and statistical concepts and skills including statistics and the use of differential equations and calculus.

D. Recommended Program Requirements

When teachers are prepared to teach specific composite courses labeled physical science or general science, they should have at least core competencies in the primary disciplines comprising the composite course. Teachers in traditional disciplines (biology, chemistry, Earth and space sciences, or physics) are generally prepared in one of three ways:

1. Single-field programs, which require specialization (often a major) in a primary discipline, with less preparation in a second discipline. In this case, the teacher should have advanced competencies in the primary discipline and at least core competencies in the second discipline, with supporting competencies in the remaining sciences.

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2. Dual field programs, which require equal preparation in two disciplines, usually with less than a major in each. In this case, teachers should have advanced competencies in both disciplines, with supporting competencies in the remaining two disciplines.

3. Broad field programs, which require preparation in three or four disciplines at once, with licensure in each discipline. In this case, teachers should have advanced competencies in one discipline and core competencies in the remaining disciplines.

Preparation of middle school teachers as general science teachers (following National Middle School Association recommendations) should follow the specific middle school standards recommended in section 2, rather than the subject-specific secondary standards. Such programs are generally for middle level specifically, or are designed for elementary teachers who wish to be certified in middle level science.

Standard 2: Nature of Science

Teachers of science engage students effectively in studies of the history, philosophy, and practice of science. They enable students to distinguish science from pseudoscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science. To show they are prepared to teach the nature of science, teachers of science must demonstrate that they:

a. Understand the historical and cultural development of science and the evolution of knowledge in their discipline.

b. Understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world.

c. Engage students successfully in studies of the nature of science including, when possible, the critical analysis of false or doubtful assertions made in the name of science.

Discussion

Understanding of the nature of science—the goals, values and assumptions inherent in the development and interpretation of scientific knowledge (Lederman, 1993)—has been an objective of science instruction since at least the turn of the last century (Central Association of Science and Mathematics Teachers, 1907). It is regarded in contemporary documents as a fundamental attribute of science literacy (AAAS, 1993; NRC, 1996) and a defense against unquestioning acceptance of pseudoscience and of reported research (Park, 2000; Sagan, 1996). Knowledge of the nature of science can enable individuals to make more informed decisions with respect to scientifically based issues, promote students' in-depth understandings of "traditional" science subject matter, and help them distinguish science from other ways of knowing (Lederman, personal communication).

An important purpose of pre-college science education is to educate individuals who can
make valid judgments on the value of knowledge created by science and other ways of knowing, and to understand why the literature regards scientific knowledge not as absolute, but as tentative, empirically based, culturally embedded, and the product of some degree of assumption, subjectivity, creativity, and inference (Lederman & Niess, 1997).

Research clearly shows most students and teachers do not adequately understand the nature of science. For example, most teachers and students believe that all scientific investigations adhere to an identical set of steps known as the scientific method (McCormas, 1996), and that theories are simply immature laws (Homer & Rubba, 1979). Even when teachers understand and support the need to include the nature of science in their instruction, they do not always do so (Lederman, 1992). Instead they may rely upon the false assumption that doing inquiry leads to understanding of science (Abd-El-Khalick & Lederman, 2000).

Explicit instruction is needed both to prepare teachers (Abd-El-Khalick & Lederman, 2000) and to lead students to understand the nature of science (Khishfe & Abd-El-Khalick, 2002). Helping teachers to focus on nature of science as an important instructional objective resulted in more explicit nature of science instruction (Lederman, Schwartz, Abd-El-Khalick & Sel, 2001).

Applications in Programs

All students of science, whether teacher candidates or not, should have knowledge of the nature of science as defined in this standard, and should have the skills needed to engage students in the critical analysis of scientific and pseudoscientific claims in an appropriate way. This requires explicit attention to the nature of science, as defined in this standard, as a part of the preparation of science teachers. Candidates should have multiple opportunities to study and analyze literature related to the history and nature of science, such as The Demon Haunted World (Sagan, 1996); Great Feuds in Science (Hellman, 1998) Facts, Fraud and Fantasy (Graor, 1979) and The Structure of Scientific Revolutions (Kuhn, 1962). In addition, they should be required to analyze, discuss and debate topics and reports in the media related to the nature of science and scientific knowledge in courses and seminars throughout the program, not just in an educational context. Students should engage in active investigation and analysis of the conventions of science as reflected in papers and reports in science, across fields, in order to understand similarities and differences in methods and interpretations in science, and to identify strengths and weaknesses of findings.

Candidates are required to demonstrate that they are effective by successfully engaging students in the study of the nature of science. Assessments with regard to understanding may include such possibilities as completion of independent study courses, seminars or assignments; projects; papers; summative readings; or case study analyses. Assessments of effectiveness must include at least some demonstrably positive student outcomes in studies related to the nature of science as delineated by the standards in this cluster.

Standard 3: Inquiry
What Matters Most: Teaching for America's Future

Report of the National Commission on Teaching & America's Future
Summary Report
September 1996
Foreword

When I was asked in 1994 to chair a new National Commission on Teaching & America's Future, I was delighted to accept. I am convinced that what matters most as Americans prepare for a new century is the quality of teaching in American schools. As the automobile executive Lee Iacocca once put it: "In a truly rational society, the best of us would be teachers, and the rest would have to settle for something less." This report explains how we can put teachers and teaching at the heart of school reform, where they belong.

This summary report is one of four produced by our Commission. The main report, What Matters Most: Teaching for America's Future, was developed for an audience of policymakers, educators, and analysts. Please refer to the main report for more detail on the Commission's findings, as well as citations that support its research. This summary report condenses the main report for easy access. A third document, aimed at educators and researchers interested in understanding and implementing reforms, provides a rich mine of information on model programs that exemplify our recommendations. A fourth volume includes the research papers commissioned for our work.

It has been my great privilege to work with an able and talented group of Commissioners. In combination, they brought many decades of wisdom and experience to our challenging task. I also want to acknowledge the work of our staff under the leadership of Executive Director Linda Darling-Hammond. The staff, like my colleagues on the Commission, never lost sight of the fact that what matters most to America's future is finding the best teachers, helping them develop their skills to the greatest extent, and rewarding them for their work on behalf of children and youth.

James B. Hunt Jr. (Chair)
Governor, State of North Carolina

We propose an audacious goal... By the year 2000, America will provide all students in the country with what should be their educational birthright: access to competent, caring, and qualified teachers.

With these words, the National Commission on Teaching & America's Future summarized its challenge to the American public. Following two years of intense study and discussion, the Commission concluded that the reform of elementary and secondary education depends first and foremost on restructuring its foundation—the teaching profession. The restructuring, we make clear, must go in two directions: toward increasing teachers' knowledge to meet the demands they face; and toward recognizing and using teachers' expertise in schools that are redesigned to support high-quality teaching and learning.

The Commission found a profession that has suffered from decades of neglect. By the standards of other professions and other countries, U.S. teacher education has historically been thin, uneven, and poorly financed. Teacher recruitment and hiring are distressingly ad hoc, and salaries lag significantly behind those of all other professions. This produces chronic shortages of qualified teachers in fields like mathematics and science, and the continual hiring of large numbers of people as "teachers" who are unprepared for their jobs.

Furthermore, in contrast with other countries that invest most of their educational dollars in well-prepared and well-supported teachers, half of the educational dollars in the United States are spent on staff and activities outside the classroom. Lack of standards for students and teachers, coupled with schools organized for 19th-century learning, leave educators without an adequate foundation for constructing good teaching. Under these conditions, excellence is hard to achieve.

In more than a decade of school reform, America is still a very long way from achieving its educational goals. Instead of all children coming to school ready to learn, more are living in poverty and without health care than a decade ago. Graduation rates and student achievement in most subjects have remained flat or have increased only slightly. Fewer than 10% of high school students can read, write, compute, and manage scientific material at the high levels required for today's "knowledge work" jobs. Meanwhile, international tests continue to show U.S. high school students ranking near the bottom in mathematics and science. This distance between our stated goals and current realities is not due to lack of effort. Many initiatives have been launched with positive effects in local communities. Nonetheless, we have reached an impasse in spreading these promising efforts to the system as a whole. It is now clear that most schools and teachers cannot produce the kind of learning the new reforms demand—not because they do not want to, but
The Nature of the Problem

Good teaching is more important than ever before in our nation's history. Due to sweeping economic changes, today's world has little room for workers who cannot read, write, and compute proficiently. Food and use resources in a responsible and effective manner can lead to these goals, and on campus schools that use these goals, well, we will have

The Commission continues to support the development of comprehensive systems. The key to successful education is a well-balanced, high-quality curriculum across the grades, designed to support students, teachers, parents, and communities. These institutions have the knowledge and skills they need to help students reach these goals, and on exit surveys schools that use these goals, well, we will have

The Commission recommends that schools make the curriculum a core program. The key to successful education is a well-balanced, high-quality curriculum across the grades, designed to support students, teachers, parents, and communities. These institutions have the knowledge and skills they need to help students reach these goals, and on exit surveys schools that use these goals, well, we will have

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Blue-collar jobs that most people once held will comprise only 10% of total employ-
ment by the year 2000, and the "knowledge work" jobs that are replacing them
require levels of knowledge and skill previously taught to only a very few students.
The education challenge facing the United States is not that its schools are not as
good as they once were. It is that schools must help the vast majority of young peo-
ple reach levels of skill and competence once thought within the reach of only a few,
while also supporting a just and civil society that helps maintain our democratic life.

At a time when all students must meet higher standards for learning, access to
good teaching is a necessity, not a privilege to be left to chance. All Americans have a
critical interest in building an education system that helps people learn and work at
high levels of competence, understand and respect other perspectives, take risks and
persevere against the odds, and continue to learn throughout life. Lack of adequate
education ultimately affects everyone. For example:

- Low levels of literacy are powerful predictors of welfare dependency and
  incarceration—and their high costs.
- More than half the adult prison population has literacy levels below those
  required by the labor market.
- Nearly 40% of adjudicated juvenile delinquents have treatable learning dis-
  abilities that were overlooked and went untreated in school.
- By the year 2010 there will be only three workers for every retiree on Social
  Security, as compared with 16 in 1950. If all these future workers are not
capable and productive, our social compact will be in grave danger.

Growing prison populations, public assistance programs, and unemployment
mean that a shrinking portion of American citizens must generate the economic base
that supports the rest of the nation—the young, the old, the ill, and those who are
not now productive. It is clear that if we do not invest in schools that can create ade-
quate life chances for all our young people, the results will be disastrous for both indi-
viduals and the nation.

The Challenge for Teaching

A more complex, knowledge-based, and multicultural society creates new expecta-
tions for teaching. To help diverse learners master much more challenging content,
teachers must go far beyond dispensing information, giving a test, and giving a
grade. They must know their subject areas deeply, and they must understand how
students think as well as what they know in order to create experiences that produce
learning. Moreover, as students with a wider range of learning needs enter and stay
in school—a growing number whose first language is not English, many others with
learning differences, and still others with learning difficulties—teachers need access
to the growing knowledge that exists about how to reach different kinds of learners
effectively.

Developing the kind of teaching needed will require much greater clarity about
what students must learn to succeed in the world that awaits them, and what teach-
ers must know and do to help them achieve it. Standards that reflect these imperatives
for student learning and for teaching are largely absent in our nation today. Although
states are just now beginning to establish standards for student learning, most schools
do not yet have the kind of high-quality, professionally informed curricular guid-
ance that will help them organize their work so that it adds up in a powerful way
across the grades and within and across subjects.

Standards for teaching are equally haphazard. Although parents might assume that
teachers, like other professionals, are educated in similar ways so that they meet the
same standards before they are admitted to practice, this is not the case. Unlike doc-
tors, lawyers, accountants, or architects, teachers do not have the same training. Some
teachers have very high levels of skills—particularly in states that require a bachelor’s
degree in the discipline to be taught; coursework in teaching, learning, curriculum,
and child development; extensive practice teaching; and a master’s degree in educa-
tion. Others learn little about their subject matter or about teaching, particularly in
states that have low requirements.

And while states have recently begun to require some form of testing for a teaching
license, most are little more than multiple-choice tests of basic skills and general
knowledge, widely criticized by educators and experts as woefully inadequate to mea-
ture teaching skill. Furthermore, in many states the cutoff scores are so low, there is
no effective standard for entry.

These difficulties are barely known to the public. But the schools’ most closely
held secret amounts to a national shame: Roughly 3% of newly hired American teach-
ers lack the qualifications for their jobs. More than 12% of new hires enter the
classroom without any formal training at all, and another 14% arrive without fully
meeting state standards.

Although no state will permit a person to write wills, practice medicine, fix
plumbing, or style hair without completing training and passing an examination,
more than 40 states allow districts to hire teachers who have not met these basic
requirements. Most states pay more attention to the qualifications of veterinarians
treating America’s cats and dogs than to those of the people educating the nation’s
children and youth.
of error as well. They do a lot of damage by shortchanging needed change. First, the idea that anyone can teach is nonsense, as any parent who has tried to manage even a half-dozen children can attest. Research confirms what parents know: the best teachers understand their subjects, know how young people learn, and have mastered a range of teaching methods. Studies have found that teacher expertise is the single most important factor in determining student achievement and that fully trained teachers are far more effective with students than those who are not prepared. Second, contrary to many presumptions, American teachers work very hard. Not only do U.S. teachers teach more hours each day and year than those in other countries, but they also make more work home to complete at night, on the weekends, and on holidays. Finally, tenure is intended to protect teachers from arbitrary dismissal for reasons of politics or patronage, but it should not support incompetence. Teacher unions in many cases have worked with school boards to evaluate, assist, and dismiss teachers who are not successful, just as they have begun working nationally to upgrade the standards of the profession. Although more work needs to be done, these initiatives have shown that change is possible.

Aside from these distractions, there are real barriers to be addressed. Unequal resources and inadequate investments in teacher recruitment are major problems. Other industrialized countries fund their schools equally and make sure there are qualified teachers for all of them by underwriting teacher preparation and salaries. However, teachers in the United States must go into substantial debt to become prepared for a field that in most states pays less than any other occupation requiring a college degree.

This situation is not necessary or inevitable. The hiring of inexperienced teachers was almost eliminated during the 1970s with scholarships and loans for college students preparing to teach, Urban Teacher Corps initiatives, and Museums of Art in Teaching (MAT) programs, coupled with wage increases. However, the cancellation of most of these recruitment incentives in the 1980s led to renewed shortages when student enrollments started to climb once again, especially in cities. Between 1987 and 1991, the proportion of well-qualified new teachers—those entering teaching with a college major or minor and a license in their fields—actually declined from about 74% to 67%.

Despite major advances in what is known about effective teaching, relatively few American teachers have access to the knowledge they need to teach. The problems stem from a view held over from the turn of the last century that schools could be run like factories and managed by top-down controls rather than by investing in teachers’ capacities to make good decisions. Teachers, it was thought, needed to know little more than how to follow the book. They could be minimally prepared, given simple tasks, and treated as semiskilled workers. Others would be hired to design teaching work and tell teachers what to do. Many states and districts spend more time and energy developing teacher-good regulations than preparing teachers who can deliver top-flight instruction.

The result of this long-standing view is that there is no real system for recruiting, preparing, and deploying America’s teachers. Major problems include the following:

- Inadequate teacher education, because accreditation is not required of teacher education programs, the quality of programs varies widely with excellent programs operating alongside those that are out of touch with current knowledge and inadequately funded to do the job. Too many American universities still teach their schools of education as “safe havens” whose excess revenues are spent on the training of doctors, lawyers, accountants, and almost any other students than prospective teachers themselves. Many still do not offer the kinds of training needed to prepare teachers for today’s new standards and changing student populations.

- Slipshod recruitment and hiring. Although the shunt of academically able young people entering teaching has been increasing, there are still too few in

The Summary Report

Comparisons of Earnings by Occupation

**Average annual earnings in the previous year, 1993**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Average Earnings</th>
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<tbody>
<tr>
<td>Physicians</td>
<td>$200,000</td>
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<tr>
<td>Lawyers and judges</td>
<td>$175,000</td>
</tr>
<tr>
<td>Private-sector executives</td>
<td>$150,000</td>
</tr>
<tr>
<td>Engineers</td>
<td>$125,000</td>
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<tr>
<td>Education administrators</td>
<td>$100,000</td>
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<tr>
<td>Sales representatives</td>
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</tr>
<tr>
<td>Scientists</td>
<td>$75,000</td>
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<tr>
<td>Agriculture &amp; forestry</td>
<td>$60,000</td>
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<td>Registered nurses</td>
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<tr>
<td>Supervisors &amp; proprietors</td>
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<tr>
<td>Writers &amp; artists</td>
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<tr>
<td>Social workers</td>
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</tr>
<tr>
<td>Teachers</td>
<td>$30,000</td>
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</table>


What Matters Most: Teaching for America’s Future

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13
The Summary Report

The Commission's Recommendations

To address these problems, we challenge the nation to embrace a set of goals that will put the nation on a path to serious, long-term improvements in teaching and learning. By the year 2000,

- All children will be taught by teachers who have the knowledge, skills, and commitments to teach children well.
- All teacher education programs will meet professional standards, or they will be closed.
- All teachers will have access to high-quality professional development and regular time for collegial work and planning.
- Both teachers and principals will be hired and retained based on their ability to meet professional standards of practice.
- Teachers’ salaries will be based on their knowledge and skills.
- Quality teaching will be the central investment of schools. Most education dollars will be spent on classroom teaching.

The history of American education overflows with suggested and attempted reforms. From the teachers’ standpoint, many if not most of them are doomed to failure because they do not emphasize—or in some cases even consider—teaching. Indeed, the “reform du jour” mentality often forces teachers to ride out the latest fad on the well-founded assumption that it, too, will pass.

Education reform can succeed only if it is broad and comprehensive, attacking many problems simultaneously. But it cannot succeed at all unless the conditions of teaching and teacher development change. And the Commission confidently believes that when its recommendations are put in place, they will staunch the endless waves of fruitless reform because our schools will have developed the capacity to continually review and improve themselves.

Our proposals provide a vision and a blueprint for the development of a 21st-century teaching profession that can make good on the nation’s educational goals. The recommendations are systemic in scope: a recipe for more about-school pilot and demonstration projects. They describe a new infrastructure for professional learning and an accountability system that ensures attention to standards for educators as well as students at every level: national, state, local school district, school, and classroom.

We urge a complete overhaul in the systems of teacher preparation and professional development in this country to ensure that they reflect and act upon the most current available knowledge and practice. This redesign should create a continuum of teacher learning based on comparable standards that operate from recruitment and preservice education through licensing, hiring, and induction into the profession, to advanced certification and ongoing professional development.

We also propose a comprehensive set of changes in school organization and management that will provide the conditions in which teachers can use their knowledge much more productively to support student learning. And finally, we recommend a set of measures for ensuring that only those who are competent to teach or to lead schools are allowed to enter or to continue in the profession—a starting point for creating professional accountability.

For the first time in the history of education reform, a broad-based group of policymakers and educators—including those who will have to take courageous steps to put these recommendations in place—have issued a comprehensive agenda for change and have pledged to take the steps necessary to implement it. We understand that these recommendations are not easy to undertake and that the self-interest of various constituencies will be challenged in the process of bringing them to life. However, we are persuaded that these reforms are absolutely essential to guarantee every child a caring, competent, and qualified teacher . . . and to guarantee America a just and prosperous future.

To put teaching and teachers at the heart of school improvement, we offer these recommendations:

1. Get serious about standards, for both students and teachers.

The Commission recommends that we renew the national promise to bring every American child up to world-class standards in core academic areas and to develop and enforce rigorous standards for teacher preparation, initial licensing, and continuing development.

Standards for both students and teachers form the linchpin for transforming the way teachers work and schools operate. The goal of standards is to support student learning. Therefore, student standards need to be reinforced by incentives that encourage students to work hard, schools to support their efforts, and teachers to acquire greater knowledge and skill.

With respect to student standards, the Commission believes every state should work on incorporating demanding standards for learning—such as those developed by professional bodies like the National Council of Teachers of Mathematics—into curriculum frameworks and new assessments of student performance.
II. Reinforce teacher preparation and professional development.

The Commission recommends that college- and school-based efforts to redesign teacher education so that the two million teachers to be hired in the next decade are adequately prepared and all teachers have access to high-quality learning opportunities.

More new teachers will be hired in the next decade than in any previous decade in our history. If they are adequately prepared at the beginning of their careers, most of the hand-rew and stopgap efforts now required should prove irrelevant in the future. In addition, if teachers have continuous access to the latest knowledge about teaching and learning, they will be better able to respond to the toughest learning problems and the challenge of meeting ever higher standards. For this to occur, several changes are essential.

- Organize teacher education and professional development around standards for students and teachers.
- Institute extended, graduate-level teacher-preparation programs that provide yearlong internships in a professional development school.
- Create and fund mentoring programs for beginning teachers that provide support and evaluate teaching skills.
- Create stable, high-quality sources of professional development—then allocate 1% of state and local spending to support them, along with additional matching funds to school districts.
- Organize new sources of professional development such as teacher academies, school-university partnerships, and learning networks that transcend school boundaries.
- Make professional development an ongoing part of teachers’ daily work through joint planning, study groups, peer coaching, and research.

If teachers are to be prepared to help their students meet the new standards being set for them, teacher preparation and professional development programs must explicitly examine the expectations embodied in new curriculum frameworks and assessments and understand what they imply for teaching and for learning.

III. Overhaul teacher recruitment, and put qualified teachers in every classroom.

The Commission recommends that states and school districts pursue aggressive policies to put qualified teachers in every classroom by providing financial incentives to correct shortages, streamlining hiring procedures, and reducing barriers to teacher mobility.

Although the nation each year produces more new teachers than it needs, shortages of qualified candidates in particular fields (e.g., mathematics and science) and
The Commission recommends that school districts in the region:

- Exchange and reward knowledge and skills.

Schools have few ways of recognizing and rewarding their staff. In some schools, when a teacher or administrator is recognized for outstanding work, they receive a small raise, a new computer, or a free lunch. But outside of these formal rewards, there are few incentives for teachers to continue to learn and grow.

- Develop high-quality pathways to teaching for recent graduates, midcareer changes, and professional development.

Many schools have difficulty attracting and retaining qualified teachers. This is particularly true in rural and urban areas, where the cost of living is high and the quality of schools is low. The Commission recommends that schools develop high-quality pathways to teaching that are attractive to recent graduates, midcareer changes, and professionals looking to make a change.

- Eliminate barriers to mobility by promoting ongoing professional development.

Teachers in rural and urban areas often struggle to find opportunities for professional development. The Commission recommends that schools eliminate barriers to mobility by promoting ongoing professional development, such as workshops, conferences, and online courses.

- Implement inclusive and effective leadership and administrative practices.

Effective and inclusive leadership is critical to the success of schools. The Commission recommends that schools implement inclusive and effective leadership practices, such as collaboration, communication, and decision-making.

- Enhance the ability of financially disadvantaged districts to pay for qualified teachers.

The cost of teaching is high, and many districts struggle to attract qualified teachers. The Commission recommends that schools enhance the ability of financially disadvantaged districts to pay for qualified teachers, such as by increasing salaries, providing incentives, and offering opportunities for professional development.

- Increase the number of qualified teachers in rural and urban areas.

The Commission recommends that schools increase the number of qualified teachers in rural and urban areas, particularly in districts with high levels of poverty and low levels of education. This can be achieved through partnerships with universities, the development of high-quality pathways to teaching, and the provision of ongoing professional development.

- Develop a regional strategy for teacher recruitment and retention.

Teacher recruitment and retention is a critical issue for schools in the region. The Commission recommends that schools develop a regional strategy for teacher recruitment and retention, such as by partnering with universities, offering incentives, and providing ongoing professional development.

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as teachers licensed in two or more subjects. All of these incentives maintain a status quo in which knowledge and expertise have little currency.

One indication that the existing system does not understand what it is doing is that it rewards experience with easier work instead of encouraging newer teachers to deal with difficult learning problems. As teachers gain experience, they can look forward to teaching in more affluent schools, working with easier schedules, dealing with "better" classes, or moving out of the classroom into administration. Teachers are rarely rewarded for applying their expertise to the most challenging learning problems or major system needs.

To address these issues, the Commission recommends that states and local education agencies:

- Develop a career continuum linked to assessments and compensation systems that reward knowledge and skill. These include the ability to teach expertly in two or more subjects, as demonstrated by performance-based licensing, as well as the ability to pass examinations of teaching skill, such as those offered by INTASC and the National Board.
- Remove incompetent teachers through peer assistance and review programs that provide necessary supports and due process.
- Set goals and enact incentives for National Board Certification in every district, with the aim of certifying 105,000 teachers—one for every school in the nation—during the next ten years.

If teaching is organized like other professions that have set consistent licensing requirements, standards of practice, and methods for assessments of expertise, the reward system can be tied up professional growth and development. A career continuum that places teaching at the top and supports growing expertise should (1) recognize accomplishment, (2) anticipate that teachers will continue to teach while taking on other roles that allow them to share their knowledge, and (3) promote continued skill development related to clear standards.

Some districts, like Cincinnati, Ohio, and Rochester, New York, have already begun to develop career pathways that tie evaluations to pay increments as key stages as teachers move from their initial license, through a period as a resident teacher under the supervision of a mentor, to designation as professional teacher. Tenure is a major step tied to a serious decision made after rigorous evaluation of performance in the first several years of teaching, incorporating administrator and peer review by expert colleagues. Advanced certification from the National Board for Professional Teaching Standards may qualify teachers for another salary step and/or for qualification to serve as a lead teacher—a role that is awarded to teachers who have demonstrated high levels of competence and who want to serve as mentors, consulting teachers, and program developers.

One other feature of a new compensation system is key. The central importance of teaching to the mission of schools should be acknowledged by a system in which the highest paid professional in a school system is an experienced National Board-Certified teacher, who should be able to earn as much by teaching as by becoming an administrator. As in other professions, teaching and administrative roles should become less distinct. The jobs of teacher, consultant, supervisor, principal, curriculum developer, researcher, mentor, and professor should be hyphenated roles, allowing many ways for individuals to use their talents and expertise without abandoning the core work of the profession.

V. Create schools that are organized for student and teacher success.

The Commission recommends that schools be restructured to become genuine learning organizations for both students and teachers: organizations that respect learning, honor teaching, and teach for understanding.

Many experts have observed that the demands of serious teaching and learning bear little relationship to the organization of the typical American school. Nothing more clearly reveals this problem than how we allocate the principal resources of school time, money, and people. Far too many people sit in offices on the sidewalks of the school’s core work, managing routines rather than improving learning. Our schools are bureaucratic inheritances from the 19th century, not the kinds of learning organizations required for the 21st.

Across the United States, the ratio of school staff to students is 1:9. However, actual class sizes average about 24, teaching 30 or more in many cities. High school teachers generally see more than 100 students per day. This is because most staff are not classroom teachers, and teachers’ work is organized like piecework on an assembly line. The organizational assumptions that led to this way of managing work are being abandoned in high-performance businesses that are flattening hierarchies, creating teams, and training employees so they can take on greater responsibilities. Many schools have proved that it is possible to restrucure adult use of time so that more teachers and administrators actually work with students on a daily basis in the classroom, thus reducing class sizes while creating more time for teacher collaboration. They do this by creating teams of teachers who share students, engaging almost all
<table>
<thead>
<tr>
<th>Schools</th>
<th>% of staff who are male</th>
<th>Average class size</th>
<th>Average high school years</th>
<th>Average weekly work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>33%</td>
<td>30</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>Researched High</td>
<td>72%</td>
<td>25</td>
<td>10</td>
<td>30</td>
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</table>

Students have found that relationships, students, and the number of teachers contribute to their overall experience. Students and teachers experience the same level of stress in both schools, but because the school's personnel are composed of 33% and 7% staff respectively, in the traditional school, there are fewer opportunities for students to form relationships with students in the traditional school. In the researched high school, student-teacher ratios are lower, and there are more opportunities for students to form relationships with students. In the traditional school, students have more opportunities to make use of the common areas, which are more spacious and better equipped with technology. In the researched high school, the smaller class sizes allow for a more personalized learning experience.
superintendents to play their vital role by streamlining hiring procedures, upgrading quality, and putting more staff and resources into the front lines of teaching.

There can be no doubt that the American people will support all these actions—and many more. The public has its educational priorities perfectly straight. A recent Public Agenda poll asked, "What is the most important thing public schools need in order to help students learn?" The top vote-getter by a large margin was "good teachers." And when the question was, "Whom do you trust to make decisions about schools?" teachers were only slightly behind parents as the runaway favorites—for outdistancing education experts, Washington bureaucrats, state officials, and every other category.

Those respondents from Main Street echo the words of ordinary and extraordinary people everywhere. World-famous violinist Jascha Heifetz put it best: 'I remember my old violin professor in Russia,' he once recalled. 'He said that someday I would be good enough to teach.' These insights underscore the Commission's crusade to make caring and competent teaching a fundamental student right.

Good teachers are those who can transmit a passion for learning. They believe all children can learn, some may take a little longer, but will not stop until they have tried everything they can and then some. They understand that learning is a lifelong experience and let their children see they are still learning... Good teachers care about their students as people, not just grades in a book.

—DOMINIQUE LENTZ, PARENT, SANTA MONICA, CALIFORNIA

The most important contribution we as educators can make to the well-being of children is to enable them to deal effectively with their universe. . . . This is not, of course, a trivial task. It combines a number of concerns, ranging from teaching basic skills to readying students for the marketplace. In essence, it combines giving them the tools to analyze a situation to make an appropriate response, the self-confidence to use those tools, and the pride and motivation to use them with excellence.

—JOHN SANDER, COMPUTER SCIENCE TEACHER, ADVANCED TECHNOLOGIES ACADEMY, LAS VEGAS, NEVADA
The Oregon Administrative Rules contain OARs filed through January 14, 2005

TEACHER STANDARDS AND PRACTICES COMMISSION

DIVISION 38

BASIC TEACHING LICENSE REQUIREMENTS

584-038-0003

Basic Teaching License Under Superseded Standards

Upon filing a correct and complete application in form and manner prescribed by the commission, a qualified applicant may be granted a Basic Teaching License, issued for three years plus time to the applicant's next birth date and renewable under OAR 584-048. Such an applicant must have enrolled in a basic teacher education program under standards superseded by 21st century licensure and be found in the judgment of the commission subject to hardship if issued an initial license instead of a basic license. If the initial license is judged preferable, the applicant will not be required to add coursework to the basic program, although institutions may make appropriate substitutions for partial updating. The recipient of a basic license may pursue either a standard license (see OAR 584-040) or a continuing license (see OAR 584-060).

(1) General requirements for the Basic Teaching License include:

(a) A bachelor's degree from a regionally accredited institution in the United States, or the foreign equivalent of such degree approved by the commission.

(b) Completion in Oregon or another U.S. jurisdiction of a basic teacher education program approved by the commission, or completion of a U.S. or foreign program evaluated as satisfactory by an Oregon institution approved to offer the corresponding program.
(c) A passing score as currently specified by the commission on each of one or more tests of subject mastery for license endorsement, except for tests waived due to special academic preparation satisfactory to the commission together with five years of experience teaching the specialty in a public school or regionally accredited private school in a U.S. jurisdiction.

(d) A passing score as currently specified by the commission on a test of basic verbal and computational skills, unless the applicant held an Oregon educator license before 1985 or has a regionally accredited doctor's degree.

(e) A passing score on a test of knowledge of U.S. and Oregon civil rights laws at the conclusion of a course or workshop approved by the commission.

(2) To be eligible for a Basic Teaching License, an applicant must satisfy a recent experience requirement in one of the following ways during the three-year period immediately preceding application:

(a) Completion of an approved teacher education program, or

(b) Beginning and completion in a public school or regionally accredited private school in a U.S. jurisdiction of at least one academic year as a full-time licensed educator or two consecutive years as a half-time licensed educator on any license appropriate for the assignment, or equivalent experience as in a state or federal school, or

(c) Receipt of 6 semester hours or 9 quarter hours of academic credit, germane to teaching licensure, from a regionally accredited college or university.

(3) To be eligible for a Basic Teaching License, an applicant must furnish fingerprints in the manner prescribed by the commission.

Stat. Auth.: ORS 342
Stats. Implemented: ORS 342.120 – ORS 342.200
Hist.: TSPC 4-1999, f. & cert. ef. 8-2-99; TSPC 2-2000, f. & cert. ef. 5-15-00

Basic Science Endorsements

584-038-0250

Basic Biology (Valid for Teaching All Science at Grades 5–8, and for Teaching All Science in Which the Majority of the Content is Biology at Grades 9–12)

Forty-five quarter hours designed to develop competence in science, distributed as follows:

(i) Twenty-seven quarter hours in biology science, including:
(a) Classical and molecular genetics;
(b) Evolution;
(c) General microbiology; and
(d) Zoology.

(2) Eighteen quarter hours in physical and earth science.

Stat. Auth.: ORS 342
Stats. Implemented: ORS 342.120 - ORS 342.200

584-038-0260

Basic Integrated Science (Valid for All Science, Except Biology, Chemistry, or Physics at Grades 9–12)

Forty-five quarter hours designed to develop competence in science, distributed as follows:

(1) Eighteen quarter hours in:

(a) Astronomy;
(b) Geology;
(c) Meteorology; and
(d) Oceanography.

(2) Twenty-seven quarter hours in:

(a) Biology; and
(b) Chemistry or physics.

Stat. Auth.: ORS 342
Stats. Implemented: ORS 342.120 - ORS 342.200
Basic Chemistry (Valid for Teaching All Science at Grades 5-8, and for Teaching All Science in Which the Majority of the Content is Chemistry at Grades 9-12)

Twenty-seven quarter hours to develop competence in chemistry, including organic and physical chemistry.

Stat. Auth.: ORS 342
Stats. Implemented: ORS 342.120 - ORS 342.200

Basic Physics (Valid for Teaching All Science at Grades 5-8, and for Teaching All Science in Which the Majority of the Content is Physics at Grades 9-12)

Twenty-seven quarter hours designed to develop competence in physics including advanced and modern physics.

Stat. Auth.: ORS 342
Stats. Implemented: ORS 342.120 - ORS 342.200
Cries of alarm may be premature, but it still makes sense to give new teachers the help and support they need to stay—and grow—in the profession.

When Melissa Fleischer began her first full-time teaching job 12 years ago in Virginia’s Fairfax County Schools, she did so without the help of a mentor. At the time, the district’s efforts to orient new teachers and assist them through their first year were limited, to say the least. “I was told, ‘Here is your key. Here is your classroom, here you go,’” she says. But times have changed. Several years ago, a state law began requiring schools to assign mentors to all new teachers. And by then Fairfax County was ahead of the game. Its Great Beginnings program for new teachers goes beyond mentoring, working with novices in a “boot camp” during the summer, then meeting with them monthly throughout their first year. The second phase of the program occurs in touch with the teacher through years two and three. Fleischer, now a seasoned vet, is a Great Beginnings coach.

The successful program is being replicated at other districts across the state and has made a big difference in teachers’ careers, says Kevin North, Fairfax’s assistant superintendent for human resources. “We historically have spent so much time on recruiting, and not as much on retention of the teachers we already have,” North says. “If we are only cycling them through, then we are not adequately serving kids.”

Fairfax County is not alone. The rush is occasionally to investigate, find funding for, implement—and debate—teacher-retention efforts. These programs vary widely in scope, goals, organization, and success and include but are not limited to “induction” programs such as Great Beginnings. And they are only part of the work many school districts are doing now to keep their teachers and give them incentives to take on big challenges, such as working in struggling schools. Today, many school districts are negotiating retention-related challenges for the first time, from differentiated pay options to the need to hire and keep highly qualified teachers to meet the demands of No Child Left Behind.

A ‘crisis’ is born
What is often seen as a teacher shortage, says the National Commission on Teaching and America’s Future (NCTAF), is re-
ally a teacher retention crisis. That was the argument in No Dream Denied: A Pledge to America’s Children, an NCCLT report that made quite a splash when it was released in January 2003.

"If we know that high-quality teaching makes a difference, why isn’t every child in America getting it?" the report asked.

"The conventional wisdom is that we lack enough good teachers," the report went on to say. "But the conventional wisdom is wrong. The root school staffing problem is teacher retention. Our inability to support high-quality teaching in many of our schools is driven not by too few teachers entering the profession, but by too many leaving it for other jobs."

The report pointed out that the number of new teachers entering the classroom increased steadily during the 1990s, but that teacher attrition occurred at a faster rate. "It is as if we were pouring teachers into a bucket with a fist-size hole in the bottom," the report noted. "No teacher supply strategy will ever keep our schools staffed with quality teachers unless we reverse debilitating turnover rates."

Assuming that teaching has become "a revolving door occupation," the report cited National Center for Education Statistics figures showing that about one-third of the country’s new teachers lose teaching sometime during their first three years on the job.

Responding to this challenge—and to the requirements of the No Child Left Behind Act—many school districts that had not paid much attention to teacher retention have quickly launched a variety of induction and mentoring programs. NCLB required that, as of 2003, any teacher hired in a Title I school must be highly qualified. (What constitutes "highly qualified" is determined by the individual states, and some standards are tougher than others.) By the 2005-06 school year, all teachers must be highly qualified. And no district that has managed to fill its classrooms with highly qualified teachers wants to lose them and begin the process again.

As a result, governors are getting increasingly involved in

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By Craig Colgan

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what used to be strictly the purview of school administrators and school boards: the hiring and assigning of teachers. Virginia’s Gov. Mark Warner, for example, has laid out a broad effort aimed at improving teacher quality in the state, including a new mentoring effort that will replicate several top induction programs, Hattif’s Great Beginnings among them. Virginia’s road to mandated mentoring programs for new teachers began in 1996 with the funding of several programs. By 1999, the state’s General Assembly had approved a law requiring a mentor for every beginning teacher. In 2002, a state report called for development of standards that focus on mentor teachers, guidelines for implementing mentoring programs, and plans for effective evaluation and monitoring.

Nationally, however, the new induction programs vary widely in scope and quality, say Richard Ingersoll and Jeffrey M. Kniffel in a February 2004 report for the Education Commission of the States. And the research that has accompanied this has not provided as much useful information as it should, the ECS report notes.

“Some studies appear to lack methodological rigor and draw conclusions that reach beyond what their data truly support. And there has been little research investigating possible negative effects of mentoring.” In other words, poorly trained mentors might simply pass on what could be ineffective teaching practices.

But a body of knowledge is gradually beginning to emerge. A recent study of mentors in the Boston Public Schools, for example, found that the mentoring programs work best for new teachers who are paired with mentors who teach the same subject at the same grade level, in the same school. The study—Professional Teaching Corps as Mentor, issued by Boston Plan for Excellence, a local education foundation—also found that after one year of teaching, nearly one-third of new teachers cut back their expectations for how long they thought they would remain in their jobs. The most commonly expressed frustration: student misbehavior, classroom management, and discipline issues.

Districts that programs to support new teachers are important, the study found, but conditions and opportunities at their own schools are the most powerful influences on whether teachers stay in the profession. And the study offered no surprising conclusion: “Teachers who gave low marks to their school for attending to their needs and providing access to critical supports were much more likely to plan to leave their position or teach elsewhere.”

How big is the problem?

Efforts to understand just how widespread teacher turnover is and whether it truly is anational crisis begin with debate about numbers and definitions.

Some critics point out that the national “turnover rate” for public school teachers is only slightly lower than that of any other—most, in fact. The NCTAF report says beginning teachers have an attrition rate of 14 percent—this is, 14 percent leave the profession permanently after one year. By the end of five years, the report says, the cumulative attrition rate is 46 percent. That compares to an attrition rate of 10 percent for first-year teachers at large private schools and 23 percent at small private schools. But bear in mind that the NCTAF figures do not apply to the entire teaching force—only to those who, at any one time, are new to the profession.

Addressing the difficulty is the fact that terms such as “turnover” and “attrition” are often used interchangeably, which can confuse the issue.

“Teacher retention only looks like a problem if you lump together ‘newer’ and ‘lower,’” says Mike Antonacci of the Education Intelligence website, a frequent critic of the retention crisis notion. “A dozen are teachers who go from one school to another at the end of the year. Teachers who leave the profession entirely. The latter group is of more concern, but even they are not testimony to a burgeoning crisis in school employment.”

Some experts argue that there is not enough turnover, for example, for schools to do a better job of developing better induction programs and more retention programs. And, if this is true, the attrition rate in the early years of teaching are way below what they are elsewhere.

Another factor is that not all school districts, even those in large urban areas, have the same experience with attrition rates year to year. “This year, we’ve had a smaller number of new hires and lower teacher attrition rate than we’ve had in years,” Paul Vailis, the chief executive officer for the School District of Philadelphia, told the Philadelphia Inquirer in May. But a leading voice in the debate says otherwise. “Certainly it needs to be recognized that some employee turnover is inevitable, necessary, and beneficial in any occupation, in

If teachers know they were supported, that makes all the difference.
chiding teaching," says Richard Ingersoll, associate professor of education and sociology at the University of Pennsylvania, and part of the NCTAF team. And, he adds, there is no question that some occupations have more turnover than teaching does.

"But the problem is not that NCTAF has exaggerated the extent and implications of teacher turnover," Ingersoll says. "This issue has been traditionally ignored by educators, policymakers, and policy makers. Research on employee turnover in other industries and occupations always counts both cross-firm movers and those leaving an occupation altogether. From an organizational viewpoint, it matters little whether employees are moving to a similar job in another firm or whether she is leaving for another career. They are a loss that must be replaced. Only research in education discounts movers.

Ingersoll says ignoring these issues can lead to serious consequences. "Teacher turnover is the real but overlooked story behind the so-called teacher shortages that have plagued many schools periodically," he says.

"If we want to ensure that all classrooms are staffed with qualified teachers, as NCLB now demands, then we will have to address teacher turnover."

**Incentives to stay**

In their efforts to keep good teachers, some states are looking at pay structures in ways that would have been politically unlikely just a few years ago. Minnesota Gov. Tim Pawlenty, for example, is talking about finding ways to pay the best teachers $100,000 per year. And states are hunting for incentives that will have top teachers into struggling schools. One approach, supported by Virginia's Warner, is to allow teachers who move into troubled schools elsewhere in the state to retain their tenure, a valuable benefit.

The pressure is on at the district level, too—not just to keep good teachers, but to move them to where they're needed most. In Philadelphia, the Education Law Center, a school-finding advocacy group, filed a complaint with the U.S. Department of Education's Office for Civil Rights charging that the district's system of assigning teachers discriminate against minority students, since fewer certified teachers are assigned to schools in those neighborhoods.

In response, Philadelphia is now working to streamline its hiring system, improve new-teacher mentoring, and provide bonuses for teachers who teach in the city's most difficult schools.

Other urban districts are also looking for ways to boost support for new teachers. The recent Boston study of new teachers gave the district's revised report on teacher retention. One glaring problem the report uncovered is that only 10 percent of teachers surveyed said the district's human resources support to be good or excellent.

To improve teacher retention, the report recommended more mentoring support as close to school sites as possible. District-led programs to support new teachers are important, the report concluded, but school-based support is more likely to make teachers decide to stick around in their schools—and in the profession.

**Listening to teachers**

One first-year teacher in Boston echoes the report's findings. Katie Bayerl, who teaches humanities to ninth- and 10th-graders, did not have a mentor this past school year. "I still go back to my principal to meet with her for lunch, because I need that feeling of support," says Bayerl. "I am considering taking a position at a different school next year because I know I still need more support and opportunities to learn. The current situation is frustrating."

Bayerl offers several tips of the type of support she needs as a new teacher:

- A mentor teacher in my building,

- A teacher in my building, she says, "who does the kind of teaching I want to do."

- Collaboration with a solid faculty. "I need at least a couple of people in the building who think about teaching, who can make me inspired," she says. "Not having been in a collaborative place this year, I am exhausted. Isolation takes the fun out of my job. I want to talk about instruction!"

An effective structure in place for dealing with disruptive students right away.

- Structured collaboration with teachers who share the same goals.

- A principal who encourages teachers to take on leadership roles. "I like to talk about work beyond my classroom role, and I have a lot of skills to offer," Bayerl says. "If I know that I can contribute to the development of the school as a whole, I will work hard and every day."

Fairfax County's Fletcher, who is also a lead mentor in her school, co-chairs the district's successful induction program, which allows her to work with teachers from across the county. She points out that an important theme in the Great Beginnings program is teaching teachers how to be reflective, constantly taking a wider look at the experience.

Another theme is to establish a training peer group. After beginning teachers have met several times in the summer, the first rule is: Nobody is alone. Mentoring plans have been completed for participants' entire first week at their new jobs.

"That group bonds in the summer, and that is so important for new teachers," she says.

In her 12-year tenure, Fletcher has seen her school district realize that it had to change and respond to needs of new teachers, and she has seen the impact when it did.

"That first year, it was just me at the end of the hall," Fletcher says. "I was 21. The post was across the hall who helped out was 65, but she was a threat because I was one of hundreds of new teachers. I felt small. I was so young. I was 1 going to make it!"

"What we do is so important. What do we do is so important. We know it's tough. If teachers know they are supported, they'll see that makes a difference."

Craig Colgan is an associate editor of American School Board Journal.
Working Summary of NCTAF National Summit:
The First Three Years of Teaching
September 28-30, 2003
Wingspread Conference Center, Racine, WI

Background

In its 2003 report, No Dream Denied, the National Commission on Teaching and America’s Future (NCTAF) found that teacher retention had become a national crisis standing in the way of the nation’s obligation to provide every child with a competent, caring, and qualified teacher in schools organized for success. No matter how many new teachers are recruited into the profession, schools lose about the same number of teachers that they hire every year, thus prolonging an apparent “shortage” condition. Unless we address the issue of teacher retention, the nation will not be able to meet No Child Left Behind’s mandate to provide “highly qualified” teachers for every classroom. No Dream Denied cites recent research that vividly portrays how many teachers schools lose annually, as well as the reasons behind their departures. For example, school conditions, not retirement, are the primary cause of teacher turnover. Research also has shown that how teachers are prepared makes a difference in the retention rates of first-year teachers, as does a new teacher’s participation in an effective mentoring or new-teacher induction program. But the bottom line is sobering: almost a third of all new teachers leave the classroom after only three years, and close to 50% leave after their fifth year.

Capitalizing on this research, NCTAF embraced a three-part strategy to address the root causes of the teacher retention crisis:

- Teaching conditions: Schools must be organized to support quality teaching in professional learning communities.
- Teacher preparation: All teachers must be well-prepared and licensed in order to ensure quality.
- Teaching as a profession: Rewarding career paths for teachers from induction to accomplished teaching must be developed with pay and pay systems that recognize teachers as professionals.

To flesh out this strategy, NCTAF arranged three national summits that would pull together participants from a variety of backgrounds: teachers, teachers union leaders, university professors and researchers, superintendents, principals, and legislators. The first national summit, held September 28-30, 2003, at the Wingspread Conference Center in Racine, Wisonsin, focused on the First Three Years of Teaching. This summit explored the period which bridges a teacher’s career from when he/she first assumes responsibility as a classroom teacher until he/she becomes a “seasoned” teacher. The second summit, which will be held at Wingspread in early December, will focus on Transforming Schools into Strong Learning Communities. This summit will focus on creating learning communities by transforming schools into places where quality teaching...
is supported and where all students attain the 21st century skills necessary to succeed in a global economy. The third and final summit, on High Quality Teacher Preparation, will be held at Barton Creek in Austin, Texas, in January 2004. That summit will focus on how to ensure that all pathways to teaching are designed to meet the six dimensions of quality teacher preparation discussed in No Dream Denied. At the end of these three summits, NCTAF intends to produce a plan that describes its vision for a transformed model of teaching and the specific actions that will be required to achieve that vision.

This paper reports on the first of these three summits, and the messages it brings to the summits that follow.
Too few of the teachers we have prepared are choosing to enter the schools, and too many of those who are hired don’t stay long enough to join their colleagues in developing a quality teaching environment once they are there. Newly prepared teachers, and those with as many as five or more years of experience, are leaving their schools in growing numbers. They are leaking out of the bucket faster than we can replace them. The response has been to try to keep the bucket full by pouring in more inexperienced teachers and under-prepared individuals at a faster rate. But this has destructive consequences for the quality of teaching in many schools. Why? Because these novice teachers flow through the schools so fast that they aren’t in their jobs long enough to become good at them (pg. 23).

No Dream Denied, 2003

Ensuring that entry-level teachers continue in the profession and become accomplished teachers is an essential component of providing quality education for all children. Achieving the vision of quality teaching in all schools begins with devising strategies for creating the conditions for an optimal entry into the teaching profession.

Participants at the first national summit came from a variety of backgrounds — teachers, superintendents, teacher union leaders, legislators, principals, university professors and researchers. They were asked to create the map for the journey that would move schools from the current or traditional system of entry — which is marked by teacher isolation — to a transformed system in which all entering teachers experience the kind of support from a professional community that will move them towards accomplished teaching.

Participants agreed that developing such support goes well beyond the buddy system of mentoring. The envisioned entry would incorporate new teachers into a professional learning community from the start, emphasizing their relationships with colleagues and marked by an expectation that they will continue to learn and grow throughout their profession. An essential element of this community is the expectation that all members of the community share responsibility for each other’s success and for the success of all students.

In the current system, teachers leave not because of poor salaries, but because of poor working conditions. They leave while they’re still young because they look down the road and see few professional opportunities. They leave because they are disappointed that the profession of teaching does not live up to their vision of what it could — and should — be.

Retention is broader than the issue of holding onto teachers for the life of their careers. “I worry about the teachers we’re losing physically as well as the teachers we are losing.”

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spiritually, mentally, and emotionally," said Ellen Moir, executive director of the New Teacher Center at the University of California-Santa Cruz.

Participants agreed that we would need to change the current system even if retention were not a problem. All agreed that, even if American schools were holding on to all of our teachers, changes would still be needed to create more positive professional environments for all teachers, including novices, and, by extension, more positive environments for all students.

The Wingspread Summit members began by sharing stories of their own induction experiences, about what made them feel welcome and a part of a community in which they were to work. By bringing forth these memories, some painful, some positive, the participants identified key elements that had supported their successful entry, and some that hadn’t.

What, then, are the elements or components necessary to move from traditional entry level teaching into a model that embraces new teachers into a culture of support? Participants focused on roles and responsibilities for novice teachers and those who prepare and support them; the learning community itself; the professional development environment for continual learning; and the system supports. Working in small discussion groups, they sought to answer several questions:

- What would our schools look like if they were welcoming and nurturing professional environments for new teachers?
- What would the work of novice teachers look like?
- What roles would others have to play in order to enable those teachers to do that work?
- How does changing the work of novice teachers change the rest of the community in which those teachers work?
- What actions must be taken to achieve that vision?

Through their discussions, summit participants surfaced a set of assumptions that guided their thinking about the answers to these questions:

- We cannot talk about the first three years of teaching in isolation. We must talk about the profession of teaching. We must have a vision of what we want the profession to look like in order to know how to effectively introduce beginners into that profession.
- We must have a vision of the career path for all teachers in order to have a clear vision of where that path begins.
- We cannot talk about the daily work of novice teachers without also talking about the daily work of all teachers. If the daily work of entering teachers changes, the daily work of every teacher in the schools in which they work will be impacted.

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If effective induction of teachers means making teaching more work public and subject to shared reflection among all practitioners in a school, that would change the culture of the schools. Any change in school culture would impact teachers, as well as principals, parents, and, of course, students.

"Millennial kids"

To help set the stage for later discussions, facilitator Cheryl Lemke of Metiri Group described research about "millenial kids."

For this generation of students — graduating from high school after 2000 — technology is changing their expectations of school and of learning. School is becoming increasingly irrelevant, in part because of the in-school/out-of-school disconnect that prevents them from incorporating technology into their learning in the same way they have incorporated technology into their non-school lives.

Technology is a ubiquitous part of the daily lives of millennial kids. Where an older generation considers computers, PDAs, MP3s and the like "technology," such devices are as commonplace for millennials as electric lights and refrigerators are for their elders. Millennials are sending messages from hand-held PDAs as easily as their parents might have picked up a telephone, and are fetching online documents as comfortably as their parents once perused a library shelf. Millennials spend more time on the Internet than with television and have a more powerful learning environment outside of school than in school.

That means that, when it comes to school, millennials want to learn:

- With technology
- With one another
- Online
- In their own time
- In their own place
- Doing things that matter

This has implications not only for today’s K-12 classrooms, but also for grooming and keeping tomorrow’s classroom teachers. At this stage, the millennials have a greater degree of comfort with technology than adults who are teaching them, including the faculty who are grooming today’s teacher candidates for the profession of teaching and the teachers in schools today who are welcoming them into the profession. Lemke suggested that entry-level teachers will become even more disenfranchised — and therefore more inclined to leave the profession — if their workplaces do not support them in using the tools to which they have grown accustomed. Just as there is a disconnect between what today’s students do with technology in school and out, so, too, is there a disconnect between how millennial teacher candidates see technology used in teacher preparation and how they use it as a powerful resource in their everyday lives.

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A VISION FOR THE FIRST THREE YEARS

In small groups, summit participants focused on developing the model introduction to teaching that they desired for novice teachers. They described the daily work of novice teachers as well as detailed the actions that would have to be taken by others — the state, the district, principals, unions, university faculty, master teachers, teachers unions, and community members — to create this view of the future.

"Some places are doing aspects of this very well. Virtually all pieces are being done very well someplace but no place has the whole package," said Brandeis University professor Shiron Feinman-Nemser.

The profession is in a state of transition, moving away from the traditional model of schools as we know them today toward a model that will be more appropriate for the 21st century. But even in this transitional phase, there are elements that could be included in a new model for teachers entering a community of support in schools.

Roles and responsibilities

One group of summit participants was asked to describe the roles and responsibilities of the entry-level teacher on a transformative journey into accomplished teaching.

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Summit participants recognized the delicate balance between two competing desires for novice teachers. First, they said, we want beginning teachers to have time to be beginners. We want to move away from a system in which beginning teachers immediately assume the same teaching load and other responsibilities as more experienced teachers. Second, we want to recognize the knowledge and expertise that they bring with them into the profession—and we also want them to recognize their own knowledge and expertise and to begin to see themselves as important contributors to discussions about addressing the learning needs of their students.

There seemed to be virtually unanimous agreement that novice teachers would not be expected to carry a full load of teaching responsibilities during their first year and perhaps for as long as their first three years. Novice teachers might work on an extended contract of 11 months in order to build more learning time into their work year. During the regular school year, their non-teaching time would be spent in observation, working alongside more experienced teachers, and working in instructional teams with their colleagues. As they mature in the profession, novice teachers would assume progressively greater responsibilities, both for their time in front of students and for non-classroom work with students in such areas as lunchroom duties, extracurricular activities, and the like.

"We need a slower transition time from the beginning of teaching to full teaching," said Carol Sherrill, supervisor of curriculum and standards, Bakersfield, California.

Many participants pointed to the example of the medical profession's use of teaching hospitals as a model that could be adapted for education. In that atmosphere, novice teachers would begin to assume responsibility appropriate for their abilities while also learning and working alongside more experienced colleagues. One model for this approach is found in what participants referred to as "professional development schools."

Even as they learn, however, novice teachers must be valued for the knowledge that they bring with them into their profession and they must be expected to share that knowledge with others. Incorporating novice teachers into instructional teams sends the message that all teachers, no matter what their status, have expertise to contribute to their colleagues. Novice teachers would not join teams merely to sit at the feet of their elders and listen. They would be there to be part of the action, to join discussions about student work, and to reflect upon their practice.

"Each teacher should be expected to contribute expertise, not just receive it," said University of Washington professor Pat Wasley.

Ellen Moir, of the New Teachers Center, was more blunt: "They can't be parasites. They have to give something back."

Montana teacher Melodee Smith-Burreson recalled an experience from her beginning years of teaching when the principal of her school asked her to share with other teachers..."
what she had learned from her college courses about teaching mathematics. "I felt included and valued. That was a powerful message to me in my first year of teaching," she said.

Setting that expectation at the beginning of their careers is essential for sending the message to novice teachers that that is how they will be expected to work during their entire careers.

**Learning communities**

Another set of summit participants worked to describe the learning communities that would most effectively advance the entry-level teacher into accomplished teaching.

The concept of teacher teams is at the heart of the learning community envisioned by summit participants. Working closely with other teachers ensures the development of healthy, trusting relationships. It is the creation of such relationships that enables teachers — both new and experienced — to make their practice more public.

The core teaching team would be composed of both experienced and novice teachers, and the team would provide opportunities for planning and inquiry as well as bringing together teachers with varying types of expertise to explore shared concerns about students. In addition, novice teachers might form their own teams in order to explore their own underlying beliefs about the profession.

At least during the transition period, an entry-level teacher would be paired with a more experienced teacher from the same discipline or grade level who would serve as a mentor. This would be a deeper relationship than the buddy system that is now used by many schools. Mentoring would be done with purpose and with the expectation that both the mentor and the novice would grow together in their understandings of teaching through the mentoring relationship, said University of Nevada-Las Vegas professor Sandra Odell. "I hear mentors saying things like, 'Do whatever works for you.' That does not convey to young teachers that there are standards for teaching."

Changing the roles and the work of novice teachers would impact the entire learning communities in which these teachers work. Changing the work of other teachers in order to support newly hired teachers would necessitate changes in contract language, particularly regarding the recognition of differentiated levels of teacher responsibility and pay.

Key to the success of this would be the development of clear standards for the differentiated levels. If differentiated pay is perceived as "merit pay," such a change would not be successful, participants said.

Teachers union leader Adam Urbanski promoted the concept of peer review as an essential piece of such a transformed system. "Nobody knows better the difference between good teaching and bad teaching than the best teachers themselves," he said.

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Peer review, he said, is necessary for creating the relationships that will sustain professional learning communities in which we want new teachers to work. “Part of community building is building community ownership,” he said. “If mentors wash their hands of that aspect of it, then mentoring is not conduciative to community building.”

Urbanski said peer review is “only controversial where it doesn’t exist.” He pointed to the experience in Rochester, New York, as an example of peer review’s success and value to the system.

Although there was support for Urbanski’s idea, there was not universal agreement among summit participants. Charlotte Danielson urged caution regarding peer review. “NCTAF should not put too many eggs in the peer review basket – it is too controversial and there are other ways to accomplish the same purpose,” she said.

Professional growth
A third group of summit participants described the professional growth experiences and opportunities that would most effectively advance the entry-level teacher into accomplished teaching.

The essence of professional growth for new teachers is assisting novices to do what they are not yet ready to do alone. What most advances the professional growth of novice teachers are opportunities to work in teams with other teachers where they are able to observe expertise in action, and reflect on their practices as well as those of their more experienced colleagues.

“These teams build the groundwork for reflective practice. They’re essential,” said Lena Cohen, coordinator of New York University’s New Educators Support Team project.

The professional learning of novice teachers needs to be tied to the school-wide plan and relevant to the work they do. That does not mean it must occur only during their work day. That means that learning time for novices would build into it elements for reflection on their practice, observation and feedback, and collaboration with other teachers. Their learning would not be merely built into their workday but actually related to their classroom practice. They would perceive that the best learning is the learning that occurs in partnership with colleagues.

“There is a symbiotic relationship that exists here. The teachers have to be involved in their own learning,” said Angela Covert, national advisor to NCTAF.

Educational consultant Charlotte Danielson echoed that thought. “Reflective practice is not natural. It’s a learned process. We’re responsible for teaching them how to engage in this sort of work,” she said.

Participation on teams has another benefit for the new teacher: it ensures that they are connected with many master teachers. “While one-to-one mentoring is very important, often it is not sufficient or it is hit or miss. The best induction programs provide a system NCTAF National Summit on the First Three Years of Teaching
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or web of interlocking supports,” said Ed Liu, research assistant for Project on the Next Generation of Teachers at the Harvard Graduate School of Education.

Finally, participants said that one of the goals of the novice period is that novice teachers feel efficacious about their ability to teach successfully. By feeling efficacious, they said, young teachers would be more likely and more willing to step forward and assume leadership responsibilities that are appropriate for their abilities. Ensuring that they are able to make this leap is necessary to their growth and, the participants believed, a crucial part of booking new teachers into the profession over the long term.

**Systemwide support**

A final group of summit participants described the systemwide support that would most effectively advance the entry-level teacher into accomplished teaching. Systemwide support includes support from higher education, superintendent/school board, principal, school culture/organization, teaching staff, and technology.

To improve retention, the group agreed, means beginning at the beginning. As former Procter & Gamble executive Bob Wehling put it: “We need a radically different on-boarding process for new teachers. The earlier we start the process, the earlier they get acclimated (to the desired system).”

Lynn Stuart, principal of Cambridgeport School in Cambridge, Massachusetts, agreed. “Setting the stage for a new teacher begins with the interview,” she said. Rather than having candidates interviewed by a personnel director and principal, new teachers would be interviewed by a number of teachers and parents. Not only would that improve the selection process, she said, it also would “send a message to prospects that they would be joining a community.”

In addition, the broader community would respond to new teachers with actions similar to those currently occurring in Clark County, Nevada, which is believed to be the fastest-growing district in the nation. Clark County’s associate superintendent, George Ann Rice, detailed community support that includes introductory phone calls to prospective candidates, support for initial living arrangements, and get-to-know-your-community events.

To get to this level of widespread community support, however, would require that community leaders understand and value the relationship between high levels of student learning and retaining and building highly qualified teachers. Because they understood this relationship, community leaders would willingly play an active role in the recruitment and induction of new teachers. They would take pride in this connection with the schools.

School districts and school boards would make commitments to support new teachers with additional time and human resources. Novice teachers need opportunities to participate in a variety of teams — grade-level or discipline-focused teams, districtwide

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data team, and an inquiry team. That can happen only with the commitment from central office and school boards during their budgeting processes.

In addition, school districts would place new teachers in schools led by principals who had demonstrated their ability to improve and ensure teaching quality and would have a depth of background in adult learning. In order to create a seamless link between the universities and the schools, these principals would develop and maintain a close relationship with at least one college of education. That would ensure a smooth exchange of information about what kind of teachers would be needed and what kind of schools teachers would be going to work in.

Universities would believe that their responsibility to an education graduate continues through their early years in the profession. Universities would recognize that teacher preparation and entry-level teaching are not separate enterprises. They would tap into the experiences of entry-level teachers in order to ensure that teacher preparation programs are providing appropriate pre-service education. They would also explore mechanisms to continue to link their graduates with others who are novices in the profession, perhaps creating online networks of entry-level teachers who can nurture and support each other.

The message from this group is that everyone who plays a role in introducing teachers into the profession must understand the importance of this process and feel a sense of responsibility for ensuring a safe and effective transition for these new teachers.

**STAKEHOLDERS’ ROLES**

In order to structure this kind of future for new teachers, various stakeholders — the state, the community, universities and teacher unions — would have to take certain actions to achieve this vision. While not defining policy options per se, participants discussed a number of possible actions for the key players.

Teachers' chairman Jonathan Saphier said widespread support for induction programs appears to be essential for their success. “Induction programs that are created by districts alone are very vulnerable,” he said. What is needed is a comprehensive plan that involves multiple stakeholders because that gives such programs more durability, he said.

**The state**

States would play a significant role in creating both the expectations that a novice teacher would have a high-quality induction experience and in establishing an environment that enables such an experience to occur.

In order to get to the model they envision, participants said states would:

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Be deliberate about planning to ensure that new teachers throughout the state are effectively introduced to the teaching profession.

Develop standards for teaching — and for the schools in which these standards are to be met — just as they now develop curriculum standards.

Provide additional resources to schools that operate as professional development schools and additional resources to districts that ensure that all new teachers work first in those schools before gaining permanent classroom assignments. This would also require additional resources for higher education institutions and other teacher preparation programs for their support of clinical experiences as a part of an extended internship model.

Develop a teacher licensing/certification system that enables the state to monitor the effectiveness of the induction programs in each district and to monitor the outcomes of each teacher education program in the state.

Maintain a clearinghouse of information on teacher recruitment and retention and actively share that information with colleges of education and school districts.

Develop a P-16 council that focuses on the relationships among the various education institutions.

The district

As significant as a state’s work might be, such work could not be done in isolation nor would it be sufficient to produce the kind of environment necessary to nurture young teachers into the profession. To make the connection with the school, districts would need to undertake certain tasks to bring the vision to reality.

To support model induction programs, participants said districts would:

- Establish model induction programs for newly-minted teachers. These programs would be housed in neighborhood schools designed to give novice teachers experiences similar to those they would encounter in a permanent assignment in the district.

- Identify highly qualified principals who are entrusted with the responsibility of preparing novice teachers for full employment in the district.

- Recognize that effective professional learning is related to the work being done by teachers and would be tied to overall schools and district goals for improving student learning.

- Ensure that every school in the district has created a professional culture that builds on the experiences that novice teachers have acquired in their induction programs.

- Establish a clear rubric for evaluating novice teachers and ensure that this is tied to the state’s standards for teachers.

- Ensure that all principals, teachers, and parents understand the importance of attracting and keeping highly qualified teachers in its classrooms.

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Higher education

Universities would also play a significant role in successfully establishing teachers in the profession. Since pre-service education will be the topic of another summit, participants at the first summit focused their attention on the way that colleges of education would interact with their graduates. Unlike today, when most universities essentially cut the cord once their graduates leave campus, summit participants envisioned a time when colleges of education would be held accountable for the success of their graduates. If a high percentage of their graduates are leaving the profession within five years, a college of education might be subject to penalties imposed by the accrediting agency or by the state agency that funds higher education in its state, suggested several participants.

They envisioned universities as being active players in the creation and maintenance of quality induction programs. This relationship would add value to the induction itself as well as providing an efficient way for knowledge about the reality of the transition to be fed back to the university community.

In this new future, universities would:

- Study the experiences of new teachers in order to improve the quality of teacher preparation.
- Recognize and value the service that faculty provide by working with novice teachers and their schools.
- Commit necessary funds necessary to create and maintain strong clinical internship and follow-up programs.
- Facilitate online connections between cohorts of their graduates.
- Link classroom educators with university resources that would enhance their personal/professional learning as well as the learning of their students.
- Certify master teachers as clinical instructors and evaluators of novice teachers.

NCTAF

As a stakeholder in the outcome, summit participants also identified several steps that NCTAF could take to move forward the agenda of this summit.

Participants suggested that NCTAF could:

- Focus on organizing schools to support students and teachers as its primary message.
- Provide definitions and tease out details for what is meant by ideas such as “differentiated staffing,” “master teachers,” “mentor teachers,” “career teachers,” “continuum of teaching,” “learning communities,” etc.

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Provide examples of successful teacher induction programs that have led to improve student achievement, perhaps by using the web site as a collection point.

Explore why good ideas that have been around for a long time have still not been embraced in practice.

Influence the actions of other professional associations, such as — AASA, NASSP, NAESP, NSBA, and PTA —by communicating to them the results of the summits.

Invite interested, informed "outsiders" who could bring new questions, perspectives to the issue.

Invite other fields with analogous career/professional education and development issues to share what they have learned.

Use the example of this summit as a blueprint and a kit for each state and locality to use in exploring the issue.

**SUMMARY**

Much of the conversation at the first summit anticipated discussions that will occur in the second and third NCTAF summits. Clearly, the three topics are interconnected and ideas from all will need to be woven into ideas from the others in order to create a final picture of the future and to identify the work that needs to be done to reach that future.

As Urbanski said during the first summit, "we cannot build a wonderful system if we don’t have wonderful relationships.” Participants at the first summit recognized that improving the work life of novice teachers is an essential aspect of building a professional learning community — and building a professional learning community is essential to improving the work life of the novice teacher.

In the final hours of the summit, NSDC Deputy Executive Director Stephanie Hirsh asked this question: “If all schools were truly learning communities, would we even need to talk about mentoring?”

Such ideas set the stage for the second summit, *Transforming Schools into Strong Learning Communities*.
To reduce high teacher turnover rates that impose heavy costs on schools, we must improve working conditions, insist on effective teacher preparation, and provide support for new teachers.
ow teachers are paid was a part of it, but overwhelmingly the things that would destroy the morale of teachers who wanted to leave were the working conditions... working in poor facilities, having to pay for supplies, and so on.

—A Los Angeles teacher talking about a high-turnover school

The 1st grade classroom in which I found myself five years ago had some two dozen ancient and battered books, an incomplete curriculum, and a collection of outdated content standards. But I later came to thrive in my profession because of the preparation I received to my credential program: the practice I received developing appropriate curricula, exposure to a wide range of learning theories, training in working with non-English-speaking students and children labeled "at risk."

It is the big things, though, that continue to sustain me as a professional and give me the courage to remain and grow: my understanding of the importance of asking questions about my own practice, the collegial relationships, and my belief in my responsibility to my students and to the institution of public education.

—A California teacher from a strong urban teacher education program

What keeps some people in teaching while others give up? What can we do to increase the holding power of the teaching profession and to create a stable, expert teaching force in all kinds of districts? Some of the answers to these questions are predictable; others are surprising. The way schools hire and the way they use their resources can make a major difference.

A growing body of evidence indicates that teachers who lack adequate training are more likely to leave the profession.

Keeping good teachers should be one of the most important agenda items for any school leader. Substantial research evidence suggests that well-prepared, capable teachers have the largest impact on student learning (see Darling-Hammond, 2000; Wilson, Floden, & Ferrini-Mundy, 2001). Effective teachers constitute a valuable human resource for schools—one that needs to be treasured and supported.

The Challenge of Teacher Attrition

The No Child Left Behind Act’s requirement that schools staff all classrooms with "highly qualified teachers" creates a major challenge, especially for schools in innercity and poor rural areas. The problem does not lie in the numbers of teachers available; we produce many more qualified teachers than we hire. The hard part is keeping the teachers we prepare.

The uphill climb to staff our schools with qualified teachers becomes steeper when teachers leave in large numbers. Since the early 1990s, the annual number of exits from teaching has surpassed the number of entries by an increasing amount (see fig. 1), putting pressure on the nation’s hiring systems. Less than 20 percent of this attrition is due to retirement (Heith, Chen, & Geis, 2000; Ingerson, 2001).

Steep attrition in the first few years of teaching is a long-standing problem. About one-third of new teachers leave the profession within five years. Rates of attrition from individual schools and districts include these leavers, plus movers who go from one school or district to another. Taken together, leavers and movers particularly affect schools that serve poor and minority students. Teacher turnover is 50 percent higher in high-poverty than in low-poverty schools (Ingerson, 2001), and new teachers in urban districts exit...
Since the early 1990s, the annual number of exits from teaching has surpassed the number of entrants by an increasing amount, putting pressure on the nation’s hiring systems.

In addition, more teachers in these schools are underprepared and unsupported, factors that strongly influence attrition (Darling-Hammond, 2000a).

The Heavy Costs of Attrition

Early attrition from teaching bears enormous costs. A recent study in Texas, for example, estimated that the state’s annual turnover rate of 15 percent, which includes a 40 percent turnover rate for public school teachers in their first three years, costs the state a "conservative" $329 million a year, or at least $8,000 per recruit who leaves in the first few years of teaching (Texas Center for Educational Research, 2000). High turnover means that schools must raise funds urgently needed for school improvements and spend them instead in a manner that produces little long-term payoff for student learning.

Given the strong evidence that teacher effectiveness increases sharply after the first few years of teaching (Kain & Singleton, 1990), this kind of churning is the beginning teaching force reduces productivity in education overall. The education system never gets a long-term payoff from its investment in novices who leave.

In addition, large concentrations of underprepared teachers create a drain on schools’ financial and human resources. In a startling number of urban schools across the United States, a large share of teachers are inexperienced, underqualified, or both. One recent estimate indicates that more than 20 percent of schools in California have more than 20 percent of their staffs teaching without credentials. These inexperienced teachers are assigned almost exclusively to low-income schools serving students of color (Shields et al., 2001).

Such schools must continually pour money into recruitment efforts and professional support for these new teachers. Other teachers, including those who serve as mentors, are stretched thin and feel overwhelmed by the needs of their colleagues in addition to those of their students. Schools spend scarce resources trying to reteach the basics each year to teachers who come in with few tools and leave before they become skilled (Carroll, Reardon, & Giauque, 2000). As a principal in one such school noted:

"Having that many new teachers on the staff at any given time means that there was less of a knowledge base. ... It means there was less cohesion on the staff. It meant that every year,
we had to recover ground in professional development that had already been covered and try to catch people up to where the school was headed (cited in Darling-Hammond, 2002)

Most important, such attrition connotes a large shift of students in high-turnover schools to a continual parade of ineffective teachers. Unless we develop policies to stem such attrition through better preparation, assignment, working conditions, and mentor support, we cannot meet the goal of ensuring that all students have qualified teachers.

Factors Influencing Teacher Attrition

In all schools, regardless of school wealth, student demographics, or staffing patterns, the most important resource for continuing improvement is the knowledge and skill of the school’s best-prepared and most committed teachers. Four major factors strongly influence whether and when teachers leave specific schools or the education profession entirely: salaries, working conditions, preparation, and mentorship support in the early years.

Salaries

Even though teachers are more altruistically motivated than some other workers, teaching must compete with other occupations for talented college and university graduates each year. To attract in these areas of these incentives and to offer sufficient incentives for professional preparation, the teaching profession must be competitive in terms of wages and working conditions.

Unfortunately, teacher salaries are relatively low. Overall, teacher salaries are about 20% below the salaries of other professionals with comparable education and training. Data from the Bureau of Labor Statistics show that in 2001, the average teacher salary ($44,040) ranked below that of

Effective teachers constitute a valuable human resource for schools—one that needs to be treasured and supported.

Teachers’ feelings about administrative support, resources for teaching, and teacher input into decision making are strongly related to their plans to stay in teaching and to their reason for leaving (Darling-Hammond, 2002a; Ingersoll, 2001, 2002). High-and-lowwealth schools differ greatly, on average, in the support that they give teachers. Teachers in more advantaged communities experience easier working conditions, including smaller class sizes and fewer problems that influence overall school decisions (NCES, 1997).

The high attrition of teachers from schools serving low-income or lower-achieving students appears to be substantially influenced by the poorer working conditions typically found in these schools. For example, a survey of California teachers (Harris, 2005) found that teachers in high-poverty, low-lacome schools report significantly worse working conditions, including poorer facilities, less access to textbooks and supplies, fewer administration supports, and larger class sizes.

Working Conditions

Teachers are more likely to quit when they work in districts that offer lower wages and when their salaries are low relative to alternative wage opportunities, especially teachers in such high-demand fields as math and science (Brewer, 1996; Mont & Bree, 1996; Murnane & Olsen, 1990; Theobald & Gris, 1996). Salary differences seem to matter more at the start of the teaching career (Gris & Theobald, 1996; Hanushek et al., 1999), whereas experienced teachers appear to place more importance on working conditions (OECD & Page, 2000).

Working Conditions: Surveys of teachers have long shown that working conditions play a major role in teachers’ decisions to switch schools or leave the profession.

Teacher Preparation

A growing body of evidence indicates that teachers who lack adequate initial
preparation are more likely to leave the profession. A recent National Center for Education Statistics report found that 29 percent of new teachers who had not had any student teaching experience left within five years, compared with only 15 percent of those who had done student teaching as part of a teacher education program (Hinkle et al., 2000). The same study found that 36 percent of uncertified entrants left within five years, compared with only 14 percent of certified entrants. In California, the state standards board found that 40 percent of emergency-permit teachers left the profession within a year, and two-thirds never received a credential (Dayle Hammond, 2002).

In Massachusetts, nearly half of all recruits from the Massachusetts Institute for New Teachers program had left within three years (Fowler, 2003), and in Houston, Texas, the attrition rate averaged 80 percent after two years for Teach for America recruits (Raymond, Fitchett, & Luque, 2001).

Other research evidence suggests that the more training prospective teachers receive, the more likely they are to stay. For example, a longitudinal study of 11 programs found that those who graduate from four-year teacher education programs enter and stay in teaching at much higher rates than do four-year teacher education graduates from the nine institutions (Andrews & Schonert, 1995). These redesigned programs provide a major in a disciplinary field, as well as intensive pedagogical training and long-term student teaching. As Figure 2 shows, both four- and five-year teacher education graduates ease and stay at higher rates than do teachers hired through alternative programs that give them only a few weeks of training (Darling-Hammond, 2000).

Taking into account the cost to states, universities, and school districts for preparation, recruitment, induction, and replacement due to attrition, the actual cost of preparing a career teacher in the more intensive five-year programs is actually less than the cost of preparing a greater number of teachers in short-term programs of only a few weeks duration. Graduates of extended five-year programs also report higher levels of satisfaction with their preparation and receive higher ratings from principals and colleagues.

In 2000, new teachers who had received training in specific aspects of teaching (for example, selection and use of instructional materials, child psychology, and framing theory), who experienced practice teaching, and who received feedback on their teaching left the profession at rates one-half as great as those who had no training in these areas (NCCTF, 2003). Similarly, first-year teachers who felt that they were well prepared for teaching were much more likely to plan to stay in teaching than those who felt poorly prepared. On such items as preparation in planning lessons, using a range of instructional methods, and assessing students, two-thirds of those reporting strong preparation intended to stay, compared with only one-third of those reporting weak preparation. 
Keeping good teachers should be one of the most important agenda items for any school leader.

Mentoring Support

Schools can enhance the beneficial effects of strong initial preparation with strong induction and mentoring in the first years of teaching. A number of studies have found that well-designed mentoring programs raise retention rates for new teachers by improving their attitudes, feelings of efficacy, and instructional skills.

Such districts as Rochester, New York, and Cincinnati, Columbus, and Toledo, Ohio, have reduced attrition rates of beginning teachers by more than two-thirds (often from levels exceeding 30 percent to rates of under 5 percent) by providing expert mentors with release time to coach beginners in their first year on the job (NCTAF, 1996). These young teachers not only stay in the profession at higher rates, but also become competent more quickly than those who must learn by trial and error.

Mentoring and induction programs will only produce these benefits if they are well designed and well supported. Although the number of state induction programs has increased (from 7 states in 1996–1997 to 55 states in 2002), only 22 states provide funding for these programs, and not all of the programs provide on-site mentors (NCTAF, 2003). In an assessment of one of the oldest programs, California's Beginning Teacher Support and Assessment Program, early pilots featuring carefully designed mentoring systems found rates of beginning teacher retention exceeding 90 percent in the first several years.
of teaching. As the program has scaled up across the state, however, only half of districts have provided mentors with time to coach novices in their class rooms (Shields et al., 2003).

Most effective are state induction programs that are tied to high-quality preparation. In Connecticut, for example, districts that hire beginning teachers must provide them with mentors who have received training in the state’s teaching standards and its portfolio assessment system, which were introduced as part of reforms during the 1990s. These reforms also raised salaries and standards for teachers and created an assessment of teaching for professional licensure modeled after that of the National Board for Professional Teaching Standards. A beginning teacher noted of this connected system,

One of the things that helped me a lot is that my cooperating teacher last year is a state assessor and she used to do live assessments. . . . She used to assess me using [state standards] for every lesson, every day, which gave me a good idea of what is expected of me and how I will be assessed by the state. Also, I learned about the components that make good teaching. (Wilson, Darling- Hammond, & Perry, 2011)

As an additional benefit, these programs provide a new lease on life for many veteran teachers. Veterans need ongoing challenges to remain motivated and excited about the profession. Many say that mentoring and coaching other teachers creates an incentive for them to remain in teaching as they learn from and share with their colleagues.

What School Leaders Can Do

The research reviewed here suggests several lessons for education policy and practice:

- Although investments in competitive salaries are important, keeping good teachers—both novices and veterans—also requires attention to the working conditions that matter to teachers. In addition to those often considered—class size, teaching load, and the availability of materials—key conditions include teacher participation in decision making, strong and supportive instructional leadership from principals, and collegial learning opportunities.

- Seeding out and hiring better-prepared teachers has many payoffs and savings in the long run in terms of both lower attrition and higher levels of competence.

- When the high costs of attrition are calculated, many of the strategic investments needed to keep good teachers—such as providing mentoring for beginners and creating ongoing learning and leadership challenges for veterans—actually pay for themselves at a large degree.

School systems can create a magnetic effect when they make it clear that they are committed to finding, keeping, and supporting good teachers. In urban centers, just as in suburban and rural areas, good teachers gravitate to schools where they know they will be appreciated and supported in their work. These teachers become a magnet for others.
References

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Great school leaders create nurturing school environments in which accomplished teaching can flourish and grow.