DOCUMENT RESUME

ED 422 323 SP 038 119

AUTHOR Koppich, Julia E.; Knapp, Michael S.
TITLE Federal Research Investment and the Improvement of Teaching. 1980-1997.
INSTITUTION Center for the Study of Teaching and Policy, Seattle, WA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO R-98-1
PUB DATE 1998-04-00
NOTE 42p.
CONTRACT R308B70003
AVAILABLE FROM University of Washington, Box 353600, College of Education, Miller Hall M201, Seattle, WA 98195-3600.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Diversity (Student); Educational Quality; *Educational Research; Elementary Secondary Education; Federal Aid; *Federal Government; *Financial Support; Higher Education; Knowledge Base for Teaching; Preservice Teacher Education; Teaching Conditions; *Teaching (Occupation)
IDENTIFIERS Teacher Knowledge; *Teaching Research

ABSTRACT

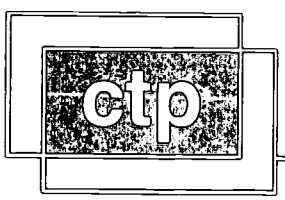
In the last 2 decades, federally-funded research has contributed much to the understanding of teaching and learning and the critical nature of teachers' subject-matter knowledge and ability to translate academic content into effective learning activities for students of different developmental levels and backgrounds. Research findings have contributed to the development of standards for beginning teaching and accomplished practice. This paper identifies some of the principal advances leading to this understanding. Information comes from literature reviews and from interviews with leaders in research and with those who use research to improve educational practice. The report provides policymakers and others with information to help them assess the impact of relatively recent appropriation of federal educational research funds. It also helps policy officials make informed choices about the future investment of federal dollars for research on teaching. The report addresses four principal topics on which federal research investment has been concentrated and to which it has made a substantial contribution: (1) understanding teaching and learning, (2) designing and implementing more effective teacher preparation programs, (3) understanding how to support practicing teachers, and (4) creating productive school and policy environments for teaching and learning. (SM)

# Federal Research Investment and the Improvement of Teaching 1980-1997

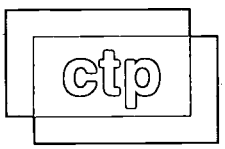
by
Julia E. Koppich
Michael S. Knapp



April, 1998
*(Document R-98-1)*




Center for the Study of Teaching and Policy
UNIVERSITY OF WASHINGTON




## Center for the Study of Teaching and Policy

**A Consortium of Five Universities**

UNIVERSITY OF WASHINGTON (lead institution)

STANFORD UNIVERSITY

TEACHERS COLLEGE/COLUMBIA UNIVERSITY

UNIVERSITY OF MICHIGAN

UNIVERSITY OF PENNSYLVANIA

Other active participants in CTP's research and dissemination program include researchers affiliated with Cornell University, the Learning Research & Development Center (LRDC) at the University of Pittsburgh, the University of California at Santa Barbara, Indiana University, and the University of South Carolina.

### Other Federally Funded Research and Development Organizations Allied with CTP

- Consortium for Policy Research in Education (CPRE)
- Center for Research on Education, Diversity, and Excellence (CREDE)
- National Partnership for Excellence and Accountability in Teaching (NPEAT)
- National Commission on Teaching and America's Future (NCTAF)

The work reported herein was supported under the Educational Research and Development Centers Program, PR/Award Number R308B70003, as administered by the National Institute on Educational Governance, Finance, Policymaking and Management, Office of Educational Research and Improvement (OERI), U.S. Department of Education. However, the contents do not necessarily represent the positions or policies of the National Institute, OERI, or the U.S. Department of Education, or the endorsement of the federal government.

# Contents

# Summary: Returns on Federal Research Investment

In the past two decades, the federal government has made a substantial investment in educational research, building on and expanding a role it has assumed since the 1960s. Much of this investment has supported investigations of teachers, teaching, and teacher development in elementary and secondary schools. This investment has paid off handsomely in efforts to improve teaching across the nation.

## Forms of Research Investment

Federal research investments related to the improvement of teaching have taken several forms:

- **Support for programmatic research through national R&D centers.** The largest single outlay of federal educational research funding has been the support of national R&D centers by the U. S. Department of Education/Office of Educational Research & Improvement (OERI, formerly the National Institute of Education). Some centers have focused solely on the nature or context of teaching or teacher development. Others have focused on teaching in particular subject areas (English, reading, writing, mathematics, science, social studies) or with particular student populations, such as the teaching of at-risk students or the relation between student diversity and educational excellence. OERI has also supported grant programs encouraging field-initiated research focused on various facets of teaching.

- **Investment in statistical information.** Part of OERI—the National Center for Educational Statistics (NCES)—has assembled and maintained databases and information regarding many facets of teachers' work and careers, including the status of the teaching profession and the supply and demand of teachers. NCES administers the Schools and Staffing Survey every three years.

- **Support for research related to particular agency missions.** The most prominent examples are the investments made by the National Science Foundation in understanding the teaching of mathematics and science and the use of technology in schools.

- **Evaluations or other studies of federal and state improvement programs.** The federal government has regularly appraised its educational improvement programs, some of which (e.g., the Eisenhower Program) are primarily concerned with the professional development of teachers, while others (e.g., Title I) include the improvement of teaching in attempts to address some *other* facet of schooling quality.

## Main Accomplishments

Federally-funded research has contributed to the improvement of teaching in the following ways:

***Federally-supported educational research has advanced knowledge about teaching, learning, the preparation and support of teachers, and the school and policy environments for teaching and learning.*** The federal presence in these fields of scholarship has been critical, both in initiating new lines of inquiry about teaching and learning, and in providing substantial support for newly-emerging lines of work. For example, we now understand, in ways we did not previously, that:

- Learning is complex cognition which requires students not simply to *know facts*, but to be able to *associate patterns of facts*.
- Teachers' knowledge of subject matter, *and* their ability to translate that knowledge into classroom learning activities appropriate to learners with different developmental levels and backgrounds, are both crucial components of improving student achievement.
- When curriculum, instructional materials, and assessments are all focused on the same goals—that is, when the policy systems that frame education are coherent—the prospects for educational improvement are enhanced.

***Federally-supported educational research has also provided a research base for a wide range of teacher and school improvement efforts, many of them supported by non-governmental sources.*** Federally-supported research has been widely utilized by reformers and others (such as private foundations) who have intervened directly in schools, developed improvement models and networks, or fashioned standards-based strategies for promoting educational excellence.

The application of these and other research findings to practice has led to more effective means of preparing teachers, better ways of supporting teachers in schools and classrooms, and the development of professional standards for both beginning and experienced teachers. Although these discoveries have yet to be applied in all or even most schools, classrooms, and teacher education institutions, the practices highlighted by federal

research have been put into effect in many settings, with demonstrated payoff for student learning.

The contributions of educational research to the improvement of teaching highlight the potential of continued federal investment. In the following pages we detail more specifically the areas of advance mentioned above, and how federal funding has contributed to each.

# Introduction

Educational research of the past two decades, much of it federally-funded, has contributed substantially to our knowledge and understanding of teaching and learning, and to the prospects for improving student achievement. The findings derived from this research and their application to school improvement efforts (e.g., the renewal of teacher education and new designs for staff development) are of particular significance given our intense national focus on the improvement of student performance. Beginning in the 1980s, in conjunction with the National Commission on Excellence in Education and its seminal reform report, A Nation at Risk, an escalating series of reform activities has engaged educators, policymakers, and the public in sustained attempts to dramatically improve teaching and learning in the nation's schools.[1]

To be sure, there were earlier waves of reform activity, such as during the Progressive Era at the turn of the century, in the wake of World War II, and in the 1960s following the Russian Sputnik launch. However, few of these efforts attended closely to the nature of teaching and learning, or more importantly, to what it would require of the nation's teaching force and support systems to sustain excellent teaching on a broad scale. Current education reform efforts pay close attention to these matters, working in the context of an education system that many hope will prepare students to participate effectively in an increasingly global economic environment.[2]

This paper seeks to identify the principal advances in our understanding of teaching, learning, and teacher improvement, and to trace the contributions made by federal research dollars. We make no pretense at exhaustively identifying all federal investments in educational research over the past two decades, or of cataloguing and assessing the precise impacts of each. We are also keenly aware that the research of the last two decades evolved from the work of earlier researchers. In this paper, we have used information gleaned from

interviews with leaders in research and with those using research to improve educational practice, supplemented by reviews of literature, to identify the *most salient* developments and the most influential lines of research in the areas of teaching and learning.

This report is written for the educational policy community. It is designed with a two-fold purpose in mind: (1) to provide policymakers and others with information that will help them assess the impact of relatively recent appropriations of federal educational research funds, and (2) to assist policy officials in making informed choices about the future investment of federal dollars for research on teaching.

We address four principal topics on which federal research investment has concentrated, and to which it has made a substantial contribution:

(1) Understanding teaching and learning

(2) Designing and implementing more effective teacher preparation programs

(3) Understanding how to support practicing teachers

(4) Creating productive school and policy environments for teaching and learning

# Advances in Our Understanding of Learning and Teaching

The somewhat limiting views of teaching that we inherited from the past had constrained our ability to see its many dimensions and possibilities. We have only recently come to accept that learning and teaching are multi-faceted activities. In part, this understanding has evolved from advances in the studies of psychology, learning, cognition, and expertise.

### Advances in Understanding of Learning and Teaching

**Theme:** *Learning and teaching are active processes to which learners and teachers bring beliefs, resources, knowledge, and creativity. Expertise and skillful performance— by learners, and also by teachers—depend not only on the command of content, but also on the individual's capacity to reorganize knowledge and represent problems in multiple ways. Learning takes place in a social context, which may shape what individuals expect of schooling, and what others expect of them.*

**Chief areas of advance**

- Conceptions and dynamics of learning
- The many dimensions of teaching
- Learning and teaching among culturally diverse and economically-disadvantaged populations
- The teacher as learner

**Illustrative lines of federal research investment**

- Learning Research & Development Center (LRDC)
- Institute for Research on Teaching (IRT)
- National Center for Research on Teacher Learning (NCRTL)
- National Center for Research on Cultural Diversity & Second Language Learning (and its successor, the Center for Research on Education, Diversity, and Excellence (CREDE))
- Center for the Social Organization of Schools (CSOS)

## Where We Were

For at least the first half of this century, human actions and interactions were described by psychologists as sets of behaviors. Proponents of behavioral psychology believed that individual actions are, in fact, reactions to external stimuli. Behaviors could thus be predicted based on the nature of the stimulus and on the knowledge of how other individuals had previously reacted to similar stimuli or circumstances.

Many were attracted to the simplicity of behaviorism; it seemed to offer a way to build a compelling science of education practice. Others questioned the adequacy of behaviorism to explain activities as complex as human learning. Nonetheless, schools were designed in large measure around the theories of behavioral psychologists. Learning was viewed as linear and sequential. All students, given the same stimulus, were thought to be capable of learning in the same way. It was assumed, therefore, that the same teaching methods, when used with all students, would produce the same results. Some people might take longer than others, but time, not teaching or learning strategies, was believed to be the determining factor.

This linear, sequential conception of learning shaped conceptions of teaching. The belief was that all teachers could be effective—and all students would learn—if all teachers would simply replicate the behaviors of successful teachers. Teaching was thought to be a set of learned skills that could be applied across subject areas and to students of diverse backgrounds, ages, and levels of achievement. The implications for teaching were profound. If we could identify the "right" set of generic teaching skills, codify them, and convey them to prospective teachers, then the job of teacher preparation would be done.

This view of teaching and learning emphasized the use of prescribed, skills-oriented curricula, diagnosis of skill deficiencies, practice and repetition. It generated policies which fruitlessly searched for so-called "teacher-proof" materials, specified in great detail behaviorally-specific learning objectives, and linked testing systems to those objectives.

Coming into its own in the early 1970s, research on teaching supported these developments. It drew heavily from behavioral psychology, or featured eclectic attempts to associate learning outcomes with whatever could be readily quantified in the classroom (e.g., teachers' behaviors or the amount of time that students engaged in academic work). This research provided a foundation for a "science" of education which was powerful in its simplicity, but it did not provide useful perspectives on complex activities such as problem solving. Nonetheless, behavioral theories maintained their influence over much of educational scholarship and practice. Teacher preparation programs were designed around sets of "competencies." Teacher proficiency was assessed on the basis of identifiable skills and observable behaviors which comprised the components of teaching "competence."

## Turning Points: The Cognitive and Socio-Cultural Revolutions Come to Education

The cognitive revolution is not new to science or psychology, but its application to education is fairly recent. In brief, the cognitivists offered ways of understanding aspects of learning—and ultimately teaching—that behavioral theories did not address. The mind, said the cognitivists, interprets and reinterprets data and creates its own images and classification systems. In order to hold and process information, humans create schemas, or associative structures, that link new data with what we know in networks of related information. Facts matter. Experience matters. But what matters most is the capacity to associate patterns of facts and experience with one another.[3] One's expertise in a particular area of study or activity is a function of the complexity of these schemas.[4] Knowing something well is not only a matter of grasping fundamental information, but also of being able to organize that knowledge so that it is useful in multiple circumstances.

Cognitive science, as applied to education, offered a powerful new set of insights. It systematically described the nature of expertise and skillful performance by both learners and teachers. And, in distinguishing expert from novice, it helped uncover what was to be

learned, and how it could be learned, in many contexts of schooling. Increasingly, cognitive research revealed that learning is cumulative and progressive, but not necessarily linear, sequential, or routinely predictable.

Other lines of research, lodged in socio-cultural theories, presented a complementary set of insights. Learners approach learning tasks in a social and historical context which colors what they expect of their schooling experience and what others expect of them. Learners' responses to their learning environments and schooling reflect the interaction between their culturally-based knowledge or assumptions and those of the school. Therefore, teaching that is sensitive to learners' cultural backgrounds, and treats them as strengths and resources for learning, is more likely to succeed.

The implications of these lines of research for teaching were enormous. If the process of moving students from novices to experts involved making it possible for them to develop associative *patterns* of facts, or "cognitive maps," then teaching was a more complex endeavor than was previously thought. If the social context of learning varied across schools and groups of children, then perhaps students *had a greater capacity for learning* than they typically displayed in settings which took little account of varied cultural backgrounds and in which social circumstances worked to the disadvantage of certain groups. These insights opened up new possibilities for teaching and learning.[5]

## What Federal Research Investments Have Contributed

The efforts of several federally-funded research centers were instrumental in making the link between cognitive science—how the mind functions and how people learn—and education.

***1. Conceptions and dynamics of learning.*** The Learning Research & Development Center (LRDC) at the University of Pittsburgh, funded substantially by the U.S. Department of Education, laid a foundation for understanding learning as complex cognition—a process that does not proceed simply from an accumulation of "basic" skills

to the subsequent attainment of "advanced" skills, but rather involves basic and advanced skills of different kinds at all stages. LRDC researchers were among the first to point out that learning is particular to specific domains, such as subject areas.[6]

***2. The many dimensions of teaching.*** Other lines of research aimed more directly at teaching itself.[7] Federally-funded work on classroom observation revealed the complexity of teaching by cataloguing and analyzing the hundreds of decisions teachers make on a daily basis. Then, in 1975, the National Institute of Education (NIE)[8] held a planning conference to map out an agenda for the next steps in research on teaching. Participants made the case for a more cognitive, complex, and contextual view of teaching. That conference led to the creation of the federally-funded Institute for Research on Teaching (IRT). During its existence, the IRT (1) shifted from behaviorist to cognitive perspectives for the conceptualization of teaching; (2) expanded the exclusive reliance on psychology for understanding teaching to include disciplines such as anthropology, sociology, and socio-linguistics; (3) recognized the importance of research in making more explicit the link between teaching and policy; (4) made research relevant to actual classroom practice by recognizing the critical role of "teachers as researchers"; and (5) focused on the development of theories that address what teachers know about subject matter *and* how to represent it in classroom activities and experiences ("pedagogical content knowledge").[9]

The work of the IRT was seminal because it overthrew the conception of teaching as a set of generic and relatively easily-learned skills. Due in part to IRT work, along with the new conceptions of learning developed by researchers at the LRDC and others, a new consensus in the educational research community—that research on teaching needed to take more explicit account of the specific subject matter that was being taught—began to emerge by the mid-1980s. What teachers know and believe about the subject(s) they teach, *and how they convey their knowledge to students*, would prove to be an essential determinant of students' opportunities to master the school curriculum.

***3. Learning and teaching among culturally diverse and economically-disadvantaged populations.*** The Center for the Social Organization of Schools (CSOS), and the more recently-funded Center for Research on the Education of Students Placed At Risk (CRESPAR), spearheaded lines of research which pursued investigations, often with federal funding, that helped establish productive ways of engaging diverse learners in academic work within classrooms and effective designs for the school program as a whole. "Success for All" schools are a direct outgrowth of this work and have begun to assemble an impressive record of student performance in large numbers of schools serving high-poverty populations.[10] Parallel work—for example, the work of the OERI-funded Center for Research on Cultural Diversity and Second Language Learning—demonstrated effective ways of teaching students whose backgrounds were culturally and linguistically different from the societal mainstream. It showed that instructional strategies for these learners could incorporate academically challenging approaches often used to teach more advantaged learners.[11]

***4. The teacher as learner.*** The research program of the IRT, and other related investigations, contributed another profound insight—that the same dynamics of learning revealed for children pertained to the professional learning of teachers. This does not apply only to their early experiences in preparation or certification programs; it is especially true of the learning teachers experience while engaged in practice. Teachers are learners, and their learning about their profession and the individuals and subject matter they teach displays the same active character as student learning. This premise underlay further lines of research, much of it undertaken by the National Center for Research on Teacher Education (NCRTE) and its successor, the National Center for Research on Teacher Learning (NCRTL), both funded by OERI.

In viewing teachers as learners, research established that there is much for teachers to learn. They need to grasp new conceptions of learning and the learner, discover anew or rediscover the nature of the subject they are teaching, and evolve new ways to represent

that content in terms that engage diverse students.[12] And if there is learning for teachers to do, there is also a substantial task in front of those who prepare teachers to enter the profession and those who support them once they are teaching.

# Advances in Teacher Preparation

Building on emerging insights about teaching and learning, educators and researchers began in the early 1980s to look more closely at teacher education. Their scrutiny was heightened in no small measure by the A Nation at Risk report, which, along with a call for more rigorous curriculum and higher graduation standards, linked the *quality of teachers*—the preparation and the structure of their careers—with students' opportunities for educational success.[13]

### Advances in the Preparation of Teachers

**Theme:** *Rethinking the way teachers are initially prepared for the profession of teaching is an essential step to improving students' learning opportunities and achievement. Preparing individuals to teach well means focusing on teachers' beliefs about learning and schooling, various forms of pedagogical and subject matter knowledge, potent forms of field experience, and standards for entry into the profession.*

**Chief areas of advance**

- Research on teachers' beliefs
- The role of subject matter and pedagogical knowledge in teacher preparation
- The role and nature of field experience
- The development of professional standards for beginning teachers

**Illustrative lines of federal research investment**

- National Center for Research on Teacher Education (NCRTE) and National Center for Research on Teacher Learning (NCRTL)
- Institute for Research on Teaching (IRT)
- National R&D centers focused on particular subject areas (e.g., National Research Center on Literature Teaching and Learning, National Center for the Study of Writing and Literature)
- Center for Research on the Context of Teaching (CRC)

## Where We Were

The National Commission on Excellence in Education criticized teacher education programs as being "weighted heavily with courses in 'educational methods' at the expense of courses of subjects to be taught...." "Persons preparing to be teachers," declared the Commission's A Nation at Risk, "should be required to meet high educational standards, to demonstrate an aptitude for teaching, and to demonstrate competence in an academic discipline. Colleges and universities offering teacher preparation programs should be judged by how well their graduates meet these criteria. Master teachers should be involved in designing teacher preparation programs and in supervising teachers during their probationary years."[14]

At the time A Nation at Risk was issued, many teacher education programs in the United States could be said to fit the description—and the criticism—of the National Commission. Historically, teacher preparation programs relied on a simpler conception of teaching that underestimated what was needed to produce substantial student learning, especially in an era of higher standards for student and school performance compounded by increasing diversity and intensity of student needs. Standards for teacher education programs at the time were often focused on "inputs"—such as resources, faculty qualifications, and library specifications—rather than on what it would take programmatically to make preparation for teaching rigorous and effective. Teacher education programs generally had subject matter "methods" courses and, at the secondary level, required a subject matter major. However, they generally offered few courses dealing with strategies for translating content knowledge into productive classroom activities, and had few requirements that teacher candidates be assessed in either subject matter or pedagogical knowledge in ways that demonstrated their ability to perform in classroom settings. Finally, new teachers' exposure to on-the-job expert advice was generally limited

to the 8 to 15 weeks of student teaching offered by most programs, and rarely extended to a mentoring relationship with master teachers across an extended probationary period.

In short, teacher preparation in the United States in the early and mid-1980s was badly mismatched with the recommendations of the National Commission on Excellence in Education and many ensuing reform manifestoes. It failed to incorporate new understandings from research on teaching and learning and took little cognizance of emerging research-based conceptions of teaching as a many-faceted, intellectually-demanding enterprise. If an increasingly diverse student body were to be prepared to meet higher and more rigorous standards, their teachers would need to be better prepared as well.

## A Turning Point: The Movement Toward a Profession of Teaching

In the years immediately following the A Nation at Risk report, momentum built toward creating a better infrastructure for the profession of teaching, with enhanced teacher education as the cornerstone. The appearance in 1986 of reform reports by the Holmes Group, a consortium of deans of leading colleges of education—Tomorrow's Teachers[15]—and the Carnegie Forum on Education and the Economy—A Nation Prepared: Teachers for the Twenty-first Century[16]—signaled the emergence of an expanded constituency for change in institutions of higher education which prepared teachers, and for changing the incentives and conditions surrounding teachers' work and careers.

With support from private foundations, these reform documents and other analyses (e.g., the work of John Goodlad and his then-incipient Center for Educational Renewal and National Network for Educational Renewal) elaborated upon the theme.[17] The stage was set for work that identified promising forms of teacher preparation which would move the nation beyond the commonly found, but now inadequate, patterns of teacher preparation inherited from preceding decades.

## What Federal Research Investments Have Contributed

Pursuing the themes expressed by these reform groups, research and experience have contributed both to the careful scrutiny of teacher education and to the information needed to revise preservice preparation. Federally-funded research centers, including the National Center for Research on Teacher Learning (NCRTL) and its predecessor, the National Center for Research on Teacher Education (NCRTE), both of which grew from the Institute for Research on Teaching, figured prominently in this process, as did subject-focused centers such as the National Center on Literature Teaching and Learning and the National Center for the Study of Writing and Literature. [18]

Among the principal findings that have helped to reshape conceptions of teacher education and human learning are understandings of how teachers' own beliefs influence their preparation and practice and the importance of subject matter preparation for quality teaching. Additional studies have demonstrated more potent forms of field experience and the importance of such experience in preparing competent teachers. Still other work has begun to create common standards for teacher preparation programs and for novice teachers.

***1. The influence of teacher beliefs on teacher learning.*** Teachers do not come to their teacher preparation programs as "blank slates." Their own experiences have already led them to form beliefs about education which address such matters as how schools work, what a "good" school looks like, what the role of the teacher is, how students and teachers should interact with one another, and the nature of instruction and learning. In large measure, the "apprenticeship of experience"—the ways in which teachers themselves experienced education—and the "apprenticeship of observation"—the ways in which teachers learn from watching others teach—provide the foundation for prospective teachers' own views about schooling and about teaching.

Research—much of it federally-funded through the National Center for Research in Teacher Learning and the National Center for Research in Teacher Education—has

demonstrated how fundamentally teachers' initial beliefs—both examined and unexamined—can influence teaching practice. Beliefs about children, diversity, conceptions of teaching and learning, and the nature of subject matter shape a potential teacher's approach to her work in ways previously not understood.[19]

The research on teacher beliefs has helped to illuminate the kinds of knowledge and experience teachers-in-training require. It is this research that has provided much of the theoretical rationale for more intensive field experiences for preservice teacher education students, as well as for the kinds of other practical and pedagogical knowledge that will serve them well throughout their careers.[20]

***2. The links between subject matter and pedagogical knowledge.*** Research, much of it conducted by four OERI-supported centers—the National Center for Research on Teacher Learning, the National Center for Research on Teacher Education, the Center for Research on Teaching in Context, and the Consortium for Policy Research in Education (CPRE)[21]—has demonstrated the critical link between teachers' own knowledge of subject matter and the skills that enable them to translate subject content into productive classroom learning activities.

Conventional wisdom held that what teachers need to know and understand about subject matter is, by and large, determined by the grade level they teach. According to this view, elementary school teachers do not need an in-depth knowledge of mathematics, science, or literature because the level at which they teach is quite basic; even high school teachers need only be conversant in the subjects they teach, not experts, given that many of the courses are merely introductory or "survey" courses.[22] These assumptions persisted with the view that teaching was a generic activity—simply a set of learned skills independent of subject matter.

However, lines of research supported by the centers noted above, among others, have shown these assumptions to be wrong. They are particularly ill-suited to teaching new kinds of standards-based academic curricula that many districts and states are now

implementing which require "teaching for understanding".[23] Quite simply, research has shown that subject matter knowledge is essential to good teaching and that the content of instruction is an important predictor of student achievement. Federally-funded research on how teachers determine what they teach (so-called "content determinants") has shown that teachers need to be sufficiently conversant in a subject to be able to determine what is important for students to know. They also need the skills to be able to choose appropriate pedagogical strategies in order to help students master the required material.[24]

***3. Toward extended, well-mentored field experience.*** There is no substitute for experience. *Being in* a classroom is fundamentally different from *reading about* a classroom. Research has shown that field experience—actually spending time in schools and classrooms under the tutelage of experienced teachers—is a critical component of learning to teach well. Apprenticing to practitioners who are both accomplished teachers *and* skilled mentors helps prospective teachers understand and confront their own preconceptions of students and teaching, and provides them with invaluable opportunities to use what they are learning in their teacher education courses. It is this kind of "real world" experience that enables fledgling teachers to begin to understand the "rub" between theory and practice[25] and to integrate theoretical constructs that frame teaching and learning with actual classroom activities and demands.

Many schools of education are now embracing the idea of extended, mentored field work. More than 300 schools offer either a five-year program, with the fifth year focused on a teaching internship, or an additional one or two years of professional preparation, including clinical training in schools, for recent college graduates or mid-career professionals. Studies have shown that graduates of these extended field experience programs are viewed by their teacher colleagues and principals as better prepared and more effective with students than are recent graduates of traditional teacher education programs.[26] While much work remains to determine the optimal length and nature of effective field experiences, current research points to the efficacy of such efforts.[27]

***4. Creating high standards for beginning teachers.*** Creating a true profession of teaching requires the development and implementation of high professional standards for entry into practice. Professional associations such as the National Council for Accreditation of Teacher Education (NCATE) have mounted a campaign over the past decade to significantly strengthen and promote professional standards for both teaching and the institutions which train teachers. Recent work, culminating with the National Commission on Teaching and America's Future (NCTAF), a blue ribbon panel supported by the Carnegie Corporation of New York, the Rockefeller Foundation, and federal dollars, has examined preservice preparation and the structures of teachers' careers, and emphasized the role and need for such standards:

> Standards are the linchpin for transforming current systems of preparation, licensing, certification, and ongoing development *so that they better support student learning* [emphasis added]. They can bring clarity and focus to a set of activities that are currently poorly connected and often badly organized. Clearly, if students are to achieve high standards, we can expect no less from their teachers.... Of greatest priority is reaching agreement on what teachers should know and be able to do in order to teach to high standards.[28]

Standards are one of the hallmarks of a profession. They serve as a set of quality indicators for individuals licensed to practice in the field. However, until recently, the research base on teaching was simply too slim to define credible standards for the profession. Now the task of establishing standards for institutions which prepare teachers, and for prospective teachers themselves, is well underway.

The Interstate New Teacher Support and Assessment Consortium (INTASC), composed of 39 states (as of 1997), is currently developing and implementing new standards for teacher licensing.[29] This effort addresses many concerns previously stated. These standards (1) embody a *common core* of knowledge about the nature of teaching, learning, and schooling that all new teachers, regardless of subject(s) or grade(s) to be taught, need to acquire; (2) require teachers to actually *demonstrate* competence; (3) place assessments of teaching practice in concert with assessments of subject matter knowledge; (4) define teaching as an activity that requires collaboration among teachers and

others, not just solo performance in the classroom; (5) apply to *individuals* seeking licensure;[30] and (6) make student outcomes a central focus of teaching practice.[31]

In developing the common core of knowledge for beginning teachers, the INTASC standards make specific use of the more complex, research-driven definition of what it means to teach successfully. In particular, the INTASC standards, which consciously take into account linguistic and learner diversity, assess the extent to which teachers can make subject matter meaningful to students, are able to make professional judgments regarding appropriate instructional strategies, and communicate effectively with students. Furthermore, the standards address whether teachers plan instruction based on measurable learning goals, continually evaluate their own teaching to improve their practice, and work collaboratively with colleagues, parents, and community agencies that support student learning.

# Advances in What It Means to Support Practicing Teachers

Federal investments in educational research have played an equally important role in identifying productive ways to support the ongoing growth and development of experienced teachers. In particular, research has helped to reconceptualize the nature of teachers' ongoing development needs, has contributed to our understanding of the collaborative nature of teaching, and has paved the way for the development of standards for accomplished practice.[32]

**Advances in the Support of Practicing Teachers**

**Theme:** *Supporting practicing teachers means rethinking professional development —giving teachers regular and ongoing access to learning opportunities, developing and sustaining professional learning communities, and creating standards and incentives for advanced certification.*

**Chief areas of advance**

- Understanding teachers' workplace context
- Demonstrating potent forms of professional development
- Experimenting with teachers' professional community
- Creating standards for advanced teaching practice

**Illustrative lines of Federal research investment**

- Center for Research on the Context of Teaching (CRC)
- National Center for Research on Teacher Learning (NCRTL)
- Consortium for Policy Research in Education (CPRE)
- National R&D centers focused on particular subject areas (e.g., National Center for the Study of Writing and Literacy)
- National Board for Professional Teaching Standards (NBPTS)

## Where We Were

It was long believed that the support of practicing teachers was a matter of providing periodic staff development experiences that would help acquaint teachers with promising practices or help them solve particular problems of practice. While there had long been experimentation with different kinds of staff development, by the 1980s research began to pinpoint the shortcomings of conventional forms of continuing education for teachers.[33]

When teaching was thought to be a generic, skill-based activity, effective professional development was conceived generally as a series of skill building workshops, often selected by school district or state education administrators without input from teachers. Such programs, which were typically short, stand-alone workshops, often relied on "packaged" staff development and focused on generic teaching topics (how to help students work together in groups, new forms of discipline, etc.).[34]

In fact, professional development in many school districts today still adheres to this pattern. For example, a recently-completed CPRE study showed that professional development opportunities available in most American school districts are one-shot workshops with little or no follow-up, do not link inservice content to teachers' needs or to their work assignments, are generally of poor quality, and pay little attention to teachers' subject matter knowledge.[35]

In sum, the dominant conceptions of staff development and teacher support since World War II have not featured learning experiences for teachers that reflect what we know about adult learning, have made little room for teachers' voices in determining what types of professional support they would like to receive, and take little account of teachers' work situations. However, in the 1980s research began to illuminate new ways of thinking about teachers' professional development.

## What Federal Research Investments Have Contributed

New insights into the nature, setting, and consequences of professional development have emerged from parallel lines of research, much of it supported by federal funds. These studies have focused on teachers' workplace contexts, new conceptions of professional development, professional learning communities, and the development of standards for advanced practice.

***1. Understanding teachers' workplace context.*** Research conducted by the federally-funded Center for Research on the Context of Teaching (CRC) and others contributed substantially to our understanding of ways in which school settings influence teacher learning. Other research drew attention to the multiple "contexts" for teachers' work, including institutions of higher education and professional associations (e.g., unions, which represent teachers' interests directly in collective bargaining[36], and associations which are built around subject matter, such as the National Science Teachers' Association, the National Council of Teachers of Mathematics, and the National Council of Teachers of English). This work demonstrated how these organizational contexts influence what teachers think about their work and careers, what they do in their schools and classrooms, and how long they persist in their careers.

***2. New conceptions of professional development.*** Research—much of it carried out by the federally-funded National Center for Research on Teacher Education, National Center for Research on Teacher Learning, and Consortium for Policy Research in Education—has demonstrated that conventional views of professional development—regarding both its content and delivery—are unlikely to contribute substantially to improved teaching and learning. Furthermore, research has shown that *good* professional development—which recognizes teaching as a collaborative activity, involves capacity building (not just skill development), and directly relates to the subjects and activities of teachers' everyday work—*can* contribute to improved student achievement.[37]

***3. Developing and sustaining professional learning communities.*** Research has led to the increasing recognition that teachers function as members of professional communities, and that effective teacher learning occurs in "communities of practice."[38] Insights into the form, formation, and function of teachers' professional learning communities have emerged from investigations by several federally-funded centers, among them the National Center for Research on Teacher Learning, the Center for Research on the Context of Teaching, and the National Center for the Study of Restructuring Schools.

Other lines of scholarship, often drawing on federally-supported work, have demonstrated that the professional community is a key agent in changing teachers' norms and knowledge, and in sustaining these changes over time. For example, research on teacher networks— formal and informal assemblages of teachers who cooperate to enhance their professional knowledge and improve their practice—has demonstrated that they (1) provide a "safe" environment in which teachers feel comfortable admitting what they do not know (and want to learn); (2) encourage deep and serious dialogue about substantive issues in teaching and learning; and (3) provide new avenues for teacher collaboration across schools, districts, and even states.[39]

***4. Standards for accomplished teaching.*** Just as standards for beginning teachers are important, so, too, are standards for experienced teachers. The 1986 report of the Carnegie Forum on Education and the Economy, A Nation Prepared: Teachers for the Twenty-first Century, called for the creation of "a National Board for Professional Teaching Standards... to establish high standards for what teachers need to know and be able to do, and to certify teachers who meet that standard".[40] The National Board, established following the report, set about combining research findings on subject matter expertise, skillful conveyance of subject matter to students, and effective teaching, to design assessments which measure and recognize accomplished practice and certify individuals who achieve this distinction.

The professional standards which resulted are set within particular subject areas and student developmental levels. Furthermore, they focus on student learning—they aim to assess the extent to which a teacher plans for and documents student progress, and then evaluates student learning and considers options to enhance it. With developmental funds from the federal government and private foundations—such as the Carnegie Corporation of New York, the DeWitt Wallace-Readers' Digest Fund, the Pew Charitable Trusts, the Eli Lilly Foundation, and the Ford Foundation—the National Board has completed certificates in 12 fields (eventually there will be 30), has certified large numbers of teachers in these fields, and soon will have many more candidates for Board certification.

The existence of National Board standards and plans for promoting their use signal the possibility that teaching will assume a more "professional" profile. Accomplished work may be more visibly recognized and the teaching profession may develop more avenues for advancement. At a minimum, these standards offer a reference point for both individual teachers' aspirations for improvement and for programs designed to help them improve.

# Advances in Constructing Supportive Organizational and Policy Environments

The emerging pictures of powerful professional development and workplace support of practicing teachers raise the question: how do we create "organizational environments"—in schools, school districts, and state systems—that will support teachers' long-term learning and improvement and enable them to create productive learning environments for students? Here, too, research has advanced our understanding over the last two decades, often with the support of federal dollars.

### Advances in Constructing Productive School and Policy Environments

**Theme:** *Teachers' ability to engage in continuous improvement of their practice is enhanced (or constrained) by the organization and leadership of the school, the resources and organization of the school district, and the configuration of relevant state-level policies. In particular, the "coherence" of these different elements is crucial to wide-scale teacher improvement, as is the attention paid to building capacity at all levels of the system.*

**Chief areas of advance**

- Understanding school-based reform and productive school environments
- The dynamics and possibilities of coherent systems
- The meanings of capacity building in district and state systems
- Understanding and facilitating the role of assessment in the improvement of teaching

**Illustrative lines of Federal research investment**

- National Center for Research on Effective Schools, subsequently the Center on Organization and Restructuring of Schools (CORS)
- Consortium for Policy Research in Education (CPRE)
- National Science Foundation research on systemic reforms
- Educational Policy and Practice Study research program
- Center for Research on Evaluation, Standards, and Student Testing (CRESST)

## Where We Were

The 1980s began with lingering skepticism about the importance of focusing on schools and systems. Research in earlier decades had cast doubt on the extent to which schools impact the overall outcomes of schooling.[41] These developments paralleled extensive investments during the 1960s and 1970s in compensatory education and related programs, each aimed at the needs of targeted groups of schoolchildren, most often those in poverty.

The implications for the support of teaching were several. First, attention had been directed primarily to categories of teachers and teaching, and to generic ways that these individuals could receive help. Second, schools and school districts had developed as compartmentalized bureaucracies, with separate programs attending to particular student needs, and with relatively little connection among them. Third, these programs had put in place a large number of specialist teachers and paraprofessionals (teacher aides), whose work was relatively uncoordinated with the work of regular classroom teachers.[42]

## A Shift in Focus: Toward Effective Schools and Coherent Educational Systems

A change in perspective on supportive organizational environments began to emerge in the 1980s from work on schools that were unusually successful in raising student achievement, and by a growing recognition that teachers' work was inevitably constrained by many systemically related policies, conditions, and structures.[43] Educational programs began to emphasize *whole-school* reforms rather than *individual-focused* remediation.

The stage was also set by high-profile reports on the nature of schooling in American schools and the need for reform.[44] The net effect for teachers was to put emphasis on the school staff as a collective body, capable of participating in school-wide deliberations, problem solving, and instructional reform. Numerous school-based reforms sprang up, with developmental work generally underwritten by private foundation funding.

A parallel effort was set in motion to address the disjunctures and disconnections between the school and the surrounding district and state-level systems.

### What Federal Research Investments Have Contributed

Federal research investments contributed to this unfolding story, particularly in the development and understanding of "systemic" district and state-level reforms. Federal research dollars have supported the documentation of how a restructured school's environment bears on the quality of teaching and, ultimately, on student learning.

***1. Structuring schools to support teacher learning and student achievement.*** Here, investigations by OERI-funded centers, the National Center for Research on Effective Schools and its successor, the Center for Research on Organization and Restructuring of Schools, were instrumental in demonstrating how attempts to restructure the school and its culture bear directly on students' learning of more ambitious curricula.[45] These developments paralleled other federally-supported work, such as that undertaken by the Center for the Social Organization of Schools, which documented and evaluated school-wide reforms (e.g., "Success for All" schools) that are demonstrably effective with disadvantaged populations. Other nationally-prominent, school-based reform efforts, although not drawing support directly from federal sources, nonetheless utilized the results of various federally-supported studies in their developmental work.

***2. Building coherent systems.*** A decade of research by the Consortium of Policy Research in Education put the spotlight on the sources and nature of "coherence" in policy systems—in other words, the extent to which some of the tools of education improvement, such as curriculum, instructional materials, and standardized tests, are aligned with one another to form a coherent whole. Converging with lines of work on policy-to-practice connections (e.g., that undertaken by the Education Policy and Practice Study at Michigan State University and the University of Michigan), these investigations

have demonstrated both the weaknesses and strengths of "systemic" reforms in affecting actual classroom practice.[46]

***3. Building organizational capacity.*** Work at the system and, perhaps more significantly, the school level began to display the importance of developing *organizational* capacity, as opposed to simply individual capacity. Research conducted by the federally-funded Center on the Organization and Restructuring of Schools revolved around the question, "How can schools be organized for high quality teaching and learning?" Among the answers to that question was the understanding that school staffs need to develop a collective focus on student learning and take joint responsibility for student achievement. To achieve this, schools must build the capacity of the their staff to work well as a cohesive unit that strives for continuous improvement.[47]

***4. Understanding and facilitating the role of assessment in the improvement of teaching.*** Research by the National Center for Research on Evaluation, Standards and Student Testing (CRESST) has built an understanding of the role assessment plays in accountability and school improvement, and illuminated the ways in which state and local assessments promote and inhibit educational reform. CRESST (in its former incarnation, the Center for the Study of Evaluation, at UCLA) conducted landmark studies on the prevalence of standardized testing programs and their effects on schools, teachers, and students. More recently, paralleling CPRE's work on accountability systems, CRESST has continued to monitor the technical quality, implementation, and consequences of new assessment systems in a number of states (California, Kentucky, Maryland, Vermont, and Arizona). Results have informed state and district policies across the country and have redefined quality assessment. Furthermore, advances made by CRESST in the methods and designs of assessment systems have provided potent models for new standards-based assessment systems, which will benefit learning and instruction as well as serve accountability needs.

## Conclusion

In the last two decades, federally-funded research, supplemented by foundation-supported work, has contributed much to our understanding of teaching and learning. The cognitive and socio-cultural revolutions, applied to education, reshaped our visions of how students learn, the ways in which teachers should teach, and the strategies needed to teach all students to high standards. Research has helped us understand the critical nature of teachers' subject matter knowledge *and* their ability to translate academic content into effective learning activities for students of different developmental levels and backgrounds.

Additionally, research findings have contributed to the development of standards for both beginning teaching and accomplished practice. We have also learned much about more effective ways to support teachers once they are in the classroom, and the conditions necessary to create and sustain schools as high performing organizations.

While it is perhaps a stretch to suggest that all of these discoveries—each of which contributes to a more effective education system—would not have been possible without federal financial support, it is, indeed, the case that without federal dollars, progress would have been haltingly slow at best. Federal support has often "jump-started" potentially valuable research, allowing researchers to venture into previously uncharted, but ultimately productive, waters, and served as an important point of leverage to secure other dollars and wider support.

The influence of federal research investments does not stop with better *understanding* of teaching, learning, and ways to support teachers. This understanding has provided a base upon which improvement programs have been built. Some of these programs have been developed and implemented with federal dollars, and even more have been initiated and sustained by the investments of private foundations or professional

groups, and of state and local governments. But all have referenced federally-supported research work as a basis and justification for their designs.

There remains an important question, however: "If we have learned so much about teaching and learning, why does it seem that so little has changed?" We all know of schools in which less learning takes place than we suspect could or should. And we are all familiar with system-wide averages that appear to fall short of excellence. But we also know of schools that do a superb job of educating young people. Moreover, we know that, year after year, most members of the public see the greatest need for school improvement not in the school to which they send their children, but in others' schools.[48]

A principal problem, we believe, lies in the fact that local, state, and, to a large extent, federal education policies are only beginning to take account of the advances outlined in this paper. However, there are many attempts to do so, and promising examples exist among educators, policymakers, and other stakeholders at all levels. They are experimenting productively with the means to renew schooling, revitalize teaching, and offer high-quality learning opportunities for school children. The more that researchers can document and describe these promising experiments, the more that educators, policymakers, and the public can consider what research has demonstrated. The more that all who care about public education engage in dialogue about what these research-based advances mean, the more likely it will be that, over time, more productive routines for educating the nation's young people will take root. We hope that, in some small way, this paper helps to stimulate that conversation.

## Acknowledgements

The authors gratefully acknowledge the comments and suggestions of the following individuals: Arthur Applebee, Betsy Ashburn, Deborah Ball, Jere Brophy, David Cohen, Thomas Corcoran, Linda Darling-Hammond, Sharon Feiman-Nemser, Robert Floden, David Florio, Sarah Freedman, Susan Fuhrman, John Goodlad, Joan Herman, James Kelly, Mary Kennedy, Ann Lieberman, Judith Warren Little, Milbrey McLaughlin, Fred Newmann, Andrew Porter, Senta Raizen, Virginia Richardson, Lee Shulman, Ed Silver, Robert Slavin, David Stern, Gary Sykes, Roland Tharp, and Suzanne Wilson. Their insights contributed greatly to this paper. Any errors remain the authors' own.

# Endnotes

[1] We make no pretense here that education reform is complete. In fact, efforts to achieve educational excellence have so far reached only a small portion of the school population.

[2] For a contemporary perspective on the comparison of American education with that of Japan and China, see Stevenson, H. and J. Stigler, *The Learning Gap: Why Our Schools are Failing and What We Can Learn from Japanese and Chinese Education*, New York, NY: Summit Books, 1992. For a discussion of the economic imperatives of a more productive education system see Berryman, S.E., and T.R. Bailey, *The Double Helix of Education and the Economy*, New York, NY: Institute on Education and the Economy, Teachers College, Columbia University, 1992.

[3] See, for example, Bruer, J.T., *Schools for Thought: A Science of Learning in the Classroom*, Cambridge, MA: MIT Press, 1993.

[4] Researchers have been writing from the cognitive perspective for decades. See, for example, Miller, G. A., "Human Memory and the Storage of Information," *IRE Transactions of Information Theory, 2-3*, 129-137, 1956.

[5] These new understandings about learning would have profound implications, some still unrealized, for policy. These findings opened the door for teachers to challenge the notion of "teacher proof" materials and laundry lists of competencies. Effective teachers use diverse strategies and curricula. They approach learning in ways that are instructionally sound but often fly in the face of policy and standardized protocols.

[6] Accordingly, some LRDC work has been supported in recent years by subject-oriented agencies, such as the National Science Foundation. Studies funded by federal, foundation, and university support established lines of research that enhanced concepts of teaching and learning and expanded the diversity of perspectives on teaching.

[7] The period of the early 1960s to the mid-1980s saw a quantum leap in the amount, range, and sophistication of educational research. Among this work was some very important research, conducted largely by the federally-funded research and development center at the University of Texas that concentrated on issues of instructional management and models of school change.

[8] In 1981, when the United States Department of Education was created, NIE was absorbed into the Office of Educational Research and Improvement (OERI).

[9] Shulman, L. "Knowledge and Teaching: Foundations of the New Reform," *Harvard Educational Review, 57*(1), 1-22, 1987.

[10] Early evidence regarding the potency of "Success for All" as a school-wide reform model began to emerge in the late 1980s. See, for example, Slavin, R.E., N.A. Madden, and N.L. Karweit, "Effective Programs for Students at Risk: Conclusions for Practice and Policy," in Authors, *Effective Programs for Students at Risk*, Needham Heights, MA: Allyn & Bacon, 1989. The evidence base has expanded substantially since then, as large numbers of schools have adopted this reform model.

[11] See Tharp, R.G., *From At-Risk to Excellence: Research, Theory, and Principles of Practice*, Research Report 1. Santa Cruz, CA: Center for Research on Education, Diversity, and Excellence, 1997.

[12] Seminal work to emerge out of the Education Policy and Practice Study (EPPS) at Michigan State University and the University of Michigan are among the best examples of research that demonstrates the kinds of learning that teachers must do in current reform contexts. See, for example, the entire thematic issue of *Educational Evaluation and Policy Analysis, 12*(4), 1990; Cohen, D.K., McLaughlin, M.W., and Talbert, J.T. (Eds.), *Teaching for Understanding: Challenges for Policy and Practice*, San Francisco: Jossey-Bass, 1993.

[13] It is interesting to note that the staff who assisted with the *A Nation at Risk* report consisted largely of individuals who worked for the National Institute for Education, precursor to the Office of Educational Research and Improvement.

[14] *A Nation at Risk*, Report of the National Commission on Excellence and Education, 1983.

[15] Holmes Group, *Tomorrow's Teachers: A Report of the Holmes Group*, East Lansing, MI: The Holmes Group, 1986.

[16] *A Nation Prepared: Teachers for the 21st Century*, Report of the Task Force on Teaching as a Profession, Carnegie Forum on Education and the Economy, 1986.

[17] Several other reports of this same era were key. In 1985, the Committee for Economic Development released *Investing in Our Children*; the California Commission on the Teaching Profession, funded by the William and Flora Hewlett Foundation, released *Who Will Teach Our Children?*; in 1986, the National Governors' Association produced *Time for Results*. All of these reports used results of federally-funded research to support their calls for fundamental changes in the teaching profession.

[18] The work of many of these same institutions has contributed to new modes of supporting practicing teachers as well, the subject of the next major section of this paper. Substantial federal investments have also contributed to research on the development of national teaching standards for content areas, such as science and mathematics.

[19] The knowledge that teacher candidates' views are powerful determinants of how they will experience teacher education, and then teaching, prompts teacher educators to bring early beliefs to the fore where teacher candidates will have an opportunity to examine them and test their validity in relation to the world of education they will face.

[20] See also Agne, K.J., G.E. Greenwood, and L.D. Miller, "Relationships Between Teacher Belief Systems and Teacher Effectiveness," *The Journal of Research and Development in Education, 27*(3), 141-152, 1994.

[21] CPRE, like NCRTL and NCRTE, is funded by OERI. In addition to federal funds, CPRE's work is supported by grants from DeWitt Wallace-Readers' Digest Fund, the Pew Charitable Trusts, and the Rockefeller, Carnegie, MacArthur, and Annie E. Casey Foundations.

[22] Other research, beyond the scope of this paper, has shown that high school courses, in particular, sacrifice depth for breadth. This type of "survey" approach to curriculum has been widely criticized as being insufficient for providing students with the kinds of intellectual tools—the abilities to analyze, to construct persuasive arguments, to problem solve—they will need in their work or professional lives.

[23] See, for example, Wilson, S.M., L. Shulman, and A.E. Richert, "150 Different Ways of Knowing: Representation of Knowledge in Teaching;" in J. Calderhead, Ed., *Exploring Teacher Thinking*, (pp. 104-124), London: Cassell, 1987.

[24] The solution to the problem of ensuring that teachers are adequately prepared in the subject(s) they will teach is not simply to require prospective teachers to enroll in larger numbers of college or university-level academic courses. As demonstrated by the National Center for Research on Teacher Learning's study *Teacher Education and Learning to Teach*, college and university courses are not always well suited to providing prospective teachers with appropriate discipline-based knowledge. University mathematics courses, for example, may teach higher-level mathematical constructs, but they do not teach teachers how to think about math concepts, how to approach mathematics problems from multiple perspectives, or how to help students truly understand mathematics.

[25] Miller, L. and D. Silvernail, "Wells Junior High School: Evolution of a Professional Development School,"in Darling-Hammond,L., Ed., *Professional Development Schools: Schools for a Developing Profession*, New York: Teachers College Press, 1994.

[26] Darling-Hammond, L., "Teacher Learning That Supports Student Learning," *Educational Leadership, 55*(5), 6-11, 1998; Andrew, M.D., and R.L. Schwab, "Has Reform in Teacher Education Influenced Teacher Performance? An Outcome Assessment of Graduates of 11 Teacher Education Programs," *Action in Teacher Education, 17*(3), 43-43, 1995; Shin, H., "Estimating Future Teacher Supply: An Application of Survival Analysis," Paper presented at the annual meeting of the American Education Research Association, 1994.

[27] One type of field experience that has gained considerable attention takes place in professional development schools (PDSs). Public schools and college and university teacher preparation programs have developed collaborative relationships for providing school and classroom experiences for preservice teachers. Experienced teachers in a PDS (sometimes called mentors, sometimes given other titles) have the responsibility of providing a range of in-school and classroom experiences for individuals preparing to teach—actual practice teaching, demonstration lessons, discussion about teaching strategies and techniques, and the like. The learning is reciprocal. Teachers in PDSs report that the interaction with fledgling teachers requires experienced practitioners to think about their teaching in ways they have previously not been challenged—to explain *why* they do things the way they do.

[28] *What Matters Most: Teaching for America's Future*, New York: National Commission on Teaching and America's Future, 1997.

[29] INTASC standards, designed to be used in initial teacher licensing, are compatible with, indeed are patterned after, standards for advanced practice established by the National Board for Professional Teaching Standards. The National Board is a topic we address in the next major section of this paper.

[30] Teacher education in the United States typically operates under the "program approval" method of licensure, in which teacher preparation programs are approved by a state agency. Individuals who complete such programs are then licensed by the state. States require few, if any, independent assessments of individual candidates' subject matter or teaching knowledge prior to licensure. However, a few states are beginning to require the National Teachers' Examination (now Praxis), created by the Education Testing Service, for licensure, and some states require Praxis for hiring.

[31] Darling-Hammond, L., "Standards Setting in Teaching: Changes in Licensing, Certification, and Assessment," (in press), a paper to be published in *The Handbook of Research on Teaching, 4th edition*. It is important to note that, due to the newness of these standards, they have not yet been validated against student achievement.

[32] It is important to note that, while this section of the paper addresses the topic of supporting teachers in schools and classrooms, other topics covered—new conceptions of professional development, building professional community, teacher networks, and standards for advanced practice—are illustrative, but not exhaustive, of the types of supports teachers require in order to be effective. Among the topics beyond

the scope of this paper, but central to the effective support of teachers, are issues of decision making authority, systems of accountability, compensation plans, and administrator preparation.

[33] See, for example, J.W. Little, "Teachers' Professional Development in a Climate of Educational Reform," *Educational Evaluation and Policy Analysis, 15*, 129-151, 1993.

[34] In fact, substantial staff development investments can be seen in teachers' salary schedules where pay advancement is, in part, a result of college unit accumulation.

[35] *Policies and Programs for Professional Development of Teachers: A 50-State Profile*, Philadelphia, PA: Consortium for Policy Research in Education, 1997.

[36] Both the National Education Association (NEA), through its National Foundation for the Improvement of Education, and the American Federation of Teachers (AFT), through its Education Research and Dissemination Project, have developed strong professional development arms.

[37] See, for example, Cohen, D. and H. Hill, "State Policy and Classroom Performance: Mathematics Reform in California," *Policy Brief*, Consortium for Policy Research in Education, 1998. In addition, the OERI-funded National Center for the Study of Writing and Literacy has, over its ten-year existence, conducted research on the uses of writing, for both teachers and students, as forms of "active literacy." The Center has found through its research that examining student writing can help teachers better understand and communicate with their students (particularly those students who have limited facility in English), and can assist them to diagnose student learning strengths and weaknesses. See Freedman, S.W., L. Flower, G. Hull, and J.R. Hayes, "The Years of Research: Achievements of the National Center for the Study of Writing and Literacy," paper prepared for the Office of Educational Research and Improvement, May 1995.

[38] For an explanation of how schools develop as communities, see Sergiovanni, T., *Building Community in Schools*, San Francisco: Jossey-Bass, 1994; and Louis, K.S., H.M. Marks, and S. Kruse, *Teachers' Professional Community in Restructuring Schools*, Madison, WI: Center on Organization and Restructuring of Schools, 1995.

[39] Lieberman, A. and M. Grolnick, "Networks and Reform in American Education," *Teachers College Record, 98*(1), 7-45, 1996. See also Lord, B., "Teachers' Professional Development: Critical Colleagueship and the Role of Professional Communities," in Nina Cobb, ed., *The Future of Education: Perspectives on National Standards in America*, New York: College Entrance Examination Board (pp. 175-204), 1994 and Siskin, L.S. and J. W. Little, (Eds.), *The Subjects in Question: Departmental Organization and the High School*, New York: Teachers College Press, 1995.

[40] *A Nation Prepared: Teachers for the 21st. Century*, Report of the Task Force on Teaching as a Profession, Carnegie Forum on Education and the Economy, 1986.

[41] Coleman, J., *Equality of Educational Opportunity*, Washington, D.C.: U.S. Office of Education, 1966.

[42] For a more complete study of the implications of education policy coherence—or incoherence—see Fuhrman, S., (Ed.), *Designing Coherent Education Policy: Improving the System*, San Francisco: Jossey-Bass, 1993.

[43] For additional insight, see Talbert, J. and M. McLaughlin, "Teacher Professionalism in Local School Contexts," *American Journal of Education, 102*, 123-153, 1994.

[44] See, for example, Boyer, E.L., *High School: A Report on Secondary Education in America*, The Carnegie Foundation for the Advancement of Teaching, New York: Harper and Row, 1983; Sizer. T.L.,

*Horace's Compromise: The Dilemma of the American High School*, Boston: Houghton Mifflin, 1984; Goodlad, J.L., *A Place Called School: Prospects for the Future*, New York: McGraw-Hill, 1984.

[45] See, for example, McLaughlin, M., J. Talbert, and N. Bascia, (Eds.), *The Contexts of Teaching in Secondary Schools: Teachers' Realities*, New York: Teachers College Press, 1990.

[46] See, for example, the EPPS reference under footnote 12, also Knapp, M.S., "Between Systemic Reforms and the Mathematics and Science Classroom: The Dynamics of Innovation, Implementation, and Professional Learning," *Review of Educational Research, 67*(2), 227-266, 1997.

[47] Newmann, F. and G. Wehlage, *Successful School Restructuring: A Report to the Public and Educators*, Madison, WI: Center on Organization and Restructuring of Schools, 1997; Sykes, G., "The 'New Professionalism' in Education: An Appraisal," (in press), chapter for Murphy, J., and K.S. Louis, (Eds.), *The Handbook of Research on Educational Administration*, New York, NY: McMillan.

[48] A consistent finding of the annual Gallup Polls regarding public perceptions of schools, locally and nationally, as reported most recently in Rose, L.C., Gallup, A. M., and Elan, S.M., "The 29th Annual Phi Delta Kappan/Gallup Poll on the Public's Attitudes Toward the Public Schools," *Phi Delta Kappan, 79*(1), 41-58.

## Center Team

Principal Investigators and Co-Principal Investigators

**UNIVERSITY OF WASHINGTON**
Michael Knapp, Center Director
James Banks
Pamela Grossman
Margaret Plecki
Sheila Valencia

**STANFORD UNIVERSITY**
Milbrey McLaughlin
Joan Talbert

**TEACHERS COLLEGE/COLUMBIA**
Linda Darling-Hammond

**UNIVERSITY OF MICHIGAN**
David Cohen
Deborah Ball

**UNIVERSITY OF PENNSYLVANIA**
Thomas Corcoran

**Researchers at Other Institutions**
Barnett Berry, University of South Carolina
David Monk, Cornell University
Edward Silver, Learning Research and Development Center (LRDC), University of Pittsburgh
Jon Snyder, University of California at Santa Barbara
Neil Theobald, Indiana University

## Center Affiliates

American Association of Colleges of Teacher Education
American Association of School Administrators
American Federation of Teachers
Association for Supervision and Curriculum Development
Council for Chief State School Officers
International Reading Association
National Alliance of Business
National Association of Elementary School Principals
National Association of Secondary School Principals
National Association of State Boards of Education
National Board for Professional Teaching Standards
National Conference of State Legislatures
National Council for Accreditation of Teacher Education
National Council for the Social Studies
National Council of Teachers of English
National Council of Teachers of Mathematics
National Education Association
National Governors' Association
National School Boards Association
National Science Teachers Association
National Staff Development Council
National Urban Coalition
National Urban League
Teachers Union Reform Network

## Contact Information

**Michael S. Knapp, Center Director**
Miller Hall M201
College of Education
University of Washington, Box 353600
Seattle, WA 98195-3600
Phone: (206) 543-1836
FAX: (206) 616-6762
email: mknapp@u.washington.edu

**Michele C. Ferguson, Center Manager**
Miller Hall 203C
College of Education
University of Washington, Box 353600
Seattle, WA 98195-3600
Phone: (206) 221-4114
FAX: (206) 616-6762
email: ctpmail@u.washington.edu

**Web Address**
http://weber.u.washington.edu/~ctpmail

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

# NOTICE

## REPRODUCTION BASIS

☐ This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☑ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").