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ABSTRACT

In the fall of 1995 the National Center for Education Statistics (NCES) held a conference to stimulate dialogue about future developments in the fields of education, statistical methodology, and technology and the implications of these developments for the nation's education statistics program. This paper summarizes and synthesizes the results of this conference and a study the NCES undertook to clarify its responsibilities over the next decade. An introductory section provides a synopsis of the major themes and conclusions from the conference and its commissioned papers. The second section describes the current foundation of the NCES, outlining its core functions, operating principles, and program. The third section summarizes some new directions that the NCES could pursue to provide information for policy, research, and practice in American education and addresses some important methodological and technological opportunities. A concluding section affirms that the most fundamental change the NCES must make is to emerge as a provider of information services and systems rather than a primary collector and provider of data per se. Data collection that occurs independently of front-line administrative and teaching systems is likely to diminish in the future. An outline of the conference agenda is presented. (Contains five graphs and six references.) (SLD)

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ED 403 327

NATIONAL CENTER FOR EDUCATION STATISTICS

Synthesis Report

FROM DATA TO INFORMATION

New Directions for the National Center for Education Statistics

U.S. Department of Education
Office of Educational Research and Improvement

NCES 96-878

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NATIONAL CENTER FOR EDUCATION STATISTICS

Synthesis Report

FROM DATA TO INFORMATION

New Directions for the National Center for Education Statistics

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NCES 96-878

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National Center for Education Statistics
Pascal D. Forgione, Jr.
Commissioner

The National Center for Education Statistics (NCES) is the primary federal entity for collecting, analyzing, and reporting data related to education in the United States and other nations. It fulfills a congressional mandate to collect, collate, analyze, and report full and complete statistics on the condition of education in the United States; conduct and publish reports and specialized analyses of the meaning and significance of such statistics; assist state and local education agencies in improving their statistical systems; and review and report on education activities in foreign countries.

NCES activities are designed to address high priority education data needs; provide consistent, reliable, complete, and accurate indicators of education status and trends; and report timely, useful, and high quality data to the U.S. Department of Education, the Congress, the states, other education policymakers, practitioners, data users, and the general public.

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COMMISSIONER'S STATEMENT

In the fall of 1995, the National Center for Education Statistics (NCES) held a conference to stimulate dialogue about future developments in the fields of education, statistical methodology, and technology, as well as to explore the implications of such developments for the nation's education statistics program. This "Futures Conference" was unique for NCES because it attempted to combine considerations in all of these fields in order to stimulate the cross-fertilization and generation of ideas that might not emerge when discussing the topics separately. At this conference, the authors presented commissioned papers on targeted issues that were expected to be important over the next few years, and the discussants provided their comments.

From several perspectives, I believe the conference was highly successful. First, staff from NCES actively participated in all of the deliberations. As a result, they became personally engaged in the process of considering alternative futures for their agency. Since the "corporate culture" of this agency is to solicit and build on staff creativity, their participation and interest in this conference was vital. Second, both the formal and informal discussions generated many new ideas. The conference, as such, accomplished far more than the collection of commissioned papers alone could have because of the active interplay of ideas. Finally, many stakeholders in NCES's future saw this conference as a clear signal of the agency's commitment to continued improvement of the usefulness and quality of our surveys and data products. The stakeholders' positive response to the meeting was further reinforced by their expressions of interest in continuing to help in important ways. The success of the conference lies not in the sum of the individual presentations, rather in an overall perspective that provides guidance toward the future.

This document and its companion publication, *Conference Proceedings*, will serve as a concrete reference to ensure that the stimulating ideas exchanged at the Futures Conference are not forgotten. While the quality of the discussion at the meeting was exceptional, one cannot expect to absorb everything said during a two-day conference. Thus, it is important to have a record that the participants can refer to this year, next year, or five years from now. Moreover, this publication will provide a way to share those ideas with others who could not participate in the conference. For instance, NCES has many customers and

other stakeholders who have expressed keen interest in the conference proceedings and whose advice and considerations are welcome as a means to sustain the dialogue about NCES's future.

It is clear that if NCES wants to continue as a key player in providing information for education policy and decision making to the American public, policymakers, education researchers, and educators nationwide, it must continually reevaluate its program and products. In the future, we expect that NCES will receive requests for more of the kinds of products and services that it already provides. Also, we expect demands for new perspectives—on covering new topical areas, implementing new technologies, and adopting new methodologies. Already, major recent changes in the field of education are shaping our future program—for example, widespread innovations to achieve education reform, efforts to adopt both curriculum and performance standards, and examination of education in the United States within an international context. Not only are methodological advances creating opportunities to produce statistics in ways that may be more efficient and effective, but also technological developments are changing the world in which we create data and disseminate our products more rapidly than ever before. The Futures Conference and this publication provide a new vision for NCES—a vision that acknowledges the constraints on the resources of governmental agencies at the end of the 20th century, as well as clearly emphasizes the opportunities that can be achieved with innovative methodologies and technologies and through close attention to the priorities for statistical knowledge in the field of education.

This contribution to envisioning NCES's future is occurring at a pivotal time of transition. The Futures Project was conceptualized under the leadership of the first Commissioner of Education Statistics, Emerson J. Elliott and carried through under the stewardship of Jeanne E. Griffith as Acting Commissioner. I plan to use this publication in the upcoming years as a source of ideas for planning and thinking and as a foundation for long-term change in the organization.

Pascal D. Forgione, Jr.
Commissioner

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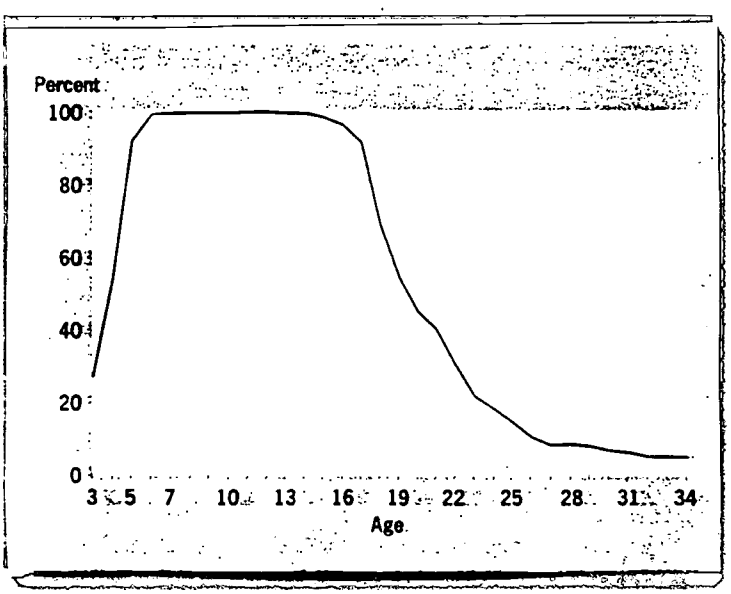
INTRODUCTION

In 1995, approximately 65 million Americans participated in elementary, secondary, or postsecondary education in the United States (U.S. Department of Education 1995b). Young people spent from one-fourth to one-half of their waking hours in school and school-related activities, while Americans of all ages continued to pursue some form of active learning that added to their repertoire of knowledge and skills. To serve these students, the nation's schools, colleges, and universities directly employed some 11.2 million people, even more than in the health industry. In addition, these direct services supported a substantial number of additional jobs in companies serving education through the production of everything from buses and computers to textbooks and software. All told, the nation spent more than $500 billion[1] on formal education, or approximately 7.4 percent of Gross Domestic Product (U.S. Department of Commerce 1995). Probably no other single activity has occupied so prominent a place in family, community, and working life.

PERCENTAGE OF THE POPULATION ENROLLED IN SCHOOL, BY AGE, OCTOBER 1993



SOURCE: U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 1995*, Washington, D.C., 26–27.

The primary purpose of the National Center for Education Statistics (NCES) is to describe this education enterprise and inform the nation about it. Congress charges NCES with collecting and reporting "statistics and information showing the condition and progress of education in the United States and other nations in order to promote and accelerate the improvement of American education."[2] In doing so, the Center conducts a range of ongoing national surveys examining early childhood education, elementary and secondary education, postsecondary education, adult literacy, and the nation's libraries. Further, in cooperation with many other countries, it supports international surveys that aid in comparing educational progress and processes across nations. NCES carries out numerous analyses of these data and annually prepares more than

> **Congress charges NCES with collecting and reporting "statistics and information showing the condition and progress of education in the United States and other nations in order to promote and accelerate the improvement of American education."**

100 reports targeted toward policymakers, educators, researchers, and the American people.

Doing this job well would be necessary no matter what the focus, but when the subject assumes the magnitude and importance of education, this responsibility takes on special significance. Therefore, NCES must ensure that it continues to describe education fully and accurately and that it performs this function efficiently and thoroughly—in other words, that it remains well informed about important education issues, key advances in methods, and new developments in the technology of collecting, managing, analyzing, and reporting large amounts of information.

To this end, NCES undertook an in-depth examination of how best to direct its responsibilities for collecting and reporting information on education over the next decade. Three principal questions guided this effort:

1) What are the major issues and trends in education that NCES should aim to address through the first decade of the next century?

2) What are the most important advances in methods for collecting and analyzing information that should guide how NCES surveys are designed and used?

3) What opportunities do technological advances in data management and communications present for improving data collection and analysis and for disseminating findings and information effectively?

To help answer these questions, NCES conducted four activities: 1) a survey of leading educators and researchers, asking them to answer one or more of the three questions listed above; 2) commissioned papers addressing key topics suggested by the survey results; 3) a conference where the authors of the commissioned papers presented their work, with subsequent discussion by NCES staff and external reviewers; and 4) a published volume, *From Data to Information: New Directions for the National Center for Education Statistics*, of the commissioned papers and discussants' comments. This paper summarizes and synthesizes the results of this work and consists of four major sections. This first introductory section provides a synopsis of the major themes and conclusions emerging from the papers and the conference. The second section describes the current foundation of NCES, delineating its core functions, operating principles, and program of work. The third summarizes some new directions that NCES could pursue to provide information for policy, research,

and practice in American education, and also addresses some important methodological and technological opportunities. The paper ends with a brief conclusion.

Two dominant themes emerged from this collaborative effort. First, NCES must place greater emphasis on transforming raw data into information useful to policymakers, educators, researchers, and the general public than it does today. Accomplishing this goal will require that the relationships between NCES and data providers and between NCES and data users change significantly. During the next 5 to 10 years, the distinctions among these three parties—NCES, data providers, and data users—will become increasingly blurred, and their communications will probably become much more interactive, continuous, and two-way, with all three parties actively and simultaneously engaged in survey design, data collection, analysis, interpretation, presentation, and dissemination. Although technology will help pave the way for this transition, considerable conceptual thinking will also be required to take full advantage of the technological opportunities.

Second, in order to be more responsive to the demands for information about education, NCES will need to broaden its conception of what constitutes "data" and strategies for their collection. Traditionally, NCES has concentrated on designing and conducting surveys asking "closed-ended" questions that lend themselves to rapid, well-defined quantification. Although such surveys are likely to remain the hallmark of NCES's data collection activities for some time, the agency will need to pay more attention to how to supplement these data with various forms of "prequantified" material and observations. Technological developments will permit inexpensive collection of increasing amounts of textual, visual, and auditory data as integrated supplements to surveys. This capacity should make it easier for researchers to ask questions and explore subjects that they did not foresee when designing the survey, thus enriching analytic power and reducing the expense of designing and conducting new surveys to examine unanticipated concerns.

Two dominant themes emerged . . . First, NCES must place greater emphasis on transforming raw data into information useful to policymakers, educators, researchers, and the general public . . . Second, NCES will need to broaden its conception of what constitutes "data" and strategies for their collection.

In addition to these two major themes, this effort led to five important conclusions about future directions for NCES. First, NCES should strive to produce information that addresses more immediate and specific policy concerns. While the agency's role in monitoring and describing major long-term trends in education must not be compromised, this role will assume even greater importance if the agency can also contribute in a timely way to more focused policy debates. The widespread emphasis on education reform during the past 10 years has

spawned a large number of different strategies for improving education. As a result, policymakers at all levels—national, state, and local—want to know more about what has and has not been accomplished.

Five Important Conclusions:

1. **Produce information that addresses more immediate and specific policy concerns.**
2. **Obtain better information that bears directly on the practices of teaching and learning.**
3. **Integrate analysis of the interrelationships among education inputs, processes, and outcomes.**
4. **Make better use of data already collected and maintained by others.**
5. **Place greater emphasis on dissemination.**

Second, surveys yielding better information that bears directly on the practices of teaching and learning would significantly enhance the contribution of NCES to both policy debate and research. Since current surveys produce scant data on the specific content of curriculum, the nature and frequency of discrete classroom activities, the practices of teachers, or the kinds of tasks students perform in order to learn, the classroom remains largely a "black box" that defies clear understanding and precise strategies for improvement. Without a clearer understanding of what constitutes effective classroom practices, it will be difficult to do more than simply describe what kinds of education reforms have been implemented. Whether they have, in fact, improved teaching and increased learning will remain unknown.

Third, survey designers should consider more carefully strategies that will permit integrated analysis of the interrelationships among education inputs, processes, and outcomes. Although existing surveys do an excellent job of providing nationally representative descriptive data on many important aspects of education, they do not, however, lend themselves very well to reliable causal analyses that might increase knowledge about what works and why. The descriptive power of national data must be preserved, but there are promising new designs emerging, which, if selectively incorporated into national surveys, might generate more robust conclusions about the relative effectiveness of various educational practices.

Fourth, NCES should make better use of data already collected and maintained by others. Doing so will help NCES simultaneously accomplish three aims: 1) expand the amount and type of data it collects; 2) adopt a wider range of data collection and analytic methods; and 3) function within the tight resource constraints that are certain to affect almost all federal agencies. Previously, NCES has pursued such a strategy with some success—for example, through the Common Core of Data (CCD) for elementary and secondary education and the Integrated Postsecondary Education Data System (IPEDS); however, high standards for data quality, especially comparability and reliability, have frequently forced the agency to collect new data that were already available in a somewhat different

form or from a different time period. Without doubt, NCES must maintain its data quality standards, but increasing cooperation with states and localities, combined with rapidly improving data management technology and communications, should create opportunities for the Center to do a better job of streamlining and coordinating data collection.

Fifth, NCES will need to place increasingly greater emphasis on dissemination. Data and information are only as valuable as the breadth, quality, and timeliness of the uses made of them. Electronic storage media (data tapes and compact disks) and printed publications will surely remain the cornerstone of the agency's strategy for distributing data, tabulations, and the results of analysis. However, NCES should pay more attention to clearinghouse and brokerage functions, as well as effective use of electronic networks.

These themes and conclusions do not represent radical departures from the major path NCES has been pursuing in recent years. Indeed, as the following section illustrates, they are well suited to building on the foundation of core functions, operating principles, and programs of work that support the current agency. Nevertheless, serious attention to these ideas will almost certainly produce important differences in what the agency now does and how it does it.

BUILDING THE FUTURE ON THE CURRENT FOUNDATION

In 1986, the Panel to Evaluate the National Center for Education Statistics, a group created under the auspices of the National Academy of Sciences (NAS), reported on the results of its 2-year assessment of the mission and effectiveness of NCES (Levine, ed. 1986). The Panel was created to address the widespread perception that the existing agency had not yet developed "the image and the reality of a competent and objective major statistical organization serving the wide need for statistics about education in the United States" (Levine, ed. 1986, p. 13). To address such problems as quality of data, timeliness, conceptual obsolescence, and insufficient funding and staff, the Panel made many important recommendations, including the following:

- Clearly establish and define the Center's role in ensuring the availability of data needed to describe the condition of education in the United States;

- Improve the compilation of education program, staff, and financial data from the states, including developing closer collaboration with the states to ensure that the Center's program of work meets both NCES and state requirements for usefulness, relevance, quality, and reliability;

- Strengthen the Center's methodological and technical capacity through more systematic use of outside expertise in the Advisory Council of Education Statistics, as well as ad hoc advisory groups;

- Develop, publish, disseminate, and implement standards to guide all phases of the Center's work, including establishing an office of statistical standards headed by a chief statistician;

- In collaboration with the states, assess and improve the quality, consistency, and reliability of data obtained from state and local agencies, from institutions of higher education, and from other sources; and

- Institute a publications policy that clearly distinguishes between different types of reports—for example, statistical summaries and digests, analytic reports, descriptive reports, and reports on methodology—and develop a schedule of fixed release dates for selected key education statistics.

Whereas 10 years ago, the future of NCES depended on rectifying fundamental weaknesses, today the agency's future can build on a strong foundation.

Ten years later, with the direction provided by the Panel, strong leadership at NCES, and support from Congress and the larger education community, NCES is much stronger and has become a widely respected statistical agency. The agency has significantly strengthened its core functions; operates under well-defined guiding principles and high standards for data collection, analysis, and reporting; and has established a clear program of work for reporting on the major aspects of education in the United States and other nations. Whereas 10 years ago, the future of NCES depended on rectifying fundamental weaknesses, today the agency's future can build on a strong foundation.

The Core Functions of NCES

The National Academy of Sciences' Committee on National Statistics defines the principal purpose of a federal statistical agency as "the compilation and analysis of data and the dissemination of information for statistical purposes" (Martin and Straf, eds. 1992). NCES adheres to this primary purpose by organizing its work around three core functions:

1) Survey Design and Data Collection

2) Information Production—data analysis, translation, and interpretation

3) Dissemination

Since national surveys are the primary means for NCES to collect data on education, during the past 10 years, the Center has devoted much effort to improving survey design and data collection. For instance, following the recommendations of the 1986 NAS Evaluation Panel, it has developed and implemented various strategies to improve data quality, to detect and reduce error, and to expedite data collection. The Center has also significantly improved the sophistication and efficiency of its sampling methods, increased its use of computer-assisted telephone interviewing, and systematically assessed the quality of data generated in its national surveys.

NCES organizes its work around three core functions:

1. ***Survey Design and Data Collection***
2. ***Information Production***
3. ***Dissemination***

Moreover, NCES has strengthened and substantially expanded its capacity to analyze data. Rigorous statistical standards now govern all aspects of its analytic function, from simple tabulations to the most sophisticated multivariate analyses.[3] The Center routinely applies procedures for quality control to all of its surveys, which include analyzing data quality, eliminating unacceptable error, and producing methodological and descriptive summary reports before releasing survey data for public use.

Finally, NCES has greatly expanded and improved its dissemination function. Toward this end, the agency has developed and implemented publication standards that now guide the production of NCES reports and the release of public use data files. A central new feature of the agency's dissemination function has been developing strict policies for protecting the privacy of participants in NCES surveys. The Center not only applies safeguards to the data released to the public but also requires that its analytic contractors follow strict requirements for limiting access to prerelease data files and for maintaining the confidentiality of survey respondents. Failure to adhere to these requirements carries stiff fines, as well as the possibility of imprisonment.

Operating Principles

In carrying out these core functions, NCES adheres to three operating principles:[4]

1) Produce information that is policy relevant, while maintaining strict impartiality, institutional independence, and neutrality with respect to programmatic effectiveness;

2) Maintain credibility with users of its data, analysis, and publications; and

3) Maintain trust among those who provide data, including individuals, institutions, and public and private agencies.

NCES's program of work must be guided by the issues and requirements of public policy and federal programs, while scrupulously avoiding specific policy recommendations or identification with particular policy agendas or ideological perspectives. This principle is perhaps easiest to achieve when the Center performs its responsibilities for providing data to others for analysis or when it produces tabulations and descriptive reports. When NCES engages in analysis or interpretation, however, it must exercise greater care to remain policy neutral while still contributing relevant information to policy debates.

NCES adheres to three operating principles:

1. ***Produce information that is policy relevant.***
2. ***Maintain credibility with users of its data.***
3. ***Maintain trust among those who provide data.***

Attention to this principle has important implications for charting future directions for NCES. The suggestions that the Center address more immediate, specific policy concerns and that it develop survey designs more strongly suited for evaluation of what works could lead it beyond the boundaries of policy relevance into policy statements and evaluation. This, in turn, could jeopardize its position of impartiality. Deriving greater policy benefit from data and information produced by NCES, therefore, must proceed with great care.

Attention to this first principle also contributes to realizing the second, credibility with users of NCES data and information. However, credibility depends on more than policy relevance and impartiality. It also derives from confidence in the rigor of survey design, the quality of the data, the strength of analysis, and the accessibility and usability of its products, publications, and services. Here again, as NCES considers making greater use of data collected and maintained by others, it will need to guard against undermining its credibility with users who now depend on the Center's increasing emphasis on methodological rigor and data quality.

Finally, the success of NCES as an information agency rests on the trust it engenders among those who supply it with data. Protecting the privacy of survey participants is a key aspect of maintaining this trust, and integrating new types of data into national surveys will pose challenges for assurances of confidentiality. Use of video and audio data—for example, taping teachers in the classroom—will require close scrutiny of this issue. Confidentiality, however, is not the only condition for securing trust among data providers. Suppliers of data also need to be confident that the information being requested is truly needed, that it will be tabulated and analyzed accurately, and that providers will be given opportunities to correct errors or clarify ambiguities. Pressures for greater timeliness or more direct electronic access to decentralized, raw data files may undermine the confidence of data providers in the absence of explicit attention to new strategies and safeguards.

Program of Work

NCES has organized its current program of work around seven major topics:[5]

- Elementary and Secondary Education
- Postsecondary Education
- Educational Assessment
- National Longitudinal Studies
- International Comparative Studies
- Vocational Education
- Libraries

Information on each of these topics is produced from a variety of surveys and studies, several of which supply data to more than one topical area. Some of the surveys, such as the CCD (on elementary and secondary schools and school districts), are designed as a census of the universe of respondents, which then serves as a sampling frame for more in-depth cross-sectional or longitudinal surveys on smaller samples of the population. The Schools and Staffing Survey (SASS), for example, collects detailed information on teachers and administrators in a sample of schools drawn from the CCD.[6] In other instances, a large comprehensive survey provides the basis for a more intensive study of a subset of respondents. In this vein, the National Postsecondary Student Aid Study (NPSAS)—a nationwide survey of students enrolled in postsecondary institutions—provides the basis for more targeted longitudinal studies of students who are starting postsecondary education, the Beginning Postsecondary Students (BPS) Longitudinal Study, and of students who have completed a baccalaureate degree or higher, the Baccalaureate and Beyond (B&B) Longitudinal Study.

Central to the NCES program of work are various surveys and studies designed to assess the knowledge, skills, and performance of American students. For instance, the National Assessment of Educational Progress (NAEP), which conducts assessments of reading, mathematics, writing, science, history, and geography for samples of students enrolled in elementary and secondary education,[7] is probably the best known of these efforts. In addition to NAEP, NCES also provides other data on student performance through transcript studies (at both the secondary and postsecondary levels); through the National Adult Literacy Survey, which examines adults' ability to use prose, documents, and mathematics in a variety of commonplace daily activities; and through international assessments that provide comparative information about student performance in the United States relative to that of other countries.

Finally, the Center conducts several long-term longitudinal studies designed to track students' paths through school and into subsequent stages of working and family life. These have included such studies as the 1980 High School and Beyond (HS&B Study), the National Education Longitudinal Study of 1988 (NELS:88), and the Early Childhood Longitudinal Study (ECLS), which is still in the planning and testing stage and is expected to begin with a kindergarten class in school year 1998–99.

These surveys now contribute to approximately 100 publications that NCES produces each year, including descriptive reports, analysis reports, methodological reports, issue briefs, and a variety of other documents. Three of these documents—the *Digest of Education Statistics*, *Projections of Education Statistics*, and *The Condition of Education*—annually provide a broad national overview of education at all levels in the United States.

In summary, during the past 10 years, NCES has been engaged in a process of steady development and improvement. In 1996, NCES is a viable and credible statistical agency, applying high standards to the provision of information on the condition of education in the United States and the nation's progress toward improving mastery of knowledge and skills among all its citizens. With this strong foundation, the agency is now well positioned to pursue some new directions that will enhance its ability to produce important information for policy, research, and practice in American education.

NEW DIRECTIONS IN INFORMATION FOR POLICY, RESEARCH, AND PRACTICE

In considering how NCES can best chart a course over the next decade that will capitalize on the foundation of work already in place, it is useful to consider its contribution to three domains of education: policy, research, and practice. These domains are by no means mutually exclusive; in fact, they overlap and interact in important ways. There are, however, information needs that are either unique or more dominant in each, and it is therefore instructive to consider the following questions individually:

- How can NCES best contribute information to discussions of education policy at the national, state, and local levels?
- How can NCES contribute information that will support significant research on education effectiveness and improvement?

- How can NCES contribute information that supports practice—i.e., the "front-line" activities that develop knowledge and skill in the nation's students?

A fourth question constantly weaves through these first three: what advances in methodology and technology can assist NCES in providing useful information to each of these domains? This section addresses each of these four questions in turn.

Information for Policy

The agenda of NCES is, in the first instance, greatly influenced by public policy issues and the requirements of federal, state, and local programs affecting education. Information contributing to policy debates can assume at least three major forms:

1) *System indicators* that describe the functioning of the education enterprise, broadly and over the long term;

2) *Implementation indicators* that describe the breadth and depth of the execution of policies and practices; and

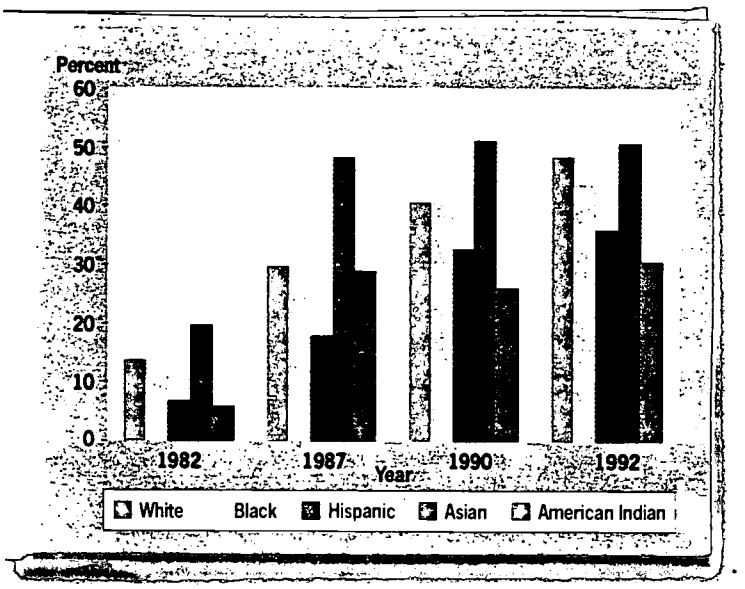
3) *Effectiveness indicators* that describe the results achieved by students and educational institutions and programs.

Although system indicators have been a long-standing focus of NCES, there are potentially important new developments for the agency to consider. NCES surveys have included information on the implementation of some generic policies and practices, but specific federal and state policy initiatives have not been examined. Surveys have also included measures of student outcomes—the NAEP is the best known example; however, these measures typically cannot be directly linked to particular policies or educational practices to permit rigorous assessments of effectiveness. What are some possible new directions for NCES to consider with respect to each of these three types of indicators?

System Indicators

Data that portray the major aspects of the American education enterprise, both cross-sectionally and over time, form the core of the mission and functions of NCES. Reporting basic descriptive information on students, faculty and other staff, institutions and governing districts, and education finances must continue to be the primary focus of NCES and should not be compromised by new initiatives. The authors contributing to this examination of new directions for NCES are unanimous on this point: the primary purpose of NCES is and should remain representatively describing and documenting the condition of education in America and other nations.

PERCENTAGE OF HIGH SCHOOL GRADUATES WHO EARNED THE RECOMMENDED UNITS IN CORE COURSES, BY RACE/ETHNICITY: 1982, 1987, 1990, AND 1992



SOURCE: U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 1995*, Washington, D.C., 78–79.

This basic description of the education system can, of course, be improved, and several of the papers included in *From Data to Information: New Directions for the National Center for Education Statistics*, offered suggestions.[8] Among the kinds of system information the authors would like to see developed are the following:

- Detail on curriculum content, including rigor and substance;
- Detail on the nature and frequency of particular teaching practices, especially those which research indicates are effective;
- Attention to the nature and frequency of student behavior that reflects engagement in learning;
- Resource allocation at the institutional and classroom level;
- Measures of teacher quality and the ways in which teachers apply their knowledge and skills in the classroom;
- More contextual information on postsecondary institutions, especially their objectives in awarding student financial aid and improved coverage of proprietary institutions;
- More attention to the interaction between education and work; and
- More attention to governance issues, particularly new organizational and oversight arrangements.

In many respects, these recommendations represent requests for "finer grain" in the descriptive data presently collected by NCES. In some instances, this aim can be accomplished by asking for more detailed information; in other instances, collecting and reporting existing data at lower levels of aggregation (the classroom, for example, rather than the school or school district) will be necessary.

Implementation Indicators

The widespread attention on education reform during the past 10 to 12 years has spawned a number of new policy initiatives at the national, state, and local levels. Congress periodically revises such mainstay education legislation as the Elementary and Secondary Education Act, the Higher Education Act, or the Individuals with Disabilities Education Act. Additionally, it undertakes new education policy initiatives such as GOALS 2000 or the School-to-Work Opportunities Act. States have also initiated many new policies to strengthen elementary, secondary, and postsecondary education. These have included changes in the requirements for high school graduation, new teacher certification regulations, modifications to postsecondary admissions standards, and new policies on college tuition and student financial aid.

Traditionally, NCES has not monitored the implementation of specific federal or state legislation. At the national level, Congress has typically provided for independent assessments or evaluations of education legislation, such as the National Assessments of Vocational Education, which have been conducted approximately every 5 years. While these national assessments make extensive use of NCES data, they also conduct independent surveys that focus more particularly on key features of the legislation being examined.

Several of the authors involved in this project have urged NCES to monitor some of the key policies and practices that have emerged from federal, state, and local legislation during the 1980s and 1990s.[9] It should be emphasized that they are not recommending that NCES assume responsibility for evaluating particular legislation, because they believe this function should continue to rest elsewhere. Rather, they are urging NCES to examine policies and practices that became more generic as they have been adopted and implemented through various federal, state, and local initiatives and are, therefore, no longer associated with any single piece of legislation. Some specific examples include the following:

- Curriculum content standards and measures of student or institutional performance;
- Length of the school day or year;
- Requirements that students complete particular courses (for example, in math, science, or foreign language) or accumulate a minimum number of credits for graduation;
- Participation in a variety of "work-based" learning opportunities, including apprenticeship, cooperative education, tech-prep programs, or school-based enterprise;
- Operation of charter schools;

- Prevalence and nature of home schooling;
- Availability and use of school choice;
- Participation in reform networks, such as the Coalition of Essential Schools, Accelerated Schools, or *High Schools That Work*;
- Changes in affirmative action policies;
- Changes in postsecondary admission requirements;
- Prevalence of state takeovers of local school districts or other forms of state intervention in financially troubled localities; and
- Changes in state policies affecting postsecondary tuition or student financial aid.

More attention to such issues by NCES would help ensure that its data are policy relevant, while still leaving responsibility for policy evaluation to independent studies and other agencies in the Department of Education.

Effectiveness Indicators

> ***In the current environment, policy analysts often face a frustrating choice: asking the right question with weak methodology and data that were not collected specifically for that purpose, or asking a much less important question with sound methodology and specially tailored information.***

In addition to information on how to implement policies and practices, policymakers would also like better information on their effectiveness. Even though it is useful to know how widespread the adoption of a particular strategy for improving education has been, it is even more useful to know how well it has worked, and why or why not. This, of course, is a primary aim of most policy evaluation, as well as many research projects.

Much of the credibility of NCES rests on its clear separation from policy evaluation and research on education impacts and outcomes. Although NCES contributes essential data and information to these efforts, it remains well removed from the conduct of any of these activities. This separation of functions contributes to the neutrality and objectivity that NCES must maintain as the nation's primary statistical agency for education. The impartial character of NCES must be preserved. Consequently, any initiative to make NCES surveys more conducive to assessments of policy effectiveness must proceed with great care.

Why consider such a course at all? First, there is potentially a substantial payoff from better integrating the nationally representative features of NCES surveys

with the more rigorous but also more narrowly circumscribed designs of policy impact studies. In the current environment, policy analysts often face a frustrating choice: asking the right question with weak methodology and data that were not collected specifically for that purpose, or asking a much less important question with sound methodology and specially tailored information.[10] Clearly, answering important questions with sound methods and precise information is more likely to improve education and the policies that support it. Combining the representative power of national surveys with the methodological rigor of experimental design would help realize this objective.

The primary benefit of integrating methodologically rigorous effectiveness assessments with nationally representative surveys lies in increasing the usefulness of these two activities beyond the results obtained when they are conducted independently.

Second, there may be significant cost savings from integrating some impact evaluations with national surveys. Both kinds of efforts are quite costly. It is not unusual for a national survey to cost in excess of $10 million, and the more rigorous policy evaluations adopting experimental design frequently cost as much or more. Both efforts often collect similar kinds of data at approximately the same points in time, sometimes even from the same respondents. Eliminating this duplication would not only reduce costs but also alleviate some of the burden on respondents participating in national surveys and evaluations.

Cost savings aside, the primary benefit of integrating methodologically rigorous effectiveness assessments with nationally representative surveys lies in increasing the usefulness of these two activities beyond the results obtained when they are conducted independently. National survey data would more directly and authoritatively address questions about policy effects; impact studies would be conducted in a nationally representative context that would increase the likelihood that study results could be generalized.

To achieve this result, NCES should carefully consider piloting the inclusion of an experimental study in one of its national surveys. Any of the longitudinal surveys now under way are potential candidates, including SASS, ECLS, or the longitudinal spin-offs of NPSAS.

What should be the focus of experimental studies imbedded or linked to national surveys? Clearly, the choice must be considered carefully, with ample input from interested policymakers, researchers, and educators. Given the mission of NCES, focusing on a particular type of educational practice would probably be more appropriate than on an assessment of a specific legislative program. One possibility, for example, would be to conduct a careful study of the consequences of homogeneous versus heterogeneous grouping of students by academic ability.[11]

Information for Research

Researchers are heavy users of information produced by NCES, and while the boundaries between policy and research are fuzzy, the interests of the research community deserve some separate attention. In the papers produced for this project, three themes emerged as priorities for focusing NCES's contribution to research over the next decade:

1) Teaching and Learning—illuminating more clearly what actually happens in the classroom;

2) Education Production—clarifying the processes of transforming education resources into student, program, and institutional outcomes; and

3) Education Outside the Classroom—depicting what and how learning occurs beyond the walls of the traditional classroom in homes, workplaces, and the community at large.

Though not exhaustive, this list provides some important directions for NCES to consider. In the next section, each topic will be briefly discussed.

Teaching and Learning

Much of the business of education occurs in the nation's classrooms—elementary, secondary, and postsecondary—yet national surveys presently tell us relatively little about what actually takes place at the classroom level. Currently, good information is available about the different types of courses taught (at both the secondary and postsecondary levels), but there is little or no nationally representative detail on the content of the curriculum or how it varies among classrooms, institutions, or states. Similarly, not much data are available on teaching practices, either the range of strategies adopted by faculty or the frequency of their use. Finally, most surveys do not offer much description of what students do to facilitate or impede learning in the classroom.[12]

While richer information on these three aspects—curriculum, pedagogy, and student behavior—would be useful in and of itself, the greatest benefit to research is likely to be achieved when information on all three is simultaneously available at the individual classroom level. That is, ideally researchers would want to examine how these three aspects of classroom activity interact and to understand how they relate to various types of education outcomes. In this way, more can be learned about what works and why in the daily business of education.

To realize this objective, one implication for future NCES surveys is clear: survey designs need to pay more attention to using the classroom as a unit of analysis. Additionally, the designs should strive to produce an *integrated* package of infor-

mation on curriculum content, teaching practices, student behaviors, and student learning outcomes. It is not sufficient, for example, to simply expand transcript studies to include more information on course content; rather, expanded information on course content must be linked to other data on teaching practices, student behavior, and student achievement.

One implication for future NCES surveys is clear: survey designs need to pay more attention to using the classroom as a unit of analysis. Additionally, the designs should strive to produce an integrated package of information on curriculum content, teaching practices, student behaviors, and student learning outcomes.

In addition to the question of what kinds of information on classroom activity can best advance future research, there is also the issue of how best to collect it. Traditionally, to obtain data on classroom activities, NCES has asked respondents questions through paper questionnaires or telephone interviews. Thus, to the extent that current surveys yield information on teaching practices or student behavior, they rely mainly on self-reports.

An alternative to collecting information through respondent self-report is direct observation by trained researchers. Until recently, direct observation has been a very expensive alternative, indeed prohibitively so for large-scale surveys involving thousands of respondents. However, recent technological and methodological advances are making direct observation, as well as the collection of source materials, more feasible.[13] Video is one of the most promising strategies for linking direct observation to more traditional survey techniques, and NCES is using this technique for the first time in designing the Third International Math and Science Survey (TIMSS).[14]

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Video, of course, is not an especially new technology. What is new, however, is its rapidly growing capacity to store large amounts of video information inexpensively in digital form that enables fast retrieval and analysis. Additionally, researchers are making steady progress in developing analytic techniques that simplify and accelerate transforming video information into coded data suited for analysis using quantitative methods. Video, therefore, can add significantly to the richness and analytic potential of a survey, since it reduces the need to anticipate all of the questions the survey must ask of respondents. As researchers observe video records, they can formulate completely new variables that may not have been considered in the design phase of the survey. In the past, such new formulations usually required asking respondents follow-up questions or designing a new survey, if such avenues were pursued at all.

Expanding surveys to include systematic collection of prequantified visual, textual, and even auditory information could produce significant new contributions to research on teaching and learning.

Closely related to this kind of use of video technology is the increasing capacity to collect, store, and analyze large amounts of textual information. For example, if researchers need better information on the content of textbooks or other printed materials used in classrooms, it is now possible to optically scan samples of these classroom documents for subsequent coding and analysis. As with video images, electronically storing and retrieving large amounts of textual information is relatively inexpensive.

These advances in storing and analyzing large amounts of what is essentially "prequantified" data promise to integrate survey research with case study methods, and represent research strategies that until now have been pursued independently of one another, each with its own strengths and weaknesses. This integration has the potential to link the representative statistical power of survey design with the richness and variety of case study information, simultaneously obtaining the best of both worlds.

Expanding surveys to include systematic collection of prequantified visual, textual, and even auditory information could produce significant new contributions to research on teaching and learning. Consequently, NCES should carefully consider how best to capitalize on its initial experience with this strategy in TIMSS, with special attention to adapting the approach to other surveys such as SASS, ECLS, or the longitudinal spin-offs of NPSAS. Additionally, the use of video in national surveys might prove especially beneficial if it were initially combined with efforts to imbed experiments in national surveys. The combination of these two methods targeted on analyzing the effectiveness of particular teaching interventions, for example, could yield very useful and robust results.

Education Production

Better understanding the interactions among curriculum, pedagogy, and student behavior in the classroom is an important piece of a larger set of research questions—how dollars are allocated (to localities, institutions, and classrooms), transformed into various resources, organized into programmatic and teaching strategies, and used to produce increases in students' knowledge and skills. In short, NCES data could play a much more significant role in expanding knowledge about how to better use education resources to improve student performance, thereby improving the overall process of education production.[15]

Achieving this goal will require some changes in the way NCES currently collects data on the financing of elementary, secondary, and postsecondary education. At present, there are two main surveys collecting financial data, CCD at the elemen-

tary and secondary level and IPEDS at the post-secondary level.[16] With respect to financial information, both of these surveys focus primarily on providing detail on revenues and expenditures, for local school districts in the case of CCD and for individual institutions in the case of IPEDS. Both surveys are designed to collect financial data primarily from an accounting perspective and are not now well suited for cost-benefit analysis of educational programs or cost-effectiveness analysis of particular teaching strategies. Neither provides information on the allocation of resources at the classroom level.

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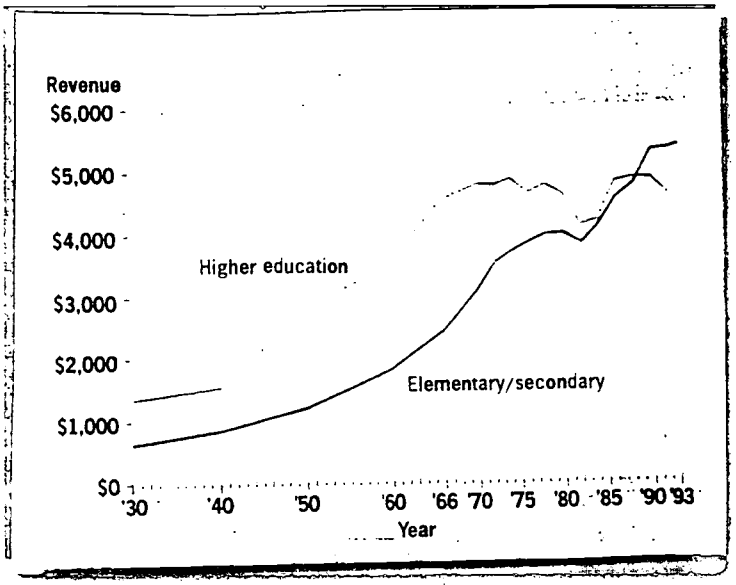
Providing data that better inform understanding of the production process of education would be aided by NCES expanding its present focus on finance to embrace a broader concentration on the economics of education. This larger conception would aim to integrate data on finance with other data on education processes and practices, as well as student outcomes. Additionally, new kinds of economic data would be required. Rather than needing more detail on expenditures for such general functions as administration, instruction, maintenance, or capital outlay, researchers would want to obtain data on the costs of specific types of staff, different kinds of school improvement strategies, alternative teaching strategies, and so on. They would also want to know more about the costs of different kinds of course content, equipment, instructional products, and assessment. In short, rendering the process of education production more intelligible depends on moving beyond traditional concerns about the distribution and expenditure of dollars to a more careful examination of how to transform dollars into effective teaching and learning in the classroom.

Three strategies for improving NCES data on education finances would help accomplish this goal. First, what constitutes useful financial data needs to be reconsidered, with special attention to better information on unit costs and transforming dollars into education processes and practices. Second, data will be needed at the classroom

PUBLIC EDUCATION REVENUE PER STUDENT, 1930–93



SOURCE: U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 1995*, Washington, D.C., 148–49.

level; information on districts or institutions is not likely to contribute much to this kind of research. Third, it must be possible to link these financial data to other data on teacher characteristics, classroom practices, student demographics and behavior, and learning outcomes. Without this kind of integrated data about how education occurs, understanding more precisely how to efficiently allocate resources for education will continue to elude researchers and policymakers.

Education Outside the Classroom

Although elementary, secondary, and postsecondary classrooms are the centers of formal education in America, it is widely understood that much learning also takes place outside the classroom in the home, the workplace, and the community at large. However, we know relatively little about what or how learning occurs in these settings, nor do we know much about how learning in these places interacts with learning in the classroom. Moreover, given that most Americans spend only 12 to 16 years in formal schooling but another 50 years or so learning in these informal environs, a thorough description of the condition of education in America would require closer attention to the learning that transpires beyond classroom walls.

Although elementary, secondary, and postsecondary classrooms are the centers of formal education in America, it is widely understood that much learning also takes place outside the classroom in the home, the workplace, and the community at large. However, we know relatively little about what or how learning occurs in these settings.

NCES surveys have already paid some attention to nonschool settings. At the present time, probably the largest of such efforts is the Early Childhood Longitudinal Study (ECLS), which will begin by focusing on the preschool lives of a cohort of children who will be followed over their early years of development. Additionally, other longitudinal studies, such as HS&B and B&B, have collected data on respondents' experiences in the workplace. Information on labor market participation, however, has been limited primarily to data on types of labor market outcomes—for example, earnings, duration of employment, and types of occupation—rather than systematically examining how learning occurs in the workplace or the degree of congruence between learning goals in schools and education requirements on the job.

Comprehensively surveying learning that occurs outside the classroom is a tall order, and NCES should approach this task incrementally. One place to focus an expanded examination of informal learning is on the workplace and the strategies adults use to maintain and upgrade the knowledge and skills needed to remain productive, actively engaged workers.[17] Such a focus is more important than ever, given the changes that are occurring in today's work world. These changes include not only rapidly developing new technologies but also major shifts in the

attachments and relationships between employers and employees. As the likelihood of lasting employment with a single employer becomes increasingly tenuous in the modern economy, individuals must assume ever greater responsibility for nurturing their own careers and continuing employability. How working adults will meet this responsibility in the future poses important new challenges for the nation's systems of education.

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Increased attention to learning through and for work could begin with the following steps. First, it is important to learn more about the knowledge and skills needed for long-term success in the labor market. Are these requirements consistent with the academic and vocational goals of formal education, and how well does the formal education system produce the desired prerequisites? Second, NCES could pay closer attention to how learning occurs in the workplace; whether the process differs in important ways from learning in the classroom, and whether the two complement or reinforce one another. Third, NCES could enrich work-related data in its current longitudinal surveys, concentrating especially on better information about what people do on the job, what contributes to their successes and failures, and how they use or do not use school-based learning to perform and advance.

As part of its own mission, NCES could independently address all three of these issues. Alternatively, the agency may want to explore opportunities for collaborating with the Department of Labor and its surveys of employers and employees. Data collected by the Labor Department tend to provide greater detail on labor market participation, while being relatively deficient on education variables. Better coordination or integration of the two Departments' survey efforts could yield some important benefits.

Information for Practice

Most teachers and administrators are accustomed to viewing data as something to be reported to others. For example, they report daily attendance to central offices to document federal, state, and local funding systems. They submit grades for report cards to students and parents and for recording on student transcripts, which in turn are reported to postsecondary admissions offices. They administer standardized achievement tests for state assessments and college admissions. Rarely, however, do teachers and administrators use data directly themselves to improve their own programs and practices. One consequence of this outlook on data is that most practitioners do not make much use of the information provided by NCES. An important challenge for NCES, therefore, is significantly increasing the value and utility of its data for local teachers and administrators.

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At least three strategies for providing better information for practice offer some important opportunities for NCES:

1) *Benchmarking*—helping local practitioners make comparisons against established norms;

2) *Networking*—linking practitioners with other practitioners and helping them discover more quickly who is doing what and where;

3) *Practitioner-Based Research and Self-Reflection*—engaging practitioners in systematic inquiry through NCES surveys and related research.

Benchmarking

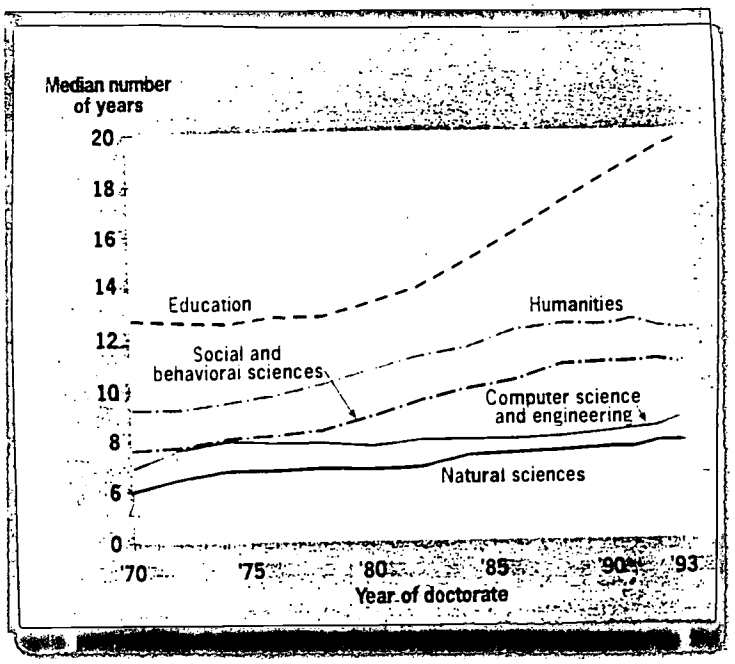
"How well am I performing?" This is an appropriate question for any professional concerned with improving practice and increasing students' mastery of knowledge and skills. For most educators, however, it is a difficult question to answer in any way other than in an impressionistic or anecdotal fashion. Until recently, education has not had enough success with helping schools, programs, and faculty to monitor their accomplishments or to use the results to improve what they do.

Fortunately, as more and more states and localities develop new strategies for tracking performance and promoting school improvement, this situation is changing. "School report cards" are now produced annually in many states. Other states have developed systems of performance measures and standards, along with procedures for school improvement plans in districts that perform below state norms. Moreover, "keeping score" and using the results to assess the relative effectiveness of different kinds of school improvement strategies are core operating principles of several large consortiums, such as *High Schools That Work* under the auspices of the Southern Regional Education Board.

NCES could make an important contribution to the continued development of these practices by improving the utility of its survey results as benchmarks for states and localities interested in knowing how their performance measures up in relation to others. A local school or school district, for example, could find out how well its record on student attendance or high school completion compares with a national or state norm. It could then further refine the comparison by examining such measures in a subset of districts or schools that are similar with respect to size or student demographics. In addition to making comparisons at a particular point in time, a local school or school district might also monitor its relative performance over time. For example, is its success in reducing dropout rates proceeding at a faster or slower pace than in comparable districts or schools?

There is nothing to prevent localities, or even individual teachers, from using current NCES data to establish these kinds of benchmarks. However, they need to work rather hard to do it. Finding the right data is not always easy, nor is determining whether the NCES estimate is comparable with a local statistic. Tailoring an NCES estimate to yield a comparison of "likes with likes" requires a knowledge of NCES data sets, as well as analysis techniques, that most practitioners do not have. Thus, there are significant barriers to transforming NCES data into useful benchmarks at the local level.

MEDIAN TOTAL TIME TO DOCTORATE DEGREES AMONG U.S. CITIZENS AND PERMANENT RESIDENTS, 1970–93



SOURCE: U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 1995*, Washington, D.C., 46–47.

However, there are at least three steps that NCES could take to make benchmarking easier for states and localities. First, in collaboration with potential state and local user-practitioners, NCES could systematically review its current dissemination activities with specific attention to how some aspects of the dissemination process could be modified to facilitate benchmarking. For example, there may be consensus on a relatively small set of indicators that NCES could publish annually in a succinct, accessible form with widespread local distribution. Such a publication might be similar to *The Pocket Condition of Education*, which NCES now produces annually, but it could be designed with local benchmarking specifically in mind.

Second, NCES could explicitly consider local benchmarking when designing selected surveys, including customized reporting of results to survey participants. At present, survey participants receive little or no direct benefit from taking part in NCES surveys, and the burden of doing so is often not trivial. Providing participants with a summary of where they stand on selected variables relative to others in the survey could be a useful service.[18] Such a summary could take the form of a traditional printed report. Alternatively, NCES might want to explore new electronic strategies that could actually distribute some limited analytic capacity along with the data (see discussion below on technological innovations).

Third, as NCES increases its capacity to provide information "on-line," it should consider strategies for developing and distributing analytic packages that enable state and local benchmarking. In other words, instead of simply making data avail-

Three steps that NCES could take to make benchmarking easier for states and localities:

1. **Review its current dissemination activities with specific attention to how some aspects of the dissemination process could be modified to facilitate benchmarking.**
2. **Explicitly consider local benchmarking when designing selected surveys.**
3. **Consider strategies for developing and distributing analytic packages that enable state and local benchmarking.**

able, NCES would also provide a menu of data analysis programs or routines that would enable practitioners to generate their own statistics quickly and easily, without requiring a sophisticated knowledge of the underlying methodology. Such a strategy would build on NCES's current practice of providing users with "table generators," increasing both the kinds of analysis that users could perform and the ease of using the analytic software.

Networking

Local teachers and administrators often want to know who else has experience with a particular school improvement strategy, type of curriculum, or teaching practice. Yet, systematically locating and communicating with other knowledgeable practitioners can be quite difficult; often it is not easy to find out who these individuals are or how to contact them. If NCES were to assume a greater role in monitoring the implementation of more specific education policies and practices (see earlier section on Implementation Indicators), it could also facilitate networking among practitioners. In addition to providing practitioners with information about the frequency with which a particular reform is being implemented and where it is being attempted, NCES could also match up interested parties and help them share information about their experiences.

This kind of knowledge brokering would represent a new function for NCES, one that may not be completely in keeping with traditional perspectives on the appropriate role of a statistical agency. Nevertheless, as NCES develops its presence on the Internet and the World Wide Web, this kind of service would be an obvious extension of its capacity to transform data into information valued by practitioners. Moreover, when providers of data also have a direct use for similar information from others, they are much more likely to respond to NCES's requests in an accurate and timely fashion. Thus, NCES's ability to monitor implementation for policy purposes could well be enhanced by its also using the information to provide an important service to teachers and administrators.

Practitioner-Based Research and Self-Reflection

Until recently, surprisingly little has been known about the specific elements of high-quality teaching (and by extension, high-quality teachers). This lack of knowledge has contributed to much misinformation and misunderstanding about what it takes to be a good teacher, as well as confusion in the public policy

arena over the role of professional development in education reform. The status of national data on teachers reflects this state of affairs, with facts limited mainly to demographic characteristics and scant information available on the quality of practice or practitioners.

A very promising development, therefore, is the recent effort on the part of the teaching profession to begin a systematic, sustained examination of what constitutes good teaching—specifically what teachers should know and be able to do to help students master high levels of proficiency. Exemplified by the work of the National Board for Professional Teaching Standards (NBPTS), as well as other organizations and state-level initiatives, this effort is forging some consensus about appropriate standards for defining advanced high-quality teaching. This work has led to the establishment of a voluntary system of certification for early childhood, elementary, middle, and secondary school teachers, including differentiation among a range of academic disciplines (for example, math, science, history and the social sciences, English, and vocational education).

These developments create an important opportunity for NCES not only to improve the data it gathers on the nation's teachers but also to contribute more directly to strengthening teaching.[19] This opportunity can be realized in two ways. First, as the work on teaching standards and certification continues to evolve, NCES should be able to define a larger array of indicators of teaching quality to include in national surveys. At a minimum, these indicators should focus on measuring teachers' command of the knowledge bases and teaching methods that are being identified as reflective of high-quality practice. Gathering such data could rely on traditional methods of written assessment or self-report. Alternatively, if NCES opts for further developing video observation techniques, these methods could significantly enrich information on the condition of teaching nationwide.[20] Furthermore, as more teachers choose to pursue national certification and as more certificates are awarded, national counts of teachers participating in and successfully completing the process will assume greater value as indicators of teacher quality.

As the work on teaching standards and certification continues to evolve, NCES should be able to define a larger array of indicators of teaching quality to include in national surveys. NCES could actively engage practitioners in this process and create opportunities for more interactive research and development.

Second, as NCES pursues this first strategy for improving data on the quality of practice, it could actively engage practitioners in this process and create opportunities for more interactive research and development. For example, if written examinations (in the style of NAEP) or video observation become part of NCES's strategy for monitoring and reporting to the nation on teacher quality, this process could be designed to simultaneously benefit individual teachers participating in the surveys. This might be accomplished in several ways. The

results of written assessments could be returned to individual teachers. Groups of teachers could be assembled to review and constructively critique video segments. Further, if the data gathering process included collecting mini-portfolios submitted by teachers, these could be systematically evaluated, with examples of best practices culled from the data and disseminated to teachers and teacher education institutions. In short, the business of collecting national data could begin to play a more direct role in professional development and the strategic improvement of teaching and schools.

Further Considerations About Methodology and Technology

Increasing the contribution of NCES to policy, research, and practice depends in part on closer attention to a number of methodological and technological opportunities. Some of these, such as imbedding experimental designs in national surveys or collecting prequantified data through video and optical scanning, have already been discussed. There are some additional considerations, however, that deserve special mention, including: 1) developments in using administrative records, 2) promising techniques for obtaining hard-to-get information or producing more finely tuned estimates, and 3) effective use of the Internet and World Wide Web.

Administrative Records

Much of the information sought by national surveys already exists, at least in an approximate form, in records maintained for administrative purposes by schools, postsecondary institutions, district offices, state agencies, and other public and private offices. Transcripts, for example, provide detailed information on courses attempted and completed, grades, credits earned, and scores from standardized tests. Personnel records contain data on teaching assignments, salaries, demographics, qualifications, and experience. And budget and accounting offices maintain extensive records on revenues and expenditures. To the extent that surveys can access and use these administrative records, they often can obtain information that is more accurate than the responses provided by survey participants, often at significantly less cost.

Several NCES surveys already rely heavily on administrative records for information. Some good examples are CCD, IPEDS, and the NPSAS. There are, however, two types of problems that have limited the usefulness of administrative records. First, the contents of the records may not meet acceptable standards of accuracy, consistency, and comparability. Second, access to administrative records is often problematic, for a variety of reasons ranging from concerns about confidentiality to technical problems that may be as mundane as locating the right filing cabinet in the right office.

Technological advances in computing and electronic networking promise to reduce both of these problems considerably over the next decade, and NCES should be alert to opportunities to exploit new developments.[21] First, electronic administrative records maintained in easy-to-use relational databases will increasingly become accepted practice among the nation's elementary, secondary, and postsecondary education systems,[22] since they will be building administrative databases to satisfy their own needs and uses for data. Consequently, *collecting* data will less often be viewed as an externally imposed burden and cost. Whether *providing* these data to national surveys will be seen as burdensome, however, will depend critically on the ease with which data can be transmitted to those requesting information. To facilitate transmission, NCES will need to pay particular attention to assisting with the standardization of data elements and with the development of cheap scannable forms and other strategies for promoting electronic access and transfer.

Second, as local educators and administrators become more sophisticated users of data (rather than just providers), the business of designing surveys, collecting and analyzing data, and reporting results is likely to become much more interactive. The traditional model in which NCES assumes primary responsibility for all of these functions is likely to yield to much more decentralized, distributed models in which the respective roles of surveyor and respondent become less distinct and more intertwined. For example, respondents who are also users of data may play a much greater role in defining survey questions and data elements. They may also develop specialized analyses (including analytic routines) that are shared with other respondent/users. NCES, in turn, may assume more responsibility for coordinating and brokering surveys, analyses, and reporting, rather than unilaterally directing and conducting all of these activities. One possible implication of these trends is a reversal in the respective roles of independent surveys and administrative records in providing national data for education. To date, administrative records have mainly been adjuncts to large-scale surveys; they have supplemented data collected through written questionnaires or telephone interviews. In the not-too-distant future, administrative records may become the basic building blocks of national data systems, with smaller targeted questionnaires designed as supplements.

One possible implication of these trends is a reversal in the respective roles of independent surveys and administrative records in providing national data for education. Administrative records may become the basic building blocks of national data systems, with smaller targeted questionnaires designed as supplements.

Methods for Producing Better Statistical Estimates

To provide good information for policy, research, and practice, NCES relies on a wide variety of survey design, data collection, and analytic methods—some relatively simple and widely known, others extraordinarily complex or reflecting recent advances in specialized fields. For purposes of this synthesis, a thorough discussion of survey and analytic methods is neither possible nor appropriate. The papers produced for this project, however, raised and discussed a number of methodological issues and developments. Four of these deserve special mention for careful consideration by NCES in charting its future course.[23]

NCES should exploit opportunities to combine well-designed, targeted controlled experiments within the national surveys that have been the hallmark of its data collection activities.

First, as mentioned previously, NCES should exploit opportunities to combine well-designed, targeted controlled experiments within the national surveys that have been the hallmark of its data collection activities. These experiments must be compatible with the mission and conduct of the larger survey effort, and a particular experiment should not be undertaken if it risks jeopardizing the nationally representative and descriptive power of the survey in which it is imbedded. However, if these criteria can be satisfied, imbedded experiments are promising examples of constructing a "whole exceeding the sum of its parts." Such experiments could contribute significantly to knowledge about what works and why in the nation's classrooms.

Second, survey questions that elicit information on sensitive topics must always be considered with great care. National surveys about education are no exception, and it is important that NCES does not avoid issues simply because they are sensitive or controversial. Methodological developments can help reduce some of the concern surrounding this issue. For example, one promising strategy called "network-based estimating," in which respondents are asked about the behavior of unidentified acquaintances in their social network, has been developed by quantitative anthropologists. There is growing evidence that this procedure produces indirect but reliable information on sensitive topics, without depending on the respondent to report directly on his or her own personal experience. NCES should explore the feasibility of using this or similar techniques in future surveys.

There are promising new developments in methods for generating indirect estimates of statistics at subnational levels or for intervening periods of time between surveys.

Third, and related to the second issue, there are promising new developments in methods for generating indirect estimates of statistics at subnational levels or for intervening periods of time between surveys. Traditionally, producing estimates for smaller units of analysis—states, for

example, or institutions within states—has depended primarily on increasing sample size. Similarly, obtaining estimates more frequently—say, every 5 years rather than every 10—typically requires administering the survey more frequently. Both of these strategies are usually quite expensive. An alternative method being developed uses auxiliary data (from ongoing administrative records, for example) along with the survey data to produce indirect estimates for smaller units of analysis or intervening periods of time. Successfully adapting these techniques to some NCES surveys could yield more finely grained estimates at a modest cost.

If NCES were able to significantly improve the connections between its surveys, it is likely that opportunities for better, more focused research would be enhanced.

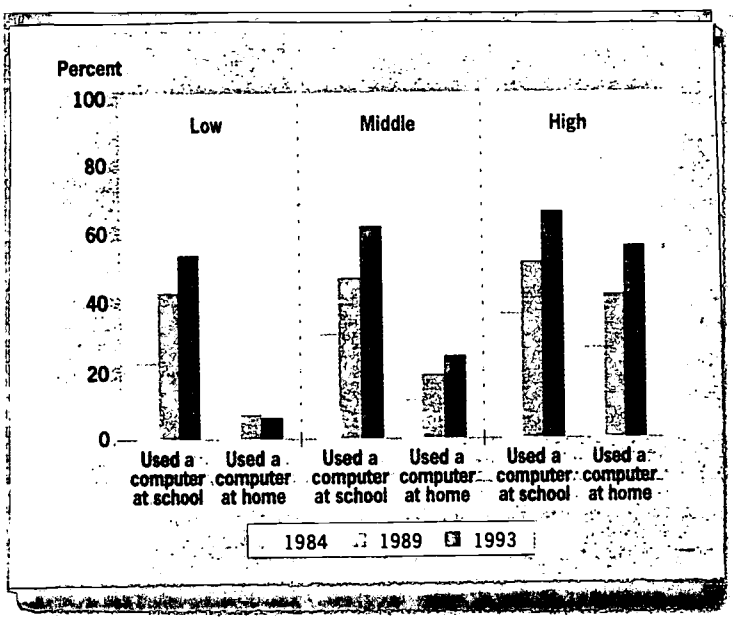
Fourth, there are long-standing calls for better linking and integrating the databases produced by NCES surveys. As noted earlier, a better understanding of how learning occurs in the classroom will require simultaneous access to data on curriculum content, teaching practices, student behavior, and student outcomes. It has been rare to find a single database with rich information on all of these attributes for a sufficiently large sample, however. If NCES were able to significantly improve the connections between its surveys, it is likely that opportunities for better, more focused research would be enhanced. However, in order to achieve this long sought-after objective, NCES must do substantial work, both conceptually and methodologically, to determine precisely what is meant by "linking" and "integrating."

Finally, NCES must continue to actively promote methodological developments and adaptations suited to its mission. Most researchers, whether engaged in a particular substantive pursuit or methodological advancement, are occupied primarily with their own interests and agendas; they are not paying much attention to the relevance of their work for NCES. Consequently, NCES needs to provide for the orderly acquisition and screening of methodological and technological applications to surveys and analysis. There are many strategies for doing this, including advisory groups, grants, conferences, commissioned papers, and so on. Whatever strategy is chosen, however, the basic objective must be an explicit and high-priority item on the agenda of NCES.

Internet and the World Wide Web

No discussion of future technological developments would be complete without some mention of the Internet and the World Wide Web.[24] However, the pace and variety with which these are evolving make any effort to forecast precisely their role in the work of NCES quite difficult, if not simply foolish. Perhaps, the most useful approach is to use the evolution of the information highway as a metaphor

PERCENTAGE OF STUDENTS WHO USED A COMPUTER AT SCHOOL OR AT HOME, BY FAMILY INCOME AND YEAR, GRADES 7–12: 1984, 1989, AND 1993



SOURCE: U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 1995*, Washington, D.C., 34–35.

for changes in communication and interaction between NCES and the public it serves. In some respects, the Internet and the World Wide Web will facilitate and hasten these changes, but in others, they are simply reflective of larger forces at work in contemporary society.

Presently, NCES is in the second stage of a three-stage evolution in how many organizations typically interact with their clients. In Stage One, to accomplish its mission, NCES dominates the relationship between itself and those who either provide or use the data it gathers. Communication tends to be mainly one-way and follows well-established paths. NCES designs the surveys, administers questionnaires or interviews, collects and cleans data, conducts its own analysis, and produces and disseminates reports. Other analysts of NCES data pursue their research independently; they do not feed back results to NCES, at least in any systematic fashion. Stage One loosely represents the pre-Internet, pre-Web world. It is history.

In Stage Two, which coincides with the advent and initial development of electronic networks, relations between NCES and providers and users of data become more interactive (though still predominantly one-way), and in some instances the distinction between data provider and user begins to blur. In this stage, surveys begin to make more use of electronically stored administrative records, and, consequently, questions or data elements may be tailored to a particular respondent. Selected providers and users may be authorized limited on-line access data to update or correct information. Although NCES continues to generate substantial analyses on its own, it also begins to pay closer attention to the analytic objectives of users. In addition to distributing data files, it also disseminates analysis files designed to facilitate specific types of research—the relationship between education and labor market participation, for example. Additionally, NCES may provide analysts with software to accelerate their analyses or to ensure that those who conduct external analyses of NCES data adopt appropriate statistical techniques. Reports are made available in electronic form, and specialized electronic user groups or technical review panels begin to form on the network. Currently, NCES is already well immersed in Stage Two.

In Stage Three, which will emerge more clearly and strongly with greater access to electronic networks and with deeper understanding about how to use them effectively, relationships between NCES and its data providers and users will become truly two-way and continuous. Any data user, who could also be a data provider (a state office, for example), might send NCES a small software program that initiates a customized database search, adds the results to NCES's data library, and returns a tailored report to the original requester. Conversely, NCES may be constantly developing small software programs that go out over the network and retrieve data needed to respond to specific inquiries from Congress, researchers, educators, or the public at large.[25]

Even though NCES will probably still produce many of its own reports, electronic versions of these documents will contain numerous electronic links to other data sets, technical references, and related reports. They may also contain interactive software that will permit users to perform "what if" analyses while perusing a report and to generate customized tables or graphics.

Surveys may assume the form of database development, with specifications designed interactively by users and providers coordinated by NCES. The scale of written questionnaires or telephone interviews will diminish considerably or be limited to highly focused inquiries. Much of this design process will occur on-line through electronic conferencing among NCES, data users, and data providers. Even though NCES will probably still produce many of its own reports, electronic versions of these documents will contain numerous electronic links to other data sets, technical references, and related reports. They may also contain interactive software that will permit users to perform "what if" analyses while perusing a report and to generate customized tables or graphics. Alternatively, users will generate their own electronic reports and analyses and create links to NCES documents residing in electronic networks. Precisely what is generated by NCES and what is generated by others may become less easy to distinguish.

Stage Three is not here yet, and it will probably look quite different from this admittedly inchoate prediction. However, this stage will probably arrive much sooner than expected. The more NCES can anticipate and help shape these developments, the more likely it will be able to use them effectively to report on the condition of education in the United States and other countries.

CONCLUSION

From data to information—transforming quantitative facts about education into knowledge useful to policymakers, researchers, practitioners, and the general public—this aim has always been central to the mission of the National Center for Education Statistics. In and of itself, this objective is not a new direction for the agency. However, what constitutes useful information and how it gets produced, distributed, and used are changing. To keep pace with these changes, indeed to stay out in front and help shape their development, NCES must chart some new directions.

The most fundamental change that NCES will need to address is its emergence as a provider of information services and systems, rather than a primary collector and provider of data per se.

Probably the most fundamental change that NCES will need to address is its emergence as a provider of information *services and systems*, rather than a primary collector and provider of data per se. In today's climate of growing demands for information, but limited resources to produce it, NCES will need to pay particular attention to assuming new roles as a facilitator, broker, translator, linkage, filter, and pathfinder in a complex web of providers and users of education data. To these new roles, the agency can bring a strong foundation of standards for high-quality data and analysis, as well as a firm understanding of the kinds of information that are most relevant to deliberating national policy for education.

As these new roles develop, NCES may find itself shedding or at least de-emphasizing old functions. Data collection that occurs independently of front-line administrative and teaching systems and their own information needs is likely to diminish significantly. This change, in combination with technological advances, may lead to data collection systems that are far more decentralized, interactive, and operating in "real time" than the systems that have traditionally supported national surveys. It is even possible that eventually NCES may find that it is no longer in the data collection business, as this function has traditionally been defined. Instead, it will be primarily a systems manager and analyst, a producer and broker of information for ongoing nationally oriented assessments, as well as thousands of state and local customized queries. Data collection and storage, however, may occur largely outside of the immediate domain of NCES.

Data collection that occurs independently of front-line administrative and teaching systems and their own information needs is likely to diminish significantly.

"Reporting statistics and information showing the condition and progress of education in the United States and other nations in order to promote and accelerate the improvement of American education" — this charge is a lasting mission for the National Center for Education Statistics. Fulfilling it successfully will require careful attention to changing national priorities, a strong commitment to improving education research and practice, and an openness to recognizing and adopting important advances in methods and technology.

NOTES

1. U.S. Department of Education, National Center for Education Statistics, "Common Core of Data" and "Financial Statistics of Institutions of Higher Education," surveys and unpublished data, FY 94–95.

2. Section 402(b) of the National Education Statistics Act of 1994 (20 U.S.C. 9001).

3. Indeed, there are now standards for all of NCES major activities—survey planning and testing, statistical processing, data provision and analysis, evaluation and documentation, and contract management and operations. See U.S. Department of Education. 1992. *NCES Statistical Standards*. Washington, D.C.: National Center for Education Statistics.

4. These follow the principles for a federal statistical agency developed in Martin and Straf, eds. (1992).

5. For a full description of the current program of work at NCES, see U.S. Department of Education. 1995a. *Programs and Plans: 1995 Edition*. Washington, D.C.: National Center for Education Statistics.

6. SASS also surveys private school teachers in a sample of schools drawn from the Private School Universe file maintained by NCES.

7. At present, legislation requires that NAEP assess reading and mathematics every 2 years; science and writing at least every 4 years; and history, geography, and other subjects determined by the National Assessment Governing Board at least every 6 years.

8. In particular, see the following papers in *From Data to Information: New Directions for the National Center for Education Statistics*, ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996): D. Brewer and C. Stasz, "Enhancing Opportunity to Learn Measures in NCES Data," pp. 3-1–3-28; D. Mandel, "Teacher Education, Training, and Staff Development: Implications for National Surveys," pp. 3-29–3-42; M. McPherson and M. Schapiro, "Tracking the Costs and Benefits of Postsecondary Education: Implications for National Surveys," pp. 6-1–6-12; D. Breneman and F. Galloway, "Special Issues in Postsecondary Education and Lifelong Learning," pp. 6-13–6-28; P. Cappelli, "Education and Work: Curriculum, Performance, and Job-Related Outcomes," pp. 8-1–8-34.

9. See especially the following papers in *From Data to Information: New Directions for the National Center for Education Statistics*, ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996): J. Jennings and D. Stark, "Tracking Education Reform: What Type of National Data Should Be Collected Through 2010?" pp. 2-1–2-11; C. Cross and A. Stempel, "Where Are We Going? Policy Implications for Data Collection Through 2010," pp. 2-12–2-18.

10. See the following papers in *From Data to Information: New Directions for the National Center for Education Statistics*, ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996): C. Metcalf, "Incorporating Experimental Designs Into New NCES Data Collection Methodologies," pp. 5-1–5-18; R. Boruch and G. Terhanian, "'So What?' The Implications of New Analytic Methods for Designing NCES Surveys," pp. 4-1–4-115.

11. See the discussion in Boruch and Terhanian, "'So What?'." These authors also suggest that NCES consider adopting a "satellite" policy that would permit including controlled experimental studies in national surveys in a fashion similar to the way NASA allows adjuncts to space missions for astrophysicists and others.

12. See Brewer and Stasz, "Enhancing Opportunities," and Mandel, "Teacher Education."

13. For a summary of trends in technological capacity to store, retrieve, and analyze data, see G. Ligon, "New Developments in Technology: Implications for Collecting, Storing, Retrieving, and Disseminating National Data for Education," pp. 9-32–9-65 in *From Data to Information: New Directions for the National Center for Education Statistics,* ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996).

14. See J. Stigler, "Large-Scale Video Surveys for the Study of Classroom Processes," pp. 7-1–7-29 in *From Data to Information: New Directions for the National Center for Education Statistics,* ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996).

15. See McPherson and Schapiro, "Tracking the Costs."

16. While SASS provides additional data on salaries of administrative and instructional personnel at the elementary and secondary level, NPSAS provides additional postsecondary information on tuition and costs.

17. See Cappelli, "Education and Work."

18. There are important confidentiality considerations that must be addressed if this kind of service were to be provided. However, with explicit attention to benchmarking at the outset of a survey, problems surrounding confidentiality could be reduced.

19. See Mandel, "Teacher Education."

20. Video already plays an important role in the certification process used by NBPTS, and NCES could build on the experience of the Board, as well as that of other researchers developing this technology.

21. See the following papers in *From Data to Information: New Directions for the National Center for Education Statistics,* ed. Gary Hoachlander (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1996): G. Ligon, "New Developments in Technology: Implications for Collecting, Storing, Retrieving, and Disseminating National Data for Education," pp. 9-32–9-65; F. Scheuren, "Administrative Record Opportunities in Education Survey Research," pp. 9-1–9-31.

22. Electronic recordkeeping is still far from universal, especially at the elementary and secondary levels; paper files are still the norm in many places.

23. These are developed in more detail in the papers by Boruch and Terhanian, "'So What?'," Metcalf, "Incorporating Experimental Designs," and Scheuren, "Administrative Record Opportunities."

24. For more information about specific opportunities for NCES to use electronic networks, see the papers by Boruch and Terhanian, "'So What?'," Ligon, "New Developments," and Scheuren, "Administrative Record Opportunities."

25. The continuing development of "object technology," a technique for more rapidly constructing software programs out of many small object modules, should hasten the explosion of this sort of interactive dissemination and sharing of programs.

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Donald B. Rubin is Professor in the Department of Statistics, Harvard University. He has written nearly 250 publications (including several books) on a variety of topics, including computational methods, causal inference, survey methods, techniques for handling missing data, Bayesian methods, multiple imputation, matched sampling, and applications in many areas of social and biomedical science. Professor Rubin is a Fellow of the American Statistical Association, the Institute for Mathematical Statistics, the International Statistical Institute, the Woodrow Wilson Society, the John Simon Guggenheim Society, the New York Academy of Sciences, the American Association for the Advancement of Sciences, and the American Academy of Arts and Sciences. He is also the recipient of two of the most prestigious awards available to statisticians: the Samuel S. Wilks Medal of the American Statistical Association and the Parzen Prize for Statistical Innovation.

Eileen Mary Sclan is currently an Assistant Professor of Education in the Department of Curriculum and Instruction at Long Island University—C.W. Post Campus. Her main areas of research interest include teachers' workplace conditions, teacher performance evaluation, and teacher induction. At present, she is analyzing national data (funded by an AERA/NCES grant) to examine the inequitable distribution of qualified teachers and workplace supports. Dr. Sclan received her Ed.D. in Educational Leadership from Teachers College, Columbia University.

David Stern is Professor of Education at the University of California at Berkeley, and Director of the National Center for Research in Vocational Education, based at Berkeley's Graduate School of Education. From 1993 to 1995, he was principal administrator in the Center for Educational Research and Innovation at the Organization for Economic Cooperation and Development in Paris. Since 1976, he has been on the faculty at Berkeley, teaching and conducting research on the relationship between education and work, and on resource allocation in schools. David Stern is the lead author of several recent books: *School to Work: Research Programs in the United States* (with N. Finkelstein, J. Stone III, J. Latting, and C. Dornsife 1995); *School-Based Enterprise: Productive Learning in American High Schools* (with J. Stone III, C. Hopkins, M. McMillion, and R. Crain 1994); and *Career Academies: Partnerships for Reconstructing American High Schools* (with M. Raby and C. Dayton 1992). He also co-edited *Market Failure in Training* (with J.M.M. Rtizen 1991), and *Adolescence and Work: Influences of Social Structure, Labor Markets, and Culture* (with D. Eichorn 1989).

P. Michael Timpane, Vice President of the Carnegie Foundation, is involved in developing all aspects of the programs of the Foundation. In his own research, he is assessing the progress and problems of contemporary national education reform. Mr. Timpane is also Professor of Education and former President of Teachers College, Columbia University, the world's most comprehensive graduate school for the preparation of educational, psychological, and health professionals. Previously, he served as Dean of Teachers College and as Deputy Director and Director of the federal government's National Institute of Education. He has conducted research on educational policy as a senior staff member at the Brookings Institution and the RAND Corporation. Also, Mr. Timpane is a member of the Pew Forum on Education Reform, for which he is currently organizing and editing a volume of essays on higher education's involvement in precollegiate school reform. In addition, he serves on the boards of Children's Television Workshop, the Southern Education Foundation, the Synergos Institute, and Jobs for Education and the American Associate of Higher Education. Mr. Timpane received a bachelor's and a master's degree in history from Catholic University, and an M.P.A. degree from Harvard University in 1970. He has received honorary doctorates from Wagner College and Catholic University.

CONFERENCE PROCEEDINGS

From Data to Information: New Directions for the National Center for Education Statistics

The conference was held in Washington, DC on November 27–29, 1995. For the complete text of the proceedings, please see NCES Publication 96-901, *From Data to Information: New Directions for the National Center for Education Statistics,* which can be ordered from NCES Project Officer Edith McArthur at (202) 219-1442.

1 **From Data to Information: New Directions for the National Center for Education Statistics**

Gary Hoachlander: *From Data to Information: New Directions for the National Center for Education Statistics*

Emerson Elliott: *Introductory Comments*

2 **Tracking Education Reform: Implications for Collecting National Data Through 2010**

John F. Jennings and Diane Stark: *Tracking Education Reform: What Type of National Data Should Be Collected Through 2010?*

Christopher T. Cross and Amy Rukea Stempel: *Where Are We Going? Policy Implications for Data Collection Through 2010*

Discussant Comments by Mary J. Frase

3 **Curriculum, Pedagogy, and Professional Development**

Dominic J. Brewer and Cathleen Stasz: *Enhancing Opportunity to Learn Measures in NCES Data*

David R. Mandel: *Teacher Education, Training, and Staff Development: Implications for National Surveys*

Discussant Comments by Michael Timpane, Eileen M. Sclan, Mary Rollefson, and Sharon Bobbitt

4 **Trends in Statistical and Analytic Methodology: Implications for National Surveys**

Robert F. Boruch and George Terhanian: *"So What?" The Implications of New Analytic Methods for Designing NCES Surveys*

Discussant Comments by Frederick Mosteller

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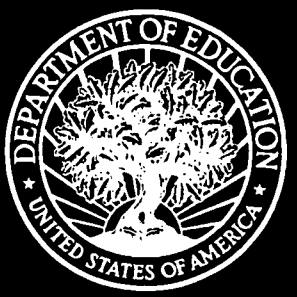

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