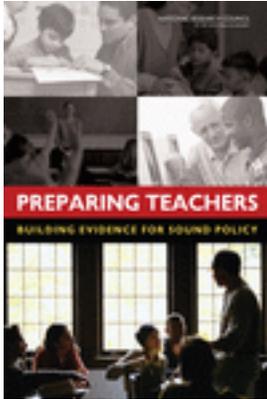


## Free Summary



### Preparing Teachers: Building Evidence for Sound Policy

Committee on the Study of Teacher Preparation Programs in the United States; National Research Council

ISBN: 978-0-309-12805-6, 234 pages, 6 x 9, paperback (2010)

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*Teachers make a difference. The success of any plan for improving educational outcomes depends on the teachers who carry it out and thus on the abilities of those attracted to the field and their preparation. Yet there are many questions about how teachers are being prepared and how they ought to be prepared. Yet, teacher preparation is often treated as an afterthought in discussions of improving the public education system. Preparing Teachers addresses the issue of teacher preparation with specific attention to reading, mathematics, and science. The book evaluates the characteristics of the candidates who enter teacher preparation programs, the sorts of instruction and experiences teacher candidates receive in preparation programs, and the extent that the required instruction and experiences are consistent with converging scientific evidence. Preparing Teachers also identifies a need for a data collection model to provide valid and reliable information about the content knowledge, pedagogical competence, and effectiveness of graduates from the various kinds of teacher preparation programs. Federal and state policy makers need reliable, outcomes-based information to make sound decisions, and teacher educators need to know how best to contribute to the development of effective teachers. Clearer understanding of the content and character of effective teacher preparation is critical to improving it and to ensuring that the same critiques and questions are not being repeated 10 years from now.*

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## Summary

Teachers make a difference. The success of any plan for improving educational outcomes depends on the teachers who carry it out and thus on the abilities of those attracted to the field and their preparation. Yet there are many questions about how teachers are being prepared and how they ought to be prepared. As mandated by Congress, the U.S. Department of Education requested that the National Research Council conduct a study of teacher preparation with specific attention to reading, mathematics, and science. The Committee on the Study of Teacher Preparation Programs in the United States was charged to address four questions:

1. What are the characteristics of the candidates who enter teacher preparation programs?
2. What sorts of instruction and experiences do teacher candidates receive in preparation programs of various types?
3. To what extent are the required instruction and experiences consistent with converging scientific evidence?
4. What model for data collection would provide valid and reliable information about the content knowledge, pedagogical competence, and effectiveness of graduates from the various kinds of teacher preparation programs?

We examined many aspects of the complex and diverse network through which the majority of the nation's teachers are prepared. It was exceptionally difficult to assemble a clear picture of teacher preparation because

there have been no systematic efforts to collect the necessary data; thus, we can provide only partial answers to the first three questions in our charge. However, we did find many sources for conclusions about the skills and knowledge most likely to be valuable to beginning teachers, as well as clear indications of the research that is most needed to build a base of knowledge to guide improvements to teacher education.

## HOW TEACHERS ARE PREPARED AND CERTIFIED

The lack of data related to the first two questions in our charge, about the characteristics of teacher candidates and how they are prepared, is surprising—at the very least because of the huge scale of the enterprise. There are approximately 3.6 million public school elementary and secondary teachers in 90,000 public schools in the United States. More than 200,000 students complete a teacher preparation program each year. Little is known about these teacher candidates except that they are predominantly female and white.

Aspiring teachers in the United States are prepared in many different kinds of programs, which in turn reflect many different kinds of career pathways. Between 70 and 80 percent are enrolled in “traditional” programs housed in postsecondary institutions; the rest enter the profession through one of the approximately 130 “alternative” routes.

Yet however they are designated, teacher preparation programs are extremely diverse along almost any dimension of interest: the selectivity of programs, the quantity and content of what they require, and the duration and timing of coursework and fieldwork. Any pathway is likely to entail tradeoffs among selectivity, the intensity of the training, and the obstacles it presents to teacher candidates. More selective pathways, and those that require greater effort and time to complete, may have the disadvantage of yielding fewer teachers to fill vacancies, for example, but the teachers they do produce may be more highly qualified.

There is some research that suggests that there are differences in the characteristics of teacher candidates who are attracted to different pathways and types of programs. There is also some research comparing the outcomes for graduates of different kinds of programs. However, the distinctions among pathways and programs are not clear-cut and there is more variation within the “traditional” and “alternative” categories than there is between these categories. We found no evidence that any one pathway into teaching is the best way to attract and prepare desirable candidates and guide them into the teaching force. This finding does not mean that the characteristics of pathways do not matter; rather, it suggests that research on the sources of the variation in preparation, such as selectivity, timing, and specific components and characteristics, is needed.

The wide variety in teacher education programs led us to consider the current mechanisms for accountability and quality control in teacher education, which strongly affect the ways that teachers are prepared. These mechanisms are a patchwork of mandatory and voluntary processes, including state program approval, program accreditation, and teacher licensure and certification. These mechanisms are not effectively linked in a coherent, outcomes-driven accountability system, and they are not grounded in solid empirical research about which program elements or accountability mechanisms are most effective, partly because such research is not available. Thus, they neither achieve the goal of a true accountability system nor provide evidence about the value of different mechanisms for producing effective teachers. In view of this lack of information, the committee recommends that the U.S. Department of Education undertake an independent evaluation of teacher education approval and accreditation in the United States.

### HIGH-QUALITY PREPARATION

For the third question in our charge, about the extent to which current practices in the preparation of mathematics, reading, and science teachers are consistent with converging scientific evidence, we found a range of potential relevant material. This material included a relatively small body of evidence about the effects of particular kinds of instruction and an even smaller body of evidence about the effects of particular approaches to teacher preparation. Other available research included descriptive and qualitative studies about many aspects of teaching and learning in the three subjects and a substantial body of empirical work on learning and cognition. In addition, the relevant professional organizations have drawn on the available research and their own intellectual traditions and experience as educators to develop content and achievement standards for students and for teachers and, in some cases, for teacher education.

These sources together provide the basis for conclusions about:

- what successful students know about the subject,
- what instructional opportunities are necessary to support successful students,
- what successful teachers know about the subject and how to teach it, and
- what instructional opportunities are necessary to prepare successful teachers.

In analyzing the available evidence, we were mindful of the need to distinguish the basis for different sorts of claims and arguments, even as we

synthesized the most important points for policy makers and teacher educators and highlighted questions that have yet to be answered.

There has been an extraordinary amount of work, from a variety of fields, on questions about the factors that influence the effectiveness of teaching, but this work is only a starting point. There is little firm empirical evidence to support conclusions about the effectiveness of specific approaches to teacher preparation. However, we found no reason to question the recommendations professional societies have made about what is important for teachers to know. Moreover, those recommendations integrate well with the relatively small body of empirical work. The research base is strongest for reading and least strong for science, and our conclusions about preparation in the three fields reflect these differences.

In general, the evidence base supports conclusions about the characteristics it is valuable for teachers to have, but not conclusions about how teacher preparation programs can most effectively develop those characteristics. For all three fields, we conclude that both strong content knowledge (a body of conceptual and factual knowledge) and pedagogical content knowledge (understanding of how learners acquire knowledge in a given subject) are important.

For teachers of reading, it is important to (1) understand that students must master the foundational skills of reading (which include a firm grasp of phonics and comprehension strategies), and (2) possess a range of approaches for helping all students develop this mastery.

In mathematics, it is important for teachers to be able to foster students' understanding of the core elements of mathematical proficiency (which include conceptual understanding, procedural fluency, and capacity for reasoning and problem solving). This capacity requires not only mathematical knowledge, but also understanding of how mathematics learning develops and of the variation in cognitive approaches to mathematical thinking.

In science, the key points are similar to those for mathematics teachers: a grounding in college-level study of the science disciplines suitable to the age groups and subjects they intend to teach; understanding of the objectives for students' science learning; understanding of the way students develop science proficiency; and command of an array of instructional approaches designed to develop students' learning of the content, intellectual conventions, and other attributes essential to science proficiency.

This was the picture we found of the evidence relevant to teacher preparation. There is very little systematic research regarding the specific ways teachers of reading, mathematics, and science are currently being prepared that we could use to make comparisons with that picture. The limited information we found does not support conclusions about the current nature and content of teacher preparation programs.

## EVALUATING EFFECTIVENESS

Ideally, teacher education programs would be evaluated on the basis of the demonstrated ability of their graduates to improve the educational outcomes of the students they teach. Unfortunately, the data needed for such evaluation do not exist, although there has been some promising work. More such research is needed, but identifying and measuring the relationship between teacher preparation and student outcomes poses methodological difficulties.

First, it is difficult to measure teacher effectiveness in valid and reliable ways. Assessments of K-12 student learning are the most readily available quantitative measures of educational outcomes. These types of measures serve important purposes, but they do not address the full range of outcomes of concern to policy makers. Indeed, much of the K-12 curriculum is not addressed by such tests. The assessment community has made important strides in developing richer measures of achievement but these are not yet at the stage where they could be easily used for systematic analysis of teacher effectiveness.

Second, establishing clear causal links between aspects of teacher preparation and outcomes for students is extremely difficult. The effects of teacher preparation are hard to disentangle from other factors, such as school, curriculum, community, and family influences. Efforts to establish causal links are also hobbled by the relative lack of data on the characteristics of teachers and their preparation; the dearth of robust measures of teachers' knowledge and practice; and difficulties in linking student achievement to instruction or to what teachers know. And, there is considerable distance in time and place between teachers' preparation and the effects their teaching may later have on student achievement.

These obstacles partly account for the paucity of strong empirical evidence regarding the effects of teacher preparation. Yet we believe that building knowledge about teacher preparation, as in any field of scholarly inquiry, requires ambitious and creative approaches to empirically examining causal relationships. It is very important to connect what occurs in preparation programs to characteristics of their graduates, to the ways those teacher-graduates interact with their students, and to learning outcomes for those students.

## A MODEL FOR FUTURE RESEARCH

Because the information about teacher preparation and its effectiveness is so limited, high-stakes policy debates about the most effective ways to recruit, train, and retain a high-quality teacher workforce remain muddled. If the base of empirical knowledge about teacher preparation is thin, the way

forward is to build on what has been done by drawing on the professional consensus in each academic field for hypotheses about which features of teacher preparation are most promising and to subject those hypotheses to rigorous research. We were asked to develop an approach to future research that would provide a firmer foundation for policy and practice in the future. We organized our response around two overarching needs:

1. improved understanding of the relationships between characteristics of teacher preparation and student learning, and
2. a comprehensive, coherent system for collecting data about teacher preparation.

### High-Priority Research Questions

The primary need is to build a body of evidence, developed from multiple perspectives and using an array of research designs, that establishes links between teacher preparation and learning—both teachers' learning and K-12 students' learning. Particularly valuable will be research that identifies and explains

- the features that make programs attractive to academically accomplished teacher candidates,
- the ways teachers' knowledge affects outcomes for students, and
- the characteristics of clinical experiences that affect outcomes for the students teacher candidates will later teach.

### Data Collection

A comprehensive data collection system would provide not only baseline information for identifying and monitoring trends in teacher preparation, but also the necessary infrastructure for research into complex questions about teacher preparation.

A comprehensive data system for teacher preparation would provide meaningful information about teacher candidates, preparation programs, practicing teachers, the schools where those teachers teach, and the students they teach: that is, it would incorporate indicators beyond standardized test scores, degree title, courses taken, or certification category. These data would be integrated so that information about teacher candidates and their preparation can be connected with their knowledge, teaching practices, career paths, school environments, and student outcomes. One key to integration will be consistent definitions of key indicators so that data from states can be compared and used for research.

As states pursue strategies for sharing data and making it more accessible

through web-based systems, possibilities for research in teacher preparation will expand. The federal government can play a critical role in coordinating states' efforts and encouraging them to move in this direction.

### CONCLUSION

The quality of the nation's teachers has been the subject of sharp critiques, and so have many preparation programs. Yet, teacher preparation is often treated as an afterthought in discussions of improving the public education system. Federal and state policy makers need reliable, outcomes-based information to make sound decisions, and teacher educators need to know how best to contribute to the development of effective teachers. Clearer understanding of the content and character of effective teacher preparation is critical to improving it and to ensuring that the same critiques and questions are not being repeated 10 years from now.



# PREPARING TEACHERS

## BUILDING EVIDENCE FOR SOUND POLICY

Committee on the Study of Teacher Preparation Programs  
in the United States

Center for Education

Division of Behavioral and Social Sciences and Education

NATIONAL RESEARCH COUNCIL  
*OF THE NATIONAL ACADEMIES*

THE NATIONAL ACADEMIES PRESS  
Washington, D.C.  
**[www.nap.edu](http://www.nap.edu)**

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This study was supported by Contract No. ED-05-CO-0012 between the National Academy of Sciences and the U.S. Department of Education; by Contract No. 20060517 with the Ewing Marion Kauffman Foundation; by Contract No. D07001 with the Carnegie Corporation of New York; by Contract No. 200700087 with The Spencer Foundation; and by the President's Fund of the National Research Council. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the organizations or agencies that provided support for the project.

#### Library of Congress Cataloging-in-Publication Data

Preparing teachers : building evidence for sound policy.

p. cm.

“Committee on the Study of Teacher Preparation Programs in the United States, Center for Education Division of Behavioral and Social Sciences and Education.”

Includes bibliographical references.

ISBN 978-0-309-12805-6 (pbk.) — ISBN 978-0-309-12996-1 (pdf) 1.

Teachers—Training of—United States.

LB1715.P727 2010

370.71'173—dc21

2010014539

Additional copies of this report are available from the National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, <http://www.nap.edu>.

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Printed in the United States of America

Suggested citation: National Research Council. (2010). *Preparing teachers: Building evidence for sound policy*. Committee on the Study of Teacher Preparation Programs in the United States, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

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## Preface

**T**he quality of teachers is increasingly recognized as critical to student learning. Holding schools and teachers accountable for student performance is a key element of plans for improving public education and is likely to remain so as the No Child Left Behind legislation is updated. Yet while the education of public school teachers has been the subject of concern, it has not been a primary focus of standards-based reform efforts. This study was mandated by Congress to answer basic questions about teacher education and the research that supports it and to highlight the way forward.

The study had two objectives: (1) to pull together a disparate and uneven research base, so that policy makers can see clearly what is and is not known and (2) to propose a research agenda to fill the gaps in that knowledge base. Our focus was clearly defined: we examined initial preparation for reading, mathematics, and science teachers. That is, although teacher learning is best understood as a process that continues throughout teachers' careers—for example, through induction, mentoring, in-service professional development, and professional collaboration—our focus was the ingredients essential to preparing “well-started beginners.”

While preparation is undeniably important, other factors have significant influence on the strength of the nation's teaching force. The incentives that attract aspiring teachers, the status of the field, the compensation teachers can expect, the conditions in which they do their work, and their opportunities for professional advancement are just a few of the factors that

affect who becomes a teacher and who stays in the field. In a report more than 20 years ago, the Carnegie Task Force on Teaching as a Profession made a number of recommendations regarding teacher preparation, but it also clearly articulated the importance of seeing it as tightly integrated with other aspects of teachers' professional lives and other elements of the education system. Although our report is not intended to address all the issues related to teacher quality, we emphasize that effective teacher education is one necessary condition for ensuring the quality of the teaching force, but is neither the only condition nor a sufficient one.

Teacher preparation programs are turning out more than 200,000 new teachers every year, and those teachers are badly needed to fill vacancies in a field that has high turnover and a particular need for teachers prepared and willing to work with the neediest children. It is important to strengthen teacher preparation, not just because teachers make up one of the largest occupational groups in the United States, but also because they are asked to serve every child and family in the country. Their work is a basis for democratic citizenship, and they are at the heart of one of the central experiences of growing up—schooling. Nevertheless, teaching has never attained the same status as law or medicine, and the uneven quality of teacher preparation is a reflection of the ambivalence with which university scholars and others have historically viewed this female-dominated field. If that is to change, improving teacher preparation is vital.

We found many gaps in the knowledge base, but it is important also to highlight the considerable grounding we found for many types of guidance regarding the preparation of reading, mathematics, and science teachers. Our goal was to provide a dispassionate summary and objective analysis that will help policy makers debate alternatives and help teacher educators provide stronger preparation, while also providing guidance for much-needed research. Teacher education deserves careful, balanced scrutiny, and that is what we have worked to provide.

A number of individuals assisted us in our information gathering and analysis and we are very grateful for their thoughtful input and their time. At our first meeting, several people provided us with a variety of perspectives and information about a range of questions related to our charge: Joan Baratz-Snowden of the American Federation of Teachers; Vicki Bernstein of the New York City Department of Education and the New York Teaching Fellows Program; Jean Braxton, dean of the School of Education of Norfolk State University; Daniel Fallon of the Carnegie Corporation; Mary Hatwood Futrell of the School of Education and Human Development of George Washington University; Frederick Hess of the American Enterprise Institute; Deborah McGriff of Edison Schools; and Jon Snyder of the Bank

Street College. At another of our meetings several individuals assisted us in exploring methodological issues: Pamela Grossman, Nomellini Olivier professor of education at Stanford University; Karen Hammerness, a post-doctoral fellow at Stanford University; Raven McCrory of the Division of Science and Mathematics Education at Michigan State University; Susan Moore-Johnson, professor of teaching and learning at Harvard University; Stephen Raudenbush of the Department of Sociology at the University of Chicago; Kate Walsh, president of the National Council on Teacher Quality; and Robert Yinger, professor of educational studies and teacher education at the University of Cincinnati and research director for the Ohio Teacher Quality Partnership.

We held workshops to explore several issues in depth. The first addressed both teacher licensure and program accreditation and we gratefully acknowledge the assistance of presenters: Dan Goldhaber of the Center on Reinventing Public Education at the University of Washington; Peter McWalters of the Rhode Island Department of Education; Frank Murray, president of the Teacher Education Accreditation Council; Kara Schmitt, formerly of the Michigan Department of Consumer and Industry Services; Kathy Sullivan of the North Carolina Department of Public Instruction; J. Fredericks Volkwein of the Penn State Center for the Study of Higher Education; Judith Watkins of the Council for Higher Education Accreditation; and Arthur Wise, president of the National Council for the Accreditation of Teacher Education.

At our second workshop we explored two issues. One was the preparation of mathematics and science teachers, and we thank: Sybilla Beckmann, a professor of mathematics at the University of Georgia; Rodger Bybee of the Biological Sciences Curriculum Study; Elizabeth Davis of the Department of Applied Economics at the University of Michigan; James Hiebert of the School of Education at the University of Delaware; Barbara Miller of the Education Development Center; Paul Sally, director of undergraduate mathematics education at the University of Chicago; Mark Windschitl of the College of Education at the University of Washington; and Robert Yager of the College of Education at the University of Iowa. The second issue was perspectives on professions in the United States, and we thank: Steven Brint, a professor of sociology at the University of California, Riverside, and Lee Shulman of the Carnegie Foundation for the Advancement of Teaching.

We explored several state and regional analyses of teacher preparation by commissioning two studies, and we extend our sincere thanks to Tim Sass of Florida State University and to Pamela Grossman and her colleagues for their investigations of data from Florida and New York City, respectively. We also thank Douglas Harris of the University of Wisconsin at Madison;

George Noell of Louisiana State University; Kent Seidel and Robert Yinger, both of the University of Cincinnati; and David Wright of the California State University System for their contributions to the workshop.

Finally, the intellectual leadership demonstrated by costudy directors Lisa Towne and Stuart Elliott in guiding the committee's work was outstanding. The substantive and editorial contributions of Alexandra Beatty were of the highest quality and added significantly to the shape and eloquence of the report. The combined administrative support and responsiveness of Tina Winters and Patricia Harvey were also of the highest quality, and we are extremely grateful for all they did throughout the committee process. We would have no report without them. We also wish to note that the views expressed in this report are those of the committee, not the sponsors who generously supported our work.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Research Council. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following individuals for their review of this report: Deborah H. Cunningham, Educational Management Services, New York State Education Department; Robert E. Floden, Institute for Research on Teaching and Learning College of Education, Michigan State University; Carolyn D. Herrington, Department of Educational Leadership and Policy Studies, Florida State University; Paul W. Holland, Paul Holland Consulting Corporation; Kenneth Howe, School of Education, University of Colorado at Boulder; Roger Howe, Department of Mathematics, Yale University; Joseph Krajcik, School of Education, University of Michigan; Henry M. Levin, Economics and Education, Teachers College, Columbia University; P. David Pearson, Graduate School of Education, University of California, Berkeley; Penelope L. Peterson, School of Education and Social Policy, Northwestern; and Steven Rivkin, Department of Economics, Amherst College.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by Diana Pullin, School of Education, Boston College, and Burton Singer, Emerging Pathogens Insti-

tute, University of Florida. Appointed by the National Research Council, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Ellen Condliffe Lagemann, *Chair*  
Committee on the Study of Teacher  
Preparation Programs in the United States



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