D. Measurement

What do we know about the components needed to build longitudinal data systems to measure the productivity of classrooms, teachers, schools, and principals?

This research question has two distinct components — at least in terms of the challenges the question raises about data systems and about the social practices that would ensure the collection of quality data. The first component is that in order to measure educational productivity, there must be attribution between the service providers (teachers, aides, resource staff) and the recipients of that service (students). While this might seem like a trivial task, most districts do not know who teaches mathematics to a particular third-grade student in any given elementary school. School data systems were not intended to capture that relationship. In addition, these relationships change during a year for reasons such as student ability regrouping, student and teacher mobility, etc.; so, tracking productivity requires a system to track changes in this linkage over time.

For quite some time, academics and policymakers have been thinking about using educational data to monitor system performance and student learning. It was not until the very recent past, however, that national education policy began to focus on actual measures of productivity, such as value-added or growth measures, rather than on simple measures of attainment. It is this shift in thinking on accountability that focuses the policy lens on both growth and attainment expectations for student outcomes.

The change in focus from attainment to growth necessitated the implementation of more complex data systems. During the past decade, educational agencies began to leverage new computing and database technologies that could effectively manage the enormous amount of data collected by schools and districts and provide more targeted data aggregation and analysis, something that had been unavailable to most district and school staff. This work often took advantage of research coming out of business schools and policy reforms emerging from modern business analysis and data warehouse systems (Bhatt and Zaveri, 2001; Creighton, 2001; Herman and Gribbons, 2001; SIF Association, 2005; Thorn, 2001; Van Horn, 1998).

In addition to the advancements in technology, recent policy initiatives at the federal, state, and local levels have accelerated the development of longitudinal data systems and have created an environment in which the tools to support more robust analysis can begin to mature. Race to the Top, the State Longitudinal Data System, and Teacher Incentive Fund grants (TIF) at the federal level require substantial changes in the management of data and the management of work on educating PK-12 students. All support enhancements in data systems and related infrastructure. All call for tracking programs to

provide evidence for what interventions work to improve instruction and increase the growth rates of student learning. In addition, Race to the Top and TIF add a focus on teacher recruitment, retention, and related reward structures.

Private philanthropic organizations such as the Bill and Melinda Gates, Michael Dell, and Archibald Bush foundations have focused on a range of organizational, business process, and educational systems reforms that have created new partnerships and capabilities in participating educational entities. The Bill and Melinda Gates Foundation - Intensive Partnership for Effective Teaching (Bill and Melinda Gates Foundation, November 19, 2009) encouraged participating districts to rethink their "approaches, strategies, and policies, including adopting better measures of teacher effectiveness that include growth in student achievement and college readiness." Districts were to build coherent systems of incentives and intervention strategies that tied growth in student learning to teacher training, promotion, tenure decisions, and overall educator compensation. In addition, Gates also launched a $45 million research effort to create robust Measures of Effective Teaching. The Foundation will field test these measures in a number of districts over the next 2 years to determine whether they can be used as reliable measures of a teacher's contribution to student learning.

The Archibald Bush Foundation has embarked on a 10-year project to improve the quality of teacher preparation in Minnesota, South Dakota, and North Dakota. The Foundation is providing initial funding to support the reorganization of the teacher education programs of participating higher education institutions with the goal of having all graduates beat average teacher value-added productivity for the baseline years in each state (2005-2010). Teacher preparation programs whose teachers outperform the benchmark will receive substantial unrestricted financial bonuses for each successful teacher in years 7 and 10 of the project.

Despite the efforts of philanthropic organizations and federal, state, and local governments, states, districts, and schools still experience difficulties using data for improvement. In addition, there is a dearth of high-quality research on the effectiveness of using data as a mechanism for improving student achievement. For example, *Clearinghouse Practitioners' Guide* warns of low levels of evidence in the following five areas of data use across 2,200 studies (Hamilton et al., 2009).

1. Making data part of an ongoing cycle of instructional improvement;
2. Teaching students to examine their own data and set learning goals;
3. Establishing a clear vision for schoolwide data use;
4. Providing support that fosters a data-driven culture within the school; and
5. Developing and maintaining a districtwide data system.

Data quality is central to effective data use in reform initiatives. One of the most compelling arguments for improving data quality is the desire to generate value-added measures for teachers. While school- and grade-level value added can usually be estimated using student test data with some limited administrative data on students, classroom value-added measures require more data that originate from a number of different source systems, including student information systems, human resources systems, and student

test data. Additionally, many value-added models are expanding to include a broader set of teacher characteristics such as years of experience, teacher preparation programs, and specific teaching credentials. Evaluation projects using value-added measures expand this list to include formal and informal professional development as well as curriculum used in a classroom or school.

While it might seem simple to assume that the data discussed above are available and accurate, many researchers and program managers have found this to be untrue. Researchers and practitioners have discovered that many mid- to large-sized school districts are not able to accurately document, link, and report the specific students that teachers taught. Human resource data quality may meet the basic payroll requirements, but it typically does not have the level of detail required to record the amount of professional development activities acquired by a specific teacher.

Once a district or state has developed the appropriate technical capacity to collect and house large amounts of data, the data are categorized into two areas for value-added analysis. First, the district or state must categorize the data into grade and content areas, which include student test scores from a state-administered testing database, student information (e.g., identification numbers, gender, other characteristics) from the student information system, and other school data from the human resource system or school information system(s). After collecting the student test scores, student information, and human resources data, researchers or project directors compare the data to the prior year to find inconsistencies, missing files or pieces of data, and/or other types of data-quality problems that can affect the accuracy of value-added analysis.

Classroom-level data are the second area of data necessary for value-added analysis. Other types of data are also necessary, such as teacher licensure data, institute of high education (IHE) human resource information, and unemployment and wage data. At this point in the process, it is also essential to have teachers and school leaders validate the data acquired for value-added analysis to ensure that the correct teacher taught the correct students at the right time and place. This is defined as validating the "student-teacher link." It is important for teachers and school administrators to validate the teacher/student links under high stakes conditions such as when schools must calculate teachers' compensation or evaluate IHEs correctly. The value-added analysis can begin after the data have been appropriately validated and cleaned. Districts or states can report value-added results in a variety of ways, depending on the audience and intended use. Some of the potential groups that may receive value-added analysis are districts, schools, teachers, state or regional education agencies, researchers, and IHEs.

The single best resource publicly available for state and local educational agencies remains the work of the data forum at the National Center for Education Statistics. In particular, the National Data Education Model provides the most comprehensive picture of best practice for linking PK-20 data.[1] It includes a wide range of existing data standards, including the following:

[1] http://www.nces.ed.gov/forum/datamodel/index.aspx

- Education Data Exchange Network and ED*Facts* record level elements;
- National Center for Education Statistics Handbooks;
- School Interoperability Framework (SIF) v2r3;
- Post-secondary Electronic Standards Council (PESC);
- *American Recovery and Reinvestment Act* assurances; and
- The Data Quality Campaign's 10 checkpoints.

These standards and indicators represent broad areas of policy and technical consensus around data required for operations, analysis, and policy making. While they do not represent a *solution* for a particular analytical task, they do provide a consistent set of data definitions and many of the core relationships necessary to create an advanced systems design or proposal for system development.

References

Bhatt, G. D., and Zaveri, J. (2001). The enabling role of decision support systems in organizational learning. *Decision Support Systems, 32*, 297-309.

Bill & Melinda Gates Foundation. (November 19, 2009). *Foundation commits $335 million to promote effective teaching and raise student achievement – Bill & Melinda Gates Foundation*. Retrieved Feb. 20, 2010, from http://www.gatesfoundation.org/press-releases/Pages/intensive-partnership-for-effective-teaching-091119.aspx

Creighton, T. B. (2001). *Schools and data: The educator's guide for using data to improve decision making*. Thousand Oaks, Calif.: Corwin Press.

Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., and Wayman, J. (2009). *Using student achievement data to support instructional decision making* (What Works Clearinghouse Practice Guide No. NCEE 2009-4067). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Herman, J., and Gribbons, B. (2001). *Lessons learned in using data to support school inquiry and continuous improvement.* Los Angeles: Center for the Study of Evaluation, University of California, Los Angeles. Retrieved Feb. 20, 2010, from http://www.cse.ucla.edu/products/Reports/TR535.pdf

SIF Association. (2005). *A comprehensive school/district data model.* Washington, D.C.: School Interoperability Framework Association.

Thorn, C. A. (2001). Knowledge management for educational information systems: What is the state of the field? *Education Policy Analysis Archives, 9*(47). Retrieved Feb. 20, 2010, from http://epaa.asu.edu/ojs/article/view/376

Van Horn, R. (1998). Data mining for research and evaluation. *Phi Delta Kappan, 80*(3), 251.

This synthesis of key research studies was written by:

Christopher Thorn, Sara Kraemer, and Jeff Watson, Wisconsin Center for Education Research.

The Center for Educator Compensation Reform (CECR) was awarded to Westat — in partnership with Learning Point Associates, Synergy Enterprises Inc., Vanderbilt University, and the University of Wisconsin — by the U.S. Department of Education in October 2006.

The primary purpose of CECR is to support Teacher Incentive Fund (TIF) grantees in their implementation efforts through provision of sustained technical assistance and development and dissemination of timely resources. CECR also is charged with raising national awareness of alternative and effective strategies for educator compensation through a newsletter, a Web-based clearinghouse, and other outreach activities.

This work was originally produced in whole or in part by the CECR with funds from the U.S. Department of Education under contract number ED-06-CO-0110. The content does not necessarily reflect the position or policy of CECR or the Department of Education, nor does mention or visual representation of trade names, commercial products, or organizations imply endorsement by CECR or the federal government.

CECR

Center for
Educator Compensation
Reform

Allison Henderson, Director
Phone: 888-202-1513
E-mail: cecr@westat.com

31082.0910.83670407