D Data On
E Enacted
C Curriculum

Improving Effectiveness of Instruction in Mathematics and Science with
Data on Enacted Curriculum

Schools across the nation are working to adapt and improve curricula and teaching practices to meet the standards for learning established by states and school districts. In mathematics and science education, "standards-based reform" typically means that teachers must plan and implement their curriculum and teaching in relation to challenging content standards with higher expectations for student knowledge and capacities.

The Council of Chief State School Officers (CCSSO) is leading a collaborative team in conducting a three-year study of the effects of a data-based model for improving instruction in K-12 math and science education. Teachers are surveyed on current instructional practices and subject content in math and science, data are analyzed and reported by school, and then used with school teams to guide efforts toward improving instruction in classrooms.

Research Questions

The primary research question is:

1. What are the effects on classroom instructional practices of a school-based model for assisting teachers in using their own school survey data on enacted curriculum and assessment results to improve the effectiveness of their instruction?

To answer this question, two additional questions will be analyzed with study data:

2. To what extent is classroom instruction aligned with state standards and assessments?
3. What is the extent of variation in classroom instructional practices in math and science education within districts and schools involved with standards-based reform?

The project team is led by Rolf K. Blank, director of education indicators at CCSSO. Andrew Porter and John Smithson of the Wisconsin Center for Education Research (WCER) at University of Wisconsin-Madison are leading the research design and data analysis, conducting the project's data collection, analysis, and reporting. The data-based technical assistance with schools is led by Diana Nunnaley and Mark Kaufman of the Regional Alliance for Mathematics and Science Education at TERC. The DEC project is supported by NSF Grant REC-0087562, under the Research on Learning in Education program.
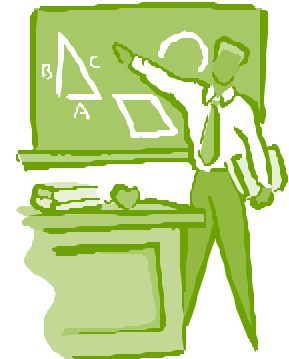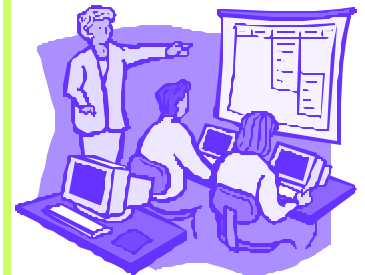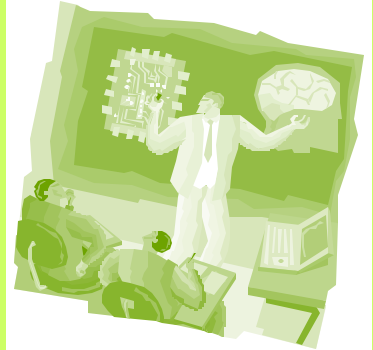
Experimental Design

The study is being carried out with four districts that are partners in the project: Charlotte-Mecklenburg, Chicago, Miami-Dade, and Philadelphia. The study sample consists of 40 middle schools in these four districts (10 per district), and the math and science teachers in the schools. An experimental research design is used to measure the effects of the program model in treatment schools vs. control schools. The design (see flow chart) consists of six steps: (a) Baseline data collection from all schools and science/math teachers; (b) Random selection of schools into 2 groups; (c) Technical assistance and professional development implementation in treatment schools, using school data reports; (d) Implementation research and validation of survey data; (e) Follow-up surveys with science/math teachers in all schools; (f) Analyze change in teaching practices and attribute effects of model ; (g) Provide technical assistance and professional development to control schools.
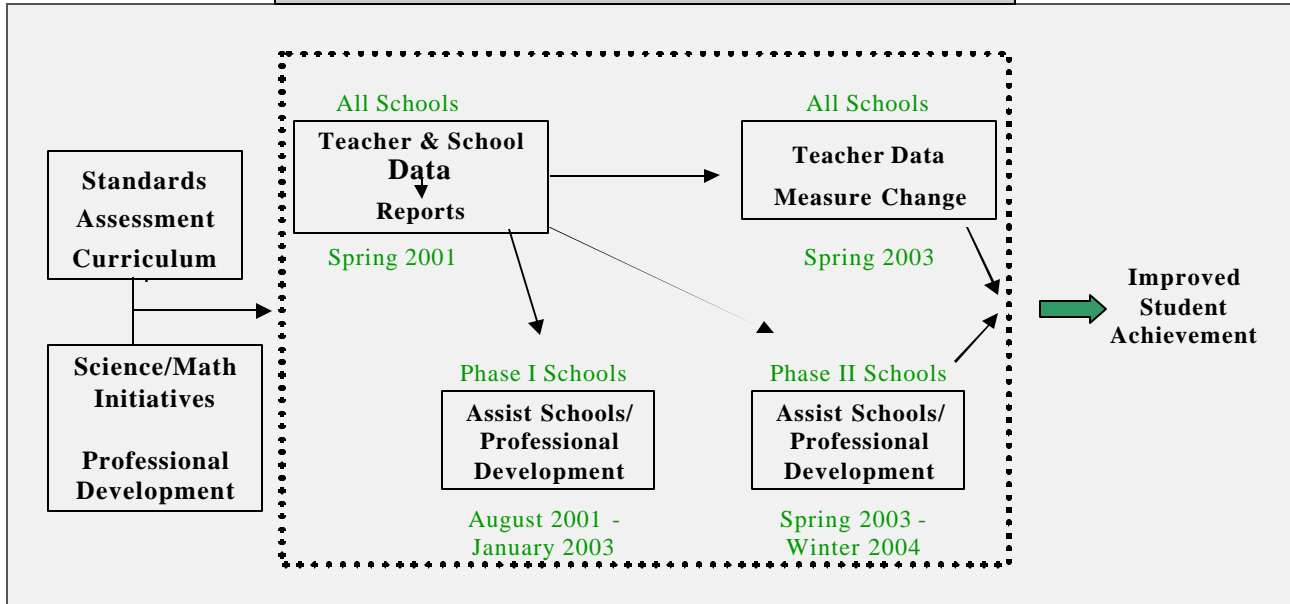
DEC Online

The DEC website provides detailed background information on the development of the project, as well as links to several helpful math and science sites.

Go to:

http://www.ccsso.org/dec/dechome.htm

DEC Project Design

	All Schools		All Schools	
Standards Assessment Curriculum	**Teacher & School Data Reports**		**Teacher Data Measure Change**	**Improved Student Achievement**
	Spring 2001		Spring 2003	
Science/Math Initiatives **Professional Development**		Phase I Schools **Assist Schools/ Professional Development** August 2001 - January 2003	Phase II Schools **Assist Schools/ Professional Development** Spring 2003 - Winter 2004	

Professional Development Model —*Using Curriculum Data*

The model for the DEC project is based on two premises about effective professional development with curriculum: 1) continuous improvement of practice using data and formative evaluation, and 2) school-based collaboration and networking aimed toward sharing teaching ideas, models, and strategies for improvement.

The steps in the assistance model process with schools are:

Two-Day PD Workshop: Working in school planning teams, teachers and administrators learn to use rich, in-depth data to inform decisions about curriculum and improved practice; gain skills in analyzing survey data and organizing data-driven dialogue; learn how to set measurable student learning goals and use curriculum data in school improvement plans.

Provide Assistance in schools: School leaders use new skills with curriculum data to work with math and science teachers in their schools. Project team provides assistance with data applications onsite, through resources, and phone/email. Math and science specialists incorporate data into their ongoing work with teachers.

PD Follow-up Workshops: During the school year, staff assist teams in further analysis of data, especially analysis of alignment of assessments, standards, and teaching practices. Goal is to move from inquiry about data into action with improving teaching. Convene additional one-day workshops with leader teams.

Evaluate Progress, and Refocus Assistance: At the end of year 1, project team meetings with staff of each school help determine progress, identify problems, and focus on further action steps for next school year. New staff in schools are brought into the model in year 2.
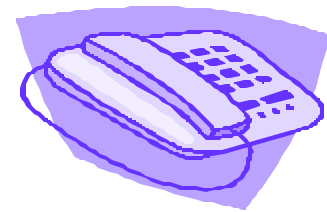
Contacts

If you have **questions**, **suggestions**, or **ideas**, please contact one of the DEC **project** staff:

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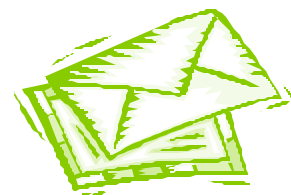   rolfb@ccsso.org

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SEC: the backbone of DEC

The Surveys of Enacted Curriculum (SEC)—a set of data collection, analysis, and reporting tools—were developed from 1998-2001 with NSF support. CCSSO, WCER, and states collaborated in the design and development of the surveys. The surveys provide a comprehensive approach to obtaining comparable, reliable data about teaching practices and instructional content in math and science as well as teacher preparation, student characteristics, and conditions and resources for teaching. The data produced by SEC are an invaluable resource for evaluating quality of math and science education across classrooms, schools, districts, and states.

Two charts (right) show examples of how SEC data are analyzed and reported:

- The top chart shows a "content map" with alignment analysis—teacher-reported data on time spent teaching math are shown by topic (Measurement) and subtopic (e.g., Use of Tools) and by teacher expectations for student learning (e.g., Memorize). Also shown is a map of the state assessment in math, coded by topic and expectations.
- The bottom chart displays "scales of instructional practices"—teacher-reported data on practices used in class summarized by standards-based concepts, e.g., Reasoning/problem solving in math.

The SEC survey instruments are available for use by educators or researchers, and over 25 model data chart formats can be used to analyze and report survey results.
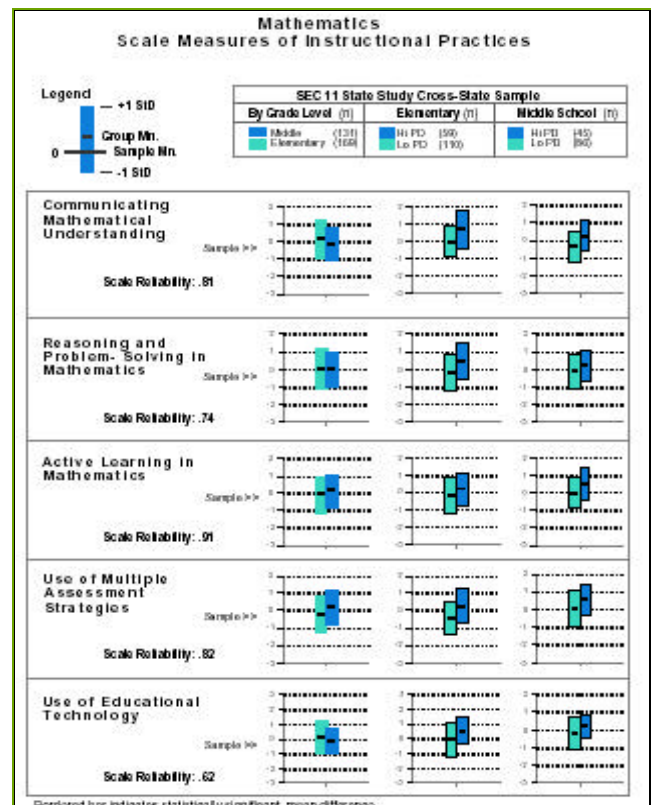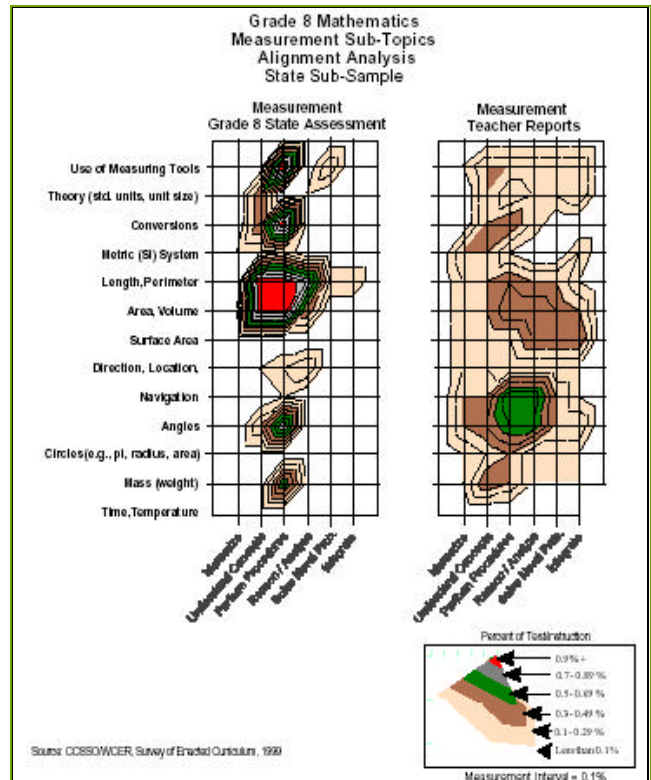
To view the SEC survey instruments, obtain study reports, papers, and additional information, please visit our website: **http://www.ccsso.org/sec.html.**

Recent products:

- **Surveys of Enacted Curriculum: Tools and Services to Assist Educators**
- **New Tools for Analyzing Teaching, Curriculum and Standards in Mathematics & Science**
- **SEC-CD**
- **SEC Guide for Professional Development**

Grade 8 Mathematics Measurement Sub-Topics Alignment Analysis State Sub-Sample

Mathematics Scale Measures of Instructional Practices