DOCUMENT RESUME

ED 452 220 TM 032 505

AUTHOR Cromey, Allison; van der Ploeg, Arie; Masini, Blase

TITLE The Call for Data-Driven Decision Making in the Midwest's Schools: NCREL's Response.

INSTITUTION North Central Regional Educational Lab., Oak Brook, IL.
PUB DATE 2000-12-00
NOTE 37p.
AVAILABLE FROM North Central Regional Educational Laboratory (NCREL), 1900 Spring Road, Suite 300, Oak Brook, IL 60523. Tel: 630-571-4700; Fax: 630-571-4716.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Data Analysis; Data Collection; *Decision Making; Educational Improvement; Educational Research; Elementary Secondary Education; *School Districts; *Systems Development
IDENTIFIERS *North Central Regional Educational Laboratory; United States (Midwest)

ABSTRACT

This report describes the efforts of the North Central Regional Educational Laboratory (NCREL) during the last several years to respond to direct requests from educational stakeholders to help integrate data into their decision-making processes related to school improvement. In some cases, NCREL cooperated in the development of educational decision-making tools, and in others, NCREL began by helping teams of practitioners use data to reinforce their curricular and instructional decisions. This work has created the platform from which NCREL will launch a significant portion of its work over the next 5 years. It has also contributed to the development of a portfolio of decision-making tools, initially conceived as a "21st Century Evaluation Portfolio" and later reframed as a collective Web site of data-driven tools called the "NCREL Toolbelt." Some examples are given of NCREL's efforts in adding value to Tier III assessment data, the data collected from standardized, large-scale assessments, in Illinois and Wisconsin. Tier I data, ongoing classroom assessment data, has been the focus of NCREL efforts in Creve Coeur, Illinois. NCREL has also worked on curriculum mapping and the use of the General Topic Tracing Map, a data collection tool used in the Third International Mathematics and Science study. NCREL's new signature effort, Education Decision Support Systems, has emerged from these efforts, and its goal will continue to be making data more available and useful for educators. Two appendixes describes the development chronology for two NCREL efforts. (Contains 4 figures, 1 table, and 16 references.) (SLD)

The Call for Data-Driven Decision Making in the Midwest's Schools: NCREL's Response

by

Allison Cromey, Arie van der Ploeg, and Blase Masini
North Central Regional Educational Laboratory
Oak Brook, Illinois

December 2000

Acknowledgments

Credit for the work described in this report goes well beyond the three authors. Many thanks go to colleagues who participated in the conceptualization, design, and implementation of these projects. Robert Bortnick (NCREL) provided much-needed project management skills to the WINSS project, and shared this responsibility with Richard Laine (IBRT) for the ILSI project. The staffs of both the Wisconsin Department of Public Instruction and the Illinois State Board of Education worked to customize these decision support systems for the specific needs of stakeholders in their states. Dan Robinson (Sligo Computer Services, Inc.) and Alane Hartley (UAQA) seamlessly translated these needs into programming and design solutions for these tools. The Quality School Portfolio, adapted for Illinois, was made possible by Derek Mitchell (CRESST).

Teachers, administrators, and students involved in the Precision Teaching study in Creve Coeur were trained and kept "on-track" by Elaine Aumiller (NCREL), Charles Merbitz (Illinois Institute of Technology), Shari Neul (Illinois Institute of Technology), and Brad Frieswyk (BGF Performance Systems). Susan Galowski (NCREL) took the lead in organizing, scoring, and inputting the quantitative data resulting from this work.

Elaine Aumiller (NCREL) helped adapt the TIMSS framework offered by the U.S. TIMSS National Research Center at Michigan State University for practitioner use on the Curriculum Mapping Web site. The Center for Application of Information Technology (CAIT) at Western Illinois University provided the programming to convert the framework to a functioning Web site.

Finally, Sabrina Laine, as director of the Evaluation and Policy Information Center at NCREL, provided organizational leadership for the development of this work and helped unite these data-driven, decision-support tools within the framework of the NCREL Toolbelt.

Contents

Introduction

As student demographics become more diverse and the gaps between low- and high-achieving students grow, it has become increasingly important to make more informed educational decisions. This need for better decision making has grown in tandem with the rise in standards-based reform and performance-based accountability systems.

"Data-driven decision-making," called an educational "mantra" during the 1990s (Nichols & Singer, 2000), assumes that some of the scientific methods that solve complex problems in medicine and industry can help determine which educational policies, programs, and teaching methods are most effective. Well-organized data about how educational systems function, the quantity and quality of their inputs, and how students learn can suggest potentially powerful solutions to challenges in education. Employing a process to use these data allows stakeholders to move beyond arrays of numbers and categories and toward better conceptualizations and more informed inquiry.

Unfortunately, current data about educational inputs, such the qualifications of teachers and the rigor of curricula, are lacking, and in most states, data about educational outcomes continue to be vague, confusing, and not clearly linked to student learning (McQueen, 2000). Not only do educators and policymakers lack quality, accessible data, they also tend to have difficulty analyzing and using the data that presently exist (e.g., large-scale standardized test scores) (Bernhardt, 1998). Contributing to this problem, educators have had little training in data analysis, lack the tools to begin, and perhaps, most important, function in a system where decisions are historically based on intuition, philosophy, and retrospect.

The Call for Data in the NCREL Region

The recent increases in educational accountability are reflected by increased standardized testing in many states, including those in the North Central region. Each state in our region, with the exception of Iowa, administers state exams—and Iowa has recently legislated specific school accountability requirements. Recently, student performance on these large-scale assessments has been linked to consequences: college tuition dollars (Michigan), grade promotion and retention (Ohio, Wisconsin), and graduation (Indiana, Wisconsin, and, soon, Illinois). The region's urban districts are also attaching high stakes to their assessment programs. As a result, the stakes for student performance are high for all participants in the educational system. The appropriateness of this trend is of

considerable debate, but few would argue that significant decisions related to school and student performance are being made based on student performance data that is gathered infrequently and far removed from everyday classroom happenings.

NCREL has found, through local and national research, issues-scanning (North Central Regional Educational Laboratory, 1999), feedback from our partners, and voices from the field, that districts and schools throughout our region are searching for better data and better methods to report and understand data in order to enhance their ability to make good administrative and educational decisions. Schools need tools to see their effects, districts and states need tools to deliver resources, and states need tools to convert inaction to action. Each of these tools must be fueled by data.

This report will describe NCREL's efforts during the last several years to respond to direct requests from educational stakeholders throughout our region to help integrate data into their decision-making processes related to school improvement. In some cases, our response was to cooperate in the development of educational decision-making tools. In others, NCREL began by helping teams of practitioners use data to inform their curricular and instructional decisions. It then evaluated the impact of these interventions and used what was learned to coordinate the development of online decision-making tools. Overall, this work has contributed to NCREL's growing expertise in the research and development of education decision support systems and has created the platform from which we will launch a significant portion of NCREL's work over the next five years. It has also contributed heavily to the development of a portfolio of decision-making tools, initially conceived as a "21st Century Evaluation Portfolio," and eventually reframed as a collective Web site of data-driven tools entitled the "NCREL Toolbelt." First, some background information is needed to understand how and why NCREL came to focus on this work.

NCREL's Response to the Call for Data

Technology has always been a central component of NCREL's efforts to make schools more productive. Almost a decade ago, NCREL was an early adopter of gopher and other embryonic Internet information retrieval tools. Our *Pathways* school development library was one of the first resources available to schools as the Internet moved from command prompts to graphical interfaces and platform-independent browsers.

While data are not dependent on technology, technology provides a support that can make data much more useful. At the same time that *Pathways* was being developed, NCREL, in

collaboration with the Council of Chief State School Officers, initiated an effort to collect detailed systematic data on state assessment programs. Using Internet-based survey forms and data collection processes, the State Student Assessment Program (SSAP) database was created. The database was the first to provide detailed, accurate information about the scope and content of the assessment programs in each of the 50 states.[1]

While building this knowledge base of assessment practice, we were also talking with school and district personnel about how useful assessment and other data were to their decision making process. The resulting conversations suggested that practitioners found themselves in a less-than-supportive data environment.

At one regional conference in the early 1990s, a school superintendent in Illinois hosted a meeting with his colleagues. He asked the two dozen superintendents in the room to fold their arms on the conference table, place their heads on their arms, and close their eyes. After some 30 seconds, he explained why they were in silence, in darkness, and alone. He wanted to simulate the decision-making context: alone, without support; with little guidance or firm research; and with no data.

Two states away, in Bloomington, Minnesota, a curriculum director was generating grant support to build data systems to support his teachers. "Linkages across Minnesota" connected teachers in nine school districts electronically and in person. Technology tools to build and share lessons aligned to state standards were developed with private partners including Norris Educational Innovations, Inc. These tools were extended to link local student performance measures to state measures and to test which instructional interventions most closely aligned with student growth.

"Linkages across Minnesota" placed teacher and student at the center of the educational process. Personalized road maps for each student's intellectual journey were to be drawn in an effort to meet the student's instructional needs.

In 1995 Illinois introduced a new set of standards and a new mandated school improvement process. The state desired software to take a lead role in supporting schools to meet the new mandates, arguing that that was more efficient than hiring numerous consultants and support personnel. It turned to NCREL to help design and build software that would permit schools to collect, manipulate, and represent data for use in school improvement decisions and reporting. The ISIP software was distributed to almost 4,000 schools. Some 400 schools installed and tried ISIP; 40 schools used it long term. The barrier to ongoing use of ISIP, it was found, was not

related to the system or the software. The barrier was human. That is, without direct personal contact, very few schools had time or initiative to experiment with a new way of doing things.

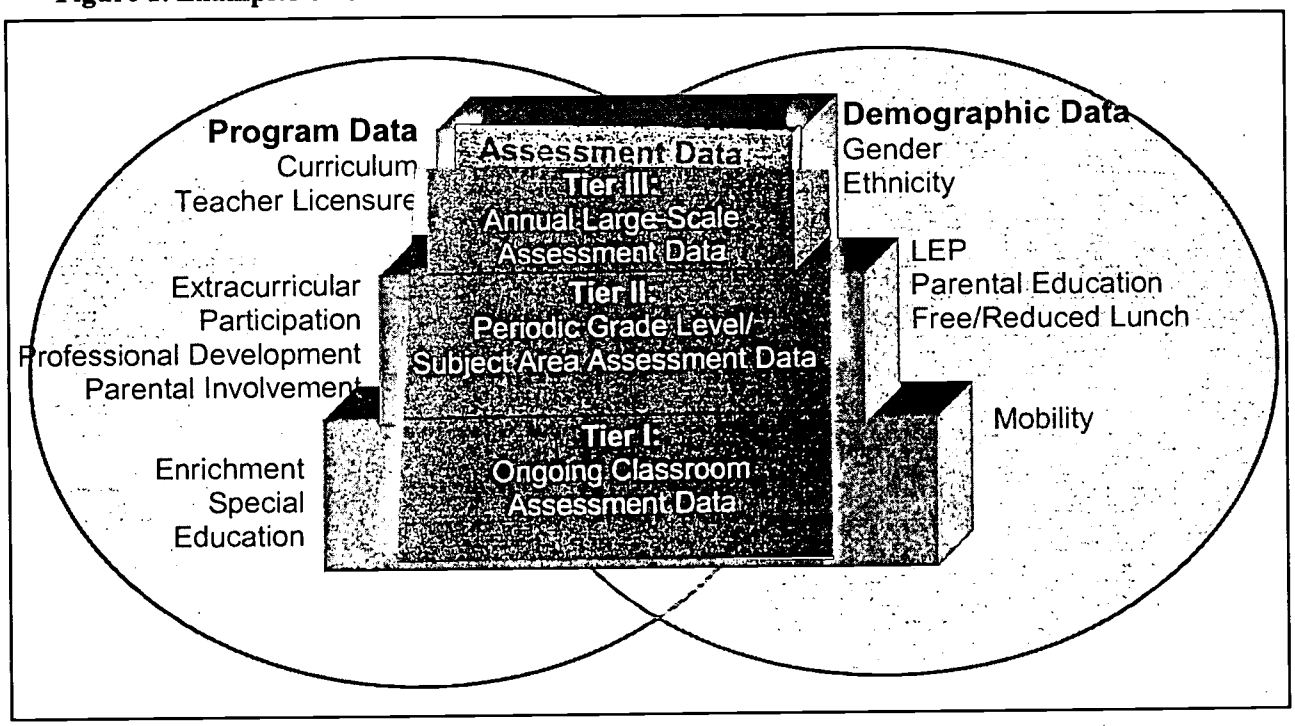
These three examples, along with many others, suggested to NCREL that decision support systems needed to support decisions *by* teachers and students and administrators, not just *about* them. In addition, they informed us that tools with technological underpinnings were not sufficient. Tools also needed to fit into an ongoing social enterprise. Tools that could not be grasped would not be used, no matter how shiny, strong, or profound. Finally, they highlighted that the data underlying decision support tools should measure outcomes that are understood and valued at the local level. That is, if data were to change people's practice, the data needed to speak to the practices themselves, not some distant construct.

User-Friendly Data

Data set up tensions between what is believed and what is seen and can signal the need for change. Data also suggest the means by which the results of interventions can be measured and tracked. Yet data must match the needs of the user. Stakeholders throughout the educational system have distinct decision-making needs and thus require different types of information. In addition, a barrage of data can be overwhelming. Data must be organized or tailored for specific audiences.

One way to conceptualize the broad array of data that are available to educators is to place them into three categories: Assessment, Demographic, and Program[2] (see Figure 1). Each of these categories is described below:

Figure 1. Examples of Common Educational Data Sources



Assessment. Assessment may be defined as any method used to better understand the current knowledge that a student possesses (Dietel, Herman, & Knuth, 1991). "Current knowledge" implies that what a student knows is always changing; to make judgments about student learning, outcome data on equivalent assessments should be tracked over time.

A multitude of assessments are available to educators. For the sake of simplicity, assessment data in Figure 1 are represented in three tiers according to their purposes and the type of feedback they provide. These tiers are described below in Table 1:

Table 1. Tiers of Assessment

	Assessment purpose	Rate of feedback	Type of feedback	Primary target of feedback
Tier I	Annual large-scale	Infrequent ↕ Frequent	General, broad ↕ Specific, narrow	General accountability audience: Policymakers, Community, Administrators, etc.
Tier II	Periodic Grade Level/Subject Area			Administrators, Teachers
Tier III	Ongoing Classroom			Teachers, Students

Demographic. Demographic data help educators understand the population of students, parents, and community members that is served by their school or district. Demographic data do not explain performance and are not within the control of educators. However, demographic data may help educators to target interventions— individual schools and districts often look at performance differentials within their own populations and consider how to overcome them.

Program. Data about educational programming, such as the scope and sequence of the curriculum, the qualifications of teachers, student participation in extracurricular activities, and so on can suggest overall school trends (e.g., over the past five years, there has been a growth in the percentage of seniors taking advanced placement courses) or needs (e.g., next year, 60 students will qualify to take Algebra I in eighth grade, but none of our current teachers are certified to teach this course). Unlike demographic data, program data is within the control of schools. Schools have the power to improve, add, or terminate programs. These data may be linked to student assessment data to find relationships that can, in turn, suggest the need for further, more specific program evaluation.

Although these categories do not comprehensively capture the universe of educational data (e.g., financial and perception data are not represented), they contribute significantly to the overall picture of the education system's performance. Each of these data sources provides a lens on what transpires each day in school and can clarify trends and effects that are easily missed. When used together, they can address the information needs of a variety of educational stakeholders.

Data Tools

Like the data that fuels them, data tools must suit the needs of schools and other educational agencies. Most educators and policymakers are not statisticians. They need tools and resources that can help them see better and that provide meaningful information quickly, reliably, and cheaply. Too frequently, administrators receive a ream of outcome data from a mandated assessment, skim the overall results, and set the remainder of the report on a shelf. Other practitioners express a strong desire to better understand these data, matched only by frustration at their lack of training in this area. Data tools are necessary to distill information and to link stakeholders to results and solutions. When educators can draw inferences from their data, they cannot only see the need for change, but can identify the direction of change needed, pinpoint the students needing intervention, and identify programs offering promising solutions.

In business and government arenas, Decision Support Systems (DSSs) have become popular and increasingly sophisticated solutions to the need for data tools.[3] Current conventional wisdom suggests that DSSs should be automated, computerized systems that collect data into a database where they reside until the moment they are brought out in a timely, valid, and understandable report. Nationwide, the development of DSSs and Web-based reporting tools for educational decision makers is increasing. But SEAs and other educational agencies face barriers to the development of DSSs, including:

- Financing to purchase and maintain modern technology
- Identifying and retaining staff with the requisite technical skills
- Finding vendors of commercial DSS products that understand schools and education
- Attempting to model decisions made in schools, which tend to be inconsistent, highly personal, and illusive to capture on a flow chart.

In spite of these difficulties, many educational agencies have developed, or are in the process of developing DSSs. Thus far, four SEAs in the Midwest, including Illinois, Wisconsin, and recently, Indiana, and Minnesota, have looked to NCREL for assistance in these projects.

Adding Value to Tier III Assessment Data

Many practitioners and researchers, with reason, cite the severe limitations of using Tier III, or large-scale, standardized assessment data for decision making. The data resulting from these assessments gives a broad view of school effectiveness. It offers little guidance to teachers seeking to make daily instructional decisions and design individualized educational interventions. The data are also inefficient indicators of student progress over time. However, these data can be

made more meaningful when they (1) can be rapidly disaggregated, (2) can be couched within longitudinal trends, and (3) can serve as a basis of comparison with other, similar schools. NCREL used these three elements to guide the development of the following state-level decision support systems:

Illinois School Improvement (ILSI) (http://ilsi.isbe.net/)

In June 1999, the Illinois State Board of Education (ISBE) requested help in developing a DSS that would assist Illinois educators analyzing and making use of state testing data. Two major functionality goals were identified:

- Design a user-friendly computer software system that enables schools to identify similar schools and access useful data on these schools.
- Design a user-friendly electronic reporting system that enables schools to merge state assessment data with their classroom, school, and district data and to print reports that are useful to various audiences

NCREL responded to this call, agreeing to codevelop a school improvement Web site for ISBE (goal 1) that was question-driven and would later serve as a template for similar resources in other NCREL states. The site would be modeled after the school improvement site in Maryland (http://www.mdk12.org/), which was designed to meet many similar goals. Besides being interactive, the Maryland site has a graphical approach to data analysis that could be joined to school improvement decision making and resources for change. NCREL chose to subcontract with the development and design teams (Sligo Computer Services, Inc. and UAQA) that had worked on the Maryland. Because of this, the Illinois school improvement Web site was at times referred to as a "daughter" of the successful Maryland site.

The Illinois School Improvement (ILSI) Web site incorporated suggestions from the partnership and from a pilot group representing practitioners throughout the state.[4] The site was broadly organized into four sections, each a complementary component of the school improvement process and each tied to general, but important questions that can drive effective inquiry. These sections include:

- Standards: *Where do we need to be?*
  Presents the Illinois Learning Standards for elementary and high school students and provides resources on how to implement the standards in the classroom.
- Analysis: *How are we doing?*

Provides data-based reports on an individual school's achievement against the Illinois Learning Standards and presents comparisons:

- Of a school to its district and the state averages
- Of progress over time
- Of a school to other schools with similar student populations.

- Process: *How will we get there?*

  Provides background information about the school improvement process and includes an interactive school improvement "starter kit."

- Knowledge: *Where can we find resources?*

  Provides information aligned to the Illinois Learning Standards organized by subject matter and key topics. Resources include:

  - Standards-related material
  - Model programs
  - Model schools
  - Professional development
  - Research.

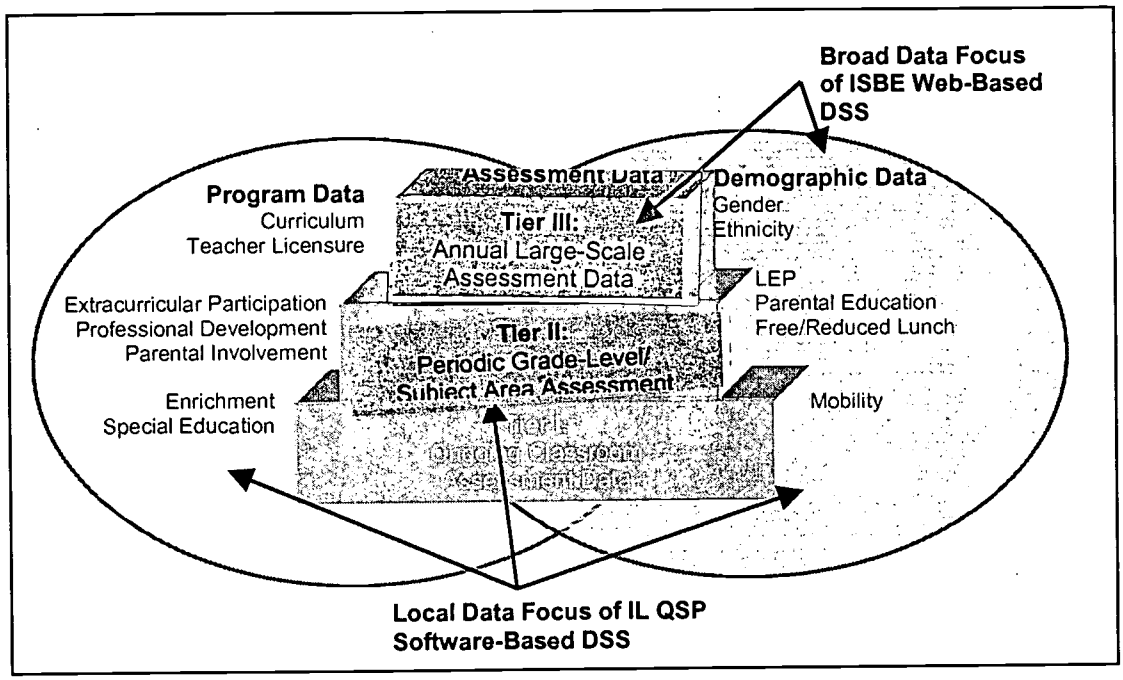
QSP for Illinois

In addition to ILSI, NCREL agreed to partner with the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) to customize their Quality School Portfolio software (QSP)[5] for Illinois. QSP software operates as a "data manager" that allows educators to import and store multiple databases, then acts as a tool to group, view, and report the data within these files (National Center for Research on Evaluation, Standards, and Student Testing, 1999). Schools enter their own data, set their own goals, and are able to create student groupings that respond to their local, specific questions. QSP accepts data that are categorical, numerical, textual (string), and chronological (i.e., dates). QSP also delivers a Resource Kit that helps schools assemble data.

The Illinois version of QSP was proposed to meet the local data needs of schools as stated in goal 2. Illinois schools would be able to house, analyze, and integrate more local data, including assessment data from Tier II and more specific demographic and program data than would be available for public viewing on the ISBE Web-based DSS. It was hoped that with these two complementary DSSs (i.e., ILSI and QSP), Tier III data would become easier to use and more

valuable to Illinois educators, and could be coupled locally with more specific data, including data from Tier II assessments (See Figure 2).

Figure 2. Broad and Local Data Focuses of Illinois DSSs.



Wisconsin Network for Successful Schools

(WINSS)(http://www.dpi.state.wi.us/sig/index.html)

With the development of ILSI under way, Wisconsin soon prioritized the need for its own DSS. Wisconsin's governor asked the Department of Public Instruction (WI DPI) to create a Web-based electronic reporting system on Wisconsin school performance, and offered a small stipend to begin this work. The objectives for this project were to:

- Provide educators with online and easily accessible data and graphic illustrations of local and statewide results from state assessments for comparative purposes
- Help schools analyze their state assessment data and guide them in making data-driven instructional decisions that support improved performance for all students
- Facilitate reporting capabilities across schools and districts, and statewide.

In January 2000, Wisconsin turned to NCREL for assistance. NCREL offered to provide technical support to the process of determining the content framework and data analysis procedures on the Web site, to assist in the adaptation of the Illinois Web site to the needs and

vision of Wisconsin, and to provide substantial funding for the development of a fully functioning Web site.[6]

Although unmistakably spawned from the Maryland site and showing familial resemblance to ILSI, the Wisconsin Information Network for Successful Schools (WINSS) still exhibits its own unique personality. Namely, the mission of Wisconsin educators includes helping students strive towards academic *and* behavioral objectives. This is evident throughout the framework, which is summarized below:

- Standards and Assessment:

  Outlines Wisconsin's expectations for students. Provides ideas, information, and tools to assess progress.

  - *What are our academic standards?*
  - *What are standards of the heart?*
  - *What indicates success in academic standards?*
  - *What indicates success in standards of the heart?*

- Data Analysis:

  Allows users to analyze data about a school by typing in the school or school district name. This directs users to the following question-driven analyses:

  - *How are students performing academically?*
  - *What programs, staff, and money are available?*
  - *What about attendance and behavior?*
  - *What are student demographics?*

  The site responds to questions by displaying school-specific graphs and tables to help users make use of these data.

- Continuous School Improvement:

  Describes the characteristics of a successful school as well as ideas and tools to help school communities in the improvement process.

  - *What makes a successful school?*
  - *How can we improve?*
  - *Who should be involved in improvement?*
  - *Where can we find planning tools?*

- Best Practices:

  Helps answer key questions related to implementing each of the seven characteristics of a successful school.

- Vision
- Evidence of Success
- High academic standards
- Family, school, and community partnerships
- Standards of the heart
- Professional development
- Leadership

Wisconsin decided against customizing QSP for the state as part of this effort and tabled plans for local DSSs until the roll-out of WINSS.

The Partnerships

The partnerships that were forged between NCREL and the states were key to the development of the DSSs. In both states, NCREL provided technical assistance and financial support to build these DSSs. Specifically, because these projects were consistent with NCREL work being funded by federal resources, the laboratory agreed to integrate the cost and personnel time needed to codevelop the tools into ongoing budget and staffing plans. In turn, each state agreed to:

- Provide leadership in customizing the DSS to the state's needs.
- Assign staff with appropriate expertise to work toward successful completion of the DSS.
- Provide data and content for the DSS.
- Provide and implement related professional development to districts and schools.
- Create a budget and plan to maintain and update the DSS once NCREL funding has been expended.

In Illinois, the partnership was rounded out by the Illinois Business Roundtable (IBRT). The IBRT Director of Education Policy and Initiatives contributed greatly to project management needs and provided a link to the formative feedback and positive public relations offered by Illinois' industry leaders. In addition, CRESST worked closely with the Illinois partnership to tailor QSP for their needs.

In Wisconsin, the partnership included the Governor's Office, which provided some financial assistance for the site, offered formative feedback during the development process, and aided plans for a statewide roll-out.

Evaluative Feedback on ILSI, IL QSP, and WINSS

Information will be needed on how these DSSs are being used and their impact on decisions at the systemic and individual student level. To this end, NCREL has planned to design and implement formal evaluations of ILSI, IL QSP, and WINSS during the next several years and will use the resulting information to continuously improve these and other similar DSSs being developed within the NCREL region.

In the meantime, NCREL has received preliminary feedback on how WINSS and ILSI have been used. Between its September 20 launch and October 10, there were over a quarter million hits on WINSS, or about 100,000 page views. By December 31, 2000, there were over 1 million hits. The ILSI Web site received approximately 100,000 hits within two weeks of its public roll-out, and approximately 150,000 hits within the first month. The data analysis features of the ILSI site were used most frequently, and users spent, on average, 20 minutes at the site.[7] This information suggests a receptive audience for integrating data into the school improvement process and a willingness to experiment with new methods for data analysis. Information related to use of WINSS, ILSI, and related sites will be formally tracked during the next contract period.

NCREL also presented the ILSI and WINSS sites at one of four regional "Education Decision Support Systems Meetings" hosted by the U.S. Department of Education, Office of the Chief Information Officer (OCIO) and the Council of Chief State School Officers (CCSSO). Discussions took place on the features and functionality of ILSI and WINSS as they compared to other educational DSSs in place or under development nationwide. The 16 DSSs that were presented during the meetings were grouped into four general models[8]:

- *Big Systems* include individual records in a data warehouse and use sophisticated database management and Web tools to manage and generate reports. These systems are complex and relatively expensive.
- *Big Pictures* look at extant statistics stored as aggregate records in a data mart. These systems allow users to see the big picture but are limited in the details that can be analyzed and reported because they are built with aggregate records.
- *Big Ideas* begin with questions (and possibly decisions to be made) and information needs that drive analyses. A data mart and/or data warehouse can be built from which to generate custom reports to match the questions. This model is called *big ideas* because the impetus for the system and for the specific reports coming from it originates from

individuals' ideas or information needs. These systems grow in spurts as new needs are identified.

- *Big Family* refers to the characteristic of having everyone from the classroom to the SEA linked into the same system. The system performs daily transactions (attendance accounting, grade reporting, financial accounting, and so on) on servers that allow the data to be shared by all levels of the education enterprise.

ILSI and WINSS are both included in the *Big Pictures* model of DSSs. Like most of the other 16 DSSs, ILSI and WINSS are Web-based, focus analyses on assessment results and other state accountability measures, and able to represent longitudinal trends in the data. Half of the presented DSSs do not go beyond reporting the results of basic descriptive and cross-tabulation analyses. ILSI and WINSS do by providing the opportunity to observe correlations between student assessment outcomes and various student demographic variables (e.g., SES, ethnicity, gender, and so on).

The most common risk factors noted among the DSSs included site maintenance, continued funding, and data quality. For ILSI, other risk factors were noted, such as the complexity of the site, the acceptance and use of the site by stakeholders, and the availability of data for the site. This initial feedback provides valuable guidance for NCREL's design of future evaluations for these tools.

Focus On Tier I: Classroom-Level Data

Tier I data, or ongoing classroom assessment data, are at the heart of the educational process. These data reflect the interactive activities of teaching and learning, the so-called "black box" between system inputs and outputs (Black & Wiliam, 1998). Although teaching and learning ultimately drive reform, reformers often ignore the sufficient measurement and analysis of these activities; moreover, these data are seldom represented in educational DSSs.

Over the past decade, NCREL has invested time and resources into exploring the use of Tier I data for ongoing, formative evaluation of the learning process and its effect on student achievement and system functioning. Based on conversations with colleagues inside and outside the lab, NCREL's researchers found and visited schools across the U.S. that collected data from the teaching and learning process daily, even hourly, and unobtrusively. These schools' processes for generating data were closely studied. More critically, the ways these schools used data proved highly informative. Often, it was the student who was the most frequent user of his or her

learning data, not the administrators. Teachers embodied the spirit of the scientist-practitioner. Frequent, collaborative data analysis helped them understand how the teaching and learning process was affecting the progress of each child. The data were typically treated formatively, experimentally, in a "what-if-I-do-this-next" mode. This approach was distinct from the summative approach more commonly found in schools. These schools used data more to help make decisions, and much less to validate decisions already made.

NCREL used these findings to drive the development of the *Practitioners' Collaboratory*: six small Chicago neighborhood schools funded in 1995 by the Chicago Annenberg Challenge. These schools proposed to build a laboratory and a collaboration. The purpose of the laboratory was to test classroom instructional techniques to identify those that worked and to find the courage to discard those that did not. Applying what had been learned about using data in schools, the group chose to reflect collaboratively about their practices and their results. Their vision was that together, teachers would become more like laboratory scientists, specifying outcomes, measuring results, testing hypotheses of increasing subtlety and strength and learning from their own and their common practices. Although encouraging, much of this work emerged in unique educational settings and with distinctive student populations. The ability to scale up these techniques needed to be evaluated in a public school setting. This opportunity presented itself with a request from the Creve Coeur School District.

The Need in Creve Coeur

In 1998, the superintendent of Illinois District 76, Creve Coeur, contacted NCREL to ask for assistance in the district's movement toward reform student learning. Creve Coeur is located on the outskirts of Peoria and has the following characteristics:

- Population: ~ 6000
- Enrollment: ~ 820
- # Schools: 3 (preK to 8)
- Demographics: 96% Caucasian
  45% free-reduced lunch (state avg. = 36%)
  35% "non-traditional" homes
  Mobility rate: 22 - 38%
  Expenditure/student: $3921, 36% lower than Illinois average
  Designated by Illinois as an "Economically-Challenged School District"Despite the implementation of various school reform initiatives over

the years, the Creve Coeur district had a history of mediocre student performance on standardized tests such as the Illinois Goal Assessment Program (IGAP).

Previous initiatives in Creve Coeur had emphasized the use of data to guide decisions related to school reform. For example, the curriculum director had performed gap analyses between the district and state curriculum for each grade and had facilitated work sessions with teachers to review this information. Teachers had worked together to better align the content and timing of their curriculum to the state standards and to maintain alignment within the local curriculum from Grades K through 8. Data from the state standardized test had been disaggregated and distilled in reports for administrators and teachers. Each week, data were also collected within classrooms on knowledge of math facts throughout the district, but these data were not analyzed or reviewed on a regular basis.

The need for improved student learning in Creve Coeur, along with the district's inclination to use data to drive their work, created an opportunity to improve the district's focus on high-periodicity (i.e., frequently occurring), classroom-level data in an effort to inform the day-to-day decision making inherent in an educational setting. A partnership between NCREL, Illinois Institute of Technology (IIT), and the Creve Coeur school district was established. The objectives of the partnership included working with a group of teachers to build a data-driven model of instruction. Specifically, the partnership aimed to co-develop a classroom procedure that would capture ongoing assessment data and feed it back to teachers for immediate evaluation on the effectiveness of instruction. Work began in the first quarter of 1999 and continued until the second quarter of 2000.

Precision Teaching: A "Hands-On," Classroom-Based DSS. Six teachers, selected by their administrators, met with NCREL/IIT staff over the course of approximately five months during the spring semester of 1999. Initially, the meetings focused on the importance of using formative data to inform classroom decision making and also served to assess techniques and tools that might best meet the teachers' needs. The partnership also prompted teachers to define a focus for their improvement efforts.

The partnership noted that students were having particular difficulty in math as reflected by standardized test scores and teacher observations. From informal conversations and by examining their curriculum, the teachers realized that year after year, they were spending a large portion of their instructional time on reviewing and reteaching basic math skills. They hypothesized that their students lacked fluency (i.e., speed and accuracy) on basic math skills, and thus appeared to

be stalled in their attempts to master higher-level mathematical skills. It was decided that the group would focus their improvement efforts primarily on mathematics.

Teachers were introduced to a process NCREL and IIT had observed being used by "data rich" schools (e.g., Ben Bronz Academy, Morningside Academy) with great success. The process, called Precision Teaching (PT) (Lindsley, 1990) began more than 30 years ago with the invention of the Change Chart (see one version in Figure 3), a tool for visualizing and making decisions about learning and performance. In essence, the Change Chart acts as a hands-on, paper and pencil decision support system for precision teaching and learning.

The use of PT is supported by substantial research (Bushell & Baer, 1994; Fuchs, Fuchs, Hamlett, & Stecker, 1991; Johnson & Layng, 1994; Lindsley, 1992) related to using student data to guide instruction by pinpointing specific learning goals, measuring student performance related to these goals, visually displaying these data to highlight individual student learning trends, and then basing the next instructional steps on each student's particular needs. It is a particularly effective method for helping learners obtain fluency on basic skills. The Creve Coeur teachers and administrators agreed to apply the decision support process used in PT within their classes in an effort to meet their math goals.

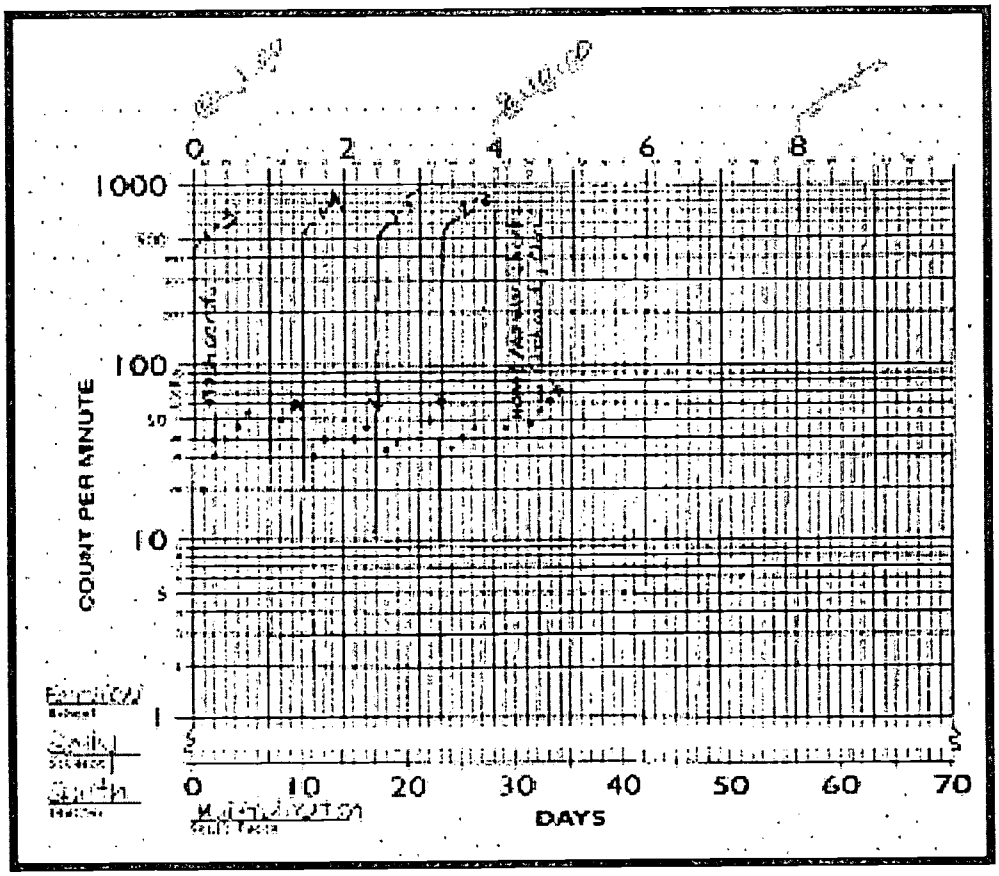
NCREL/IIT staff trained teachers to pinpoint measurable academic performance goals, manage daily practice sessions, monitor student charts, and make instructional decisions based on Change Charts displaying individual student data. Students were trained to chart and share their data with others and to become active participants in the learning process. This included:

- Setting their own learning goals ("aims").
- Analyzing their data to determine the speed and direction of their learning progress.
- Advocating for themselves by asking for help from a teacher or peer if their data showed they were not learning.
- Asking for more challenging work if they reached their goals.

On a daily basis, students had timed practice sessions on math facts to measure their fluency (i.e., speed and accuracy). Students recorded their performances on the Change Charts (number correct and incorrect) and teachers worked with them to adjust their goals, the curriculum, or the instruction based on how well students were improving and learning. Weekly, students displayed their charts and presented their learning data to the rest of the class. NCREL/IIT staff periodically observed teachers and students during these practice and data-sharing sessions, offering immediate feedback and suggestions on the process, encouraging data-based decisions, and

responding to specific questions. In addition, NCREL/IIT staff facilitated teacher-only data-sharing sessions after school.

Figure 3. Example of Change Chart used to track daily progress in Precision Teaching. The chart shows student learning progress over time.



A four-day institute took place during July 1999 to plan for an improved implementation during the fall semester. Administrators were trained to manage the work of teachers and to provide instructional leadership by attending student chart-sharing sessions once a week. The administrators also agreed to collect data on student learning trends within each classroom, to use these data to guide interventions with teachers, and to report their findings to the superintendent. Teachers discussed their needs to improve PT methods through improved organization, flexible student grouping, and peer coaching. Teachers reported that they were unaccustomed to making frequent, individualized decisions about student learning; at times, this made instructional

decision making difficult and stressful. To improve this situation, they agreed that their math materials should allow students to move at an individualized pace through the curriculum.

After investigating several options, Creve Coeur teachers chose to use basic-skills materials (i.e., Morningside Math (Johnson, 1996)) that had been specifically designed to progress in small, sequenced curricular steps based upon individual student performance. Then they decided to compact the basic-skills component of the math curriculum into a daily period of approximately twenty minutes, which would consist of timed, individualized practice, data collection and sharing, and instructional decision making. After each practice session, traditional didactic math instruction would take place.

Evaluation. The partnership worked together to develop an evaluation plan for the 1999/2000 academic year that would describe how frequent, classroom-based data-driven decision making affected student performance on various outcome measures.[9] The evaluation plan included continued consultation and monitoring by the NCREL/IIT partners as well as significant data collection and peer consultation by teachers. Outcome measures were chosen to speak to a variety of stakeholders within the district (i.e., Change Charts, curriculum-based tests, achievement tests). In addition, qualitative data were collected in the form of classroom observations, field notes, and teacher tape-recorded journals.

Summary of Quantitative Results. Through the end of February 2000, results strongly supported the proposition that the implementation of frequent, data-driven decision making in classrooms as embodied in the PT decision support system, complemented by Morningside math materials, had a robust positive impact on student achievement as measured by timings on basic mathematic skills (i.e., addition, subtraction, multiplication, division). All of the overall comparisons showed that the data-driven, PT classes ended up with superior performance to a statistically significant degree. While this finding was particularly strong in Grades 1, 3, and 4, it must be noted that within-grade comparisons were mixed; not all PT classes outperformed all "control" classes on all skills. Furthermore, the results may be understatements of the power of data-driven decision making in the district for three reasons:

- First, it was discovered that teachers in the control classrooms had their students practice the outcome measures once per week, while teachers in the PT classrooms used the outcome measures with students only at evaluation times (Time 1, September; Time 2, December; Time 3, February; Time 4, May). A potential "practice effect" may have artificially inflated the results for the control classes.

- Second, analyses may be artificially biased toward the control classrooms due to the larger number of participants in these groups.
- Third, several of the classes were unable to maintain the full implementation for the entire year.

Between Time 3 and Time 4, results varied and sometimes diverted from the existing trends. This time period represented the end of the technical assistance that was being offered to administrators, teachers, and students by NCREL and IIT. In addition, standardized testing occurred during this period and may have interfered with the implementation of data-driven decision making in the classrooms. Interviews with teachers suggested that these factors had a moderating effect on the implementation during this time.

Math results from the ISAT were also analyzed for Grades 3 and 5 to compare the performance of students in the experimental and control classrooms. Overall, there was no significant difference in the average performance of the groups on this large-scale measure.

Summary of Qualitative Results. As teachers shared charts of their student's data, they learned to analyze the celeration lines, or learning trends reflected by the data, to guide their decisions. When data indicated that children were not learning (i.e., their data were "flat"), teachers and administrators explored instructional options, identified new teaching options and learning goals, and used the PT decision support system to reflect the efficacy of these interventions.

During the fall semester, PT teachers were concerned that they were not "covering enough material" because their students were practicing skills until they became fluent and were working at a wide range of competency levels, while students in the control classes were moving through the curriculum at a predetermined pace. However, students responded very positively to the program's timings, data plotting, and data sharing procedures. Students asked for timings, concentrated well, and negotiated individual learning goals with their teachers on a regular basis. As a result, teachers were able to accommodate the individual needs of their students because (a) they had data to reflect these needs, (b) they had learning materials that allowed for individualized practice and progress, and (c) the efficacy of instructional interventions was rapidly and efficiently manifested by student charts.

In May 2000, teachers reported that their students continued to feel positively about the program. It was also reported that PT classes had ended up addressing more material than the control classes: they were able to make "leaps" in the curriculum without additional instruction. This progress was attributed to their focus on developing fluent basic math skills through this

implementation. Thus, their more efficient teaching process ended up saving weeks of time in spite of the investment in data collection, plotting, and analysis each day.

These results are encouraging and suggest that maintaining and scaling up the data-driven decision making model over the course of a few years would accelerate student learning. With more efficient mastery of basic math skills, more attention could be devoted to enhancing student's conceptual understanding of math as well as their problem-solving skills. These authors suggest that, in time, this would allow for improved performance on large-scale assessments that emphasize higher-order thinking skills, such as the ISAT. Finally, the study shows that the efficiency of learning can be raised in the area of math skills, and attempting to replicate these results in other academic areas should be a priority.

SeeChange: PT Goes to the Web (http://scc.iit.edu/beta)

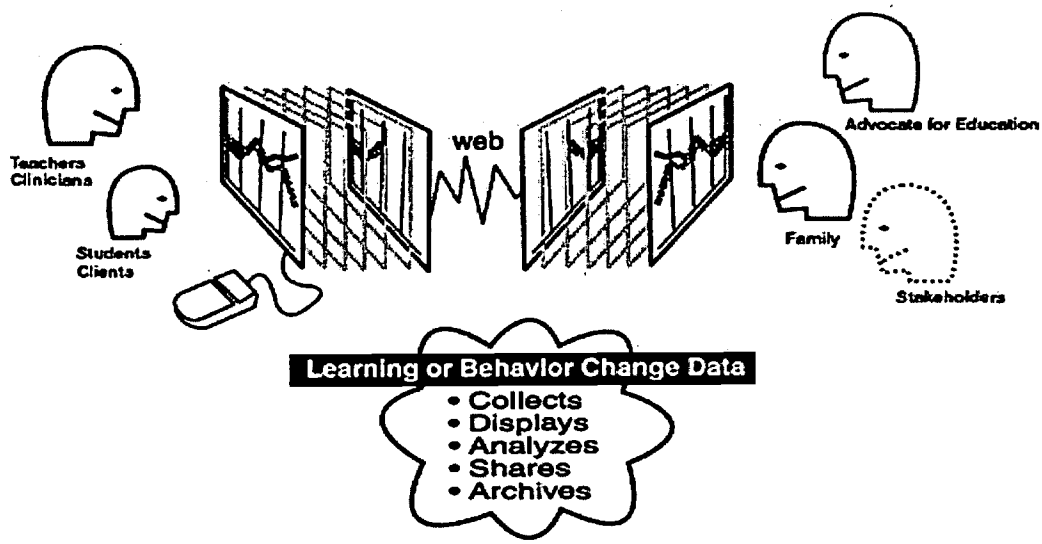
The results from implementing the "hands-on," PT-based decision support system in Creve Coeur were indeed promising. Yet the history of PT and feedback from the Creve Coeur teachers suggested that scaling up this strategy would be limited by the need to maintain data and individual student charts via paper and pencil. "SeeChange," a Web-based tool, was conceived to overcome this obstacle.

Codeveloped by IIT and NCREL, SeeChange allows these strategies to be streamlined via online data entry, archiving, and graphing. Using the site, educators who measure student performance each day have a rapid, user-friendly way to analyze and share these data for decision making (See Figure 4).

SeeChange allows each user, using a password, to enter, archive, access, and aggregate student performance data on a 24/7 basis via the Internet. "Permission levels," based on the role and appropriate data needs of various users, are assigned to protect student confidentiality. The site is designed to grow over time as users archive a wealth of data on learning indicators (e.g., state learning standards) in different subject areas and use these data to evaluate and improve outcomes of interventions, teaching practices, and curriculum.

The SeeChange Web site also allows all educational stakeholders (e.g., students, teachers, administrators, and parents) to view student progress on an ongoing basis. Administrators can "see change" and rearrange administrative structure to help teachers work with learners to induce change. Finally, frequent and specific feedback empowers learners to improve.

Figure 4. SeeChange illustration



Evaluation. SeeChange will be piloted and formatively evaluated during the next two years. The objective of this work will be to help NCREL/IIT understand how SeeChange is used by various stakeholders and the impact it has on student learning. This feedback, in turn, will inform future development of the site.

Curriculum Mapping With TLNs: Intersection of Program and Demographic Data

The recent national curriculum reform movement stresses the creation of rigorous academic standards. Among the criteria outlined by the American Federation of Teachers (AFT) is the assertion that standards must "reflect various levels of knowledge and skills comparable to what students in high-achieving countries are expected to master" (Gandal, 1995). Researchers responded with an analysis of curriculum data, a form of program data, generated by the General Topic Tracing Map (GTTM), a simple and versatile data collection tool used in the Third International Math and Science Study (TIMSS). GTTM data created an overall picture of the "composite U.S. curriculum" in math and science from K-12 and enabled international comparisons. Findings indicated that the U.S. mathematics curriculum is unfocused and lacking in rigor and that, overall, the U.S. curriculum is designed to cover far more topics than the international average (Schmidt, McKnight, Valverde, Houang, & Wiley, 1997; Schmidt,

McKnight, & Raizen, 1997). By maintaining a high number of topics, each topic is less likely to be covered in detail. The result is a U.S. curriculum of great breath, but lacking in depth.

Although enlightening, these findings provide little information for individual school districts given the existing variance in curriculum guides and textbooks. For local educational systems to examine and reflect upon the appropriateness of their own curricula, they need data that:

- Provide an overview of the *breadth* of the curricula.
- Illustrate the *flow* of topics through the curricula.
- Indicate the *duration of time* topics are in the curricula.
- Signify the *rigor* of the curricula.

The task of generating data about these facets of curricula is currently time and labor intensive for schools, and avenues to relate these data to demographic variables or to a broader national or international context are few. This limits the ability of schools to objectively analyze their curricula along these domains. It also suggests that there are few resources for schools aiming to improve and optimize the design of their curricula.

The GTTM provides a potential solution to this quandary by generating data that reflect characteristics of local curricula across these four domains. Because GTTM is tied to TIMSS, parallel information about curricula breadth, flow, duration, and rigor is available for the U.S. and for over 40 nations. The results of these analyses can be used to make comparisons across the curricula, to link curricular trends to demographic variables, and to guide data-driven reform.

Bringing Curriculum Mapping to the Field

In 1997, NCREL formed a partnership with the First in the World Consortium (FITW), consisting first of 10, and eventually 20 school districts north of Chicago. Participating FITW superintendents had made a collective agreement to pursue the national goal that U.S. students would become "first in the world" in mathematics and science achievement. An important goal of the FITW consortium was to discern if their curricula were "a mile wide and an inch deep," as was the composite U.S. curriculum. The consortium successfully petitioned the U.S. Department of Education for the right to assess its students using TIMSS. It received a multitude of data as a result, but had little direction regarding how to proceed. NCREL provided technical assistance for analyzing the TIMSS data. NCREL also assisted in administering the GTTM to all participating districts. In partnering with FITW, NCREL aimed to better understand the specific needs of practitioners as they used large-scale assessment and survey data to guide local school improvement processes.

Considerable NCREL support was required to make GTTM data "user friendly" at the consortium, district, and school level. In addition to processing these data, NCREL compiled consortium, national, and international GTTM data into a report,[10] along with guidelines for conducting comparative analyses. NCREL also conducted several training sessions to show FITW stakeholders how to use the report and the data within. Finally, NCREL facilitated the analysis of GTTM data by a group of local practitioners.

Scaling Up Curriculum Mapping

During 2000 NCREL began to scale up the GTTM along two avenues. First, a self-administered paper and pencil workbook was produced, complete with generic displays for the user to plot data. Second, a Curriculum Mapping Web site was created, a more sophisticated Web-based version allowing users to enter GTTM data online, call up multiple displays with their data, and superimpose these data against data representing the U.S. and other TIMSS countries.[11] The Web site was conceived as a simple, fast, and accessible tool that would allow districts to reform local curricula through data-driven decisions. The workbooks were conceived as both stand-alone tools for basic analyses as well as a "teaser" for the Web site.

Several issues came to a head to lead NCREL to embark on these scaling-up efforts. First, the national curriculum reform movement, instigated by the TIMSS, motivated local districts to reflect upon the breadth and depth of their curricula. Second, NCREL's experience with FITW indicated a dependence on technical assistance by other local practitioners and administrators interested in doing curriculum mapping. Finally, NCREL anticipated additional needs from new benchmark groups, including five consortia and 13 states that had participated in the TIMSS-R (repeat). A number of these benchmark groups reside in the NCREL region.[12] These groups now have access to their own rich survey data from the TIMSS-R. But the GTTM, administered with the TIMSS, was not administered with the TIMSS-R. For these groups to take full advantage of their participation in the TIMSS-R, they would need access to the GTTM as well as assistance with the resulting data.

Beginning in spring of 2000, NCREL simultaneously developed the workbooks and the Web site in partnership with the U.S. TIMSS National Research Center at Michigan State University, the major publishers of U.S. and international GTTM data from the TIMSS. Construction of the Web site was contracted to the Center for the Advancement of Information Technology (CAIT) at Western Illinois University. Both tools were completed in December 2000.

NCREL has become nationally recognized through conference presentations, papers, and positive word-of-mouth from FITW for its expertise in working with TIMSS data at the practitioner level. NCREL staff have been invited to conduct interactive workshops on the Curriculum Mapping Web site at two professional conferences (National Staff Development Council, December 2000; Association for Supervision and Curriculum Development, March 2001). In addition, a brief mention of the Curriculum Mapping Web site on a TIMSS e-mail list (6/1/00) quickly generated a great deal of interest. Within weeks, approximately 20 contacts, from Alaska to Florida, inquired about the roll-out date of the site and future NCREL products related to the TIMSS and/or GTTM.

A DSS for Curriculum Mapping (www.ncrel.org/currmap)

In the next few years, NCREL will continue to partner with the U.S. TIMSS National Research Center to use and expand the curriculum mapping Web site. This partnership will include systematically collecting GTTM data from TIMSS-R benchmark groups through the Web site, then describing the curriculum profiles reported by benchmark groups, and national and international Web site users. These data will also help NCREL build upon our preliminary findings regarding demographic variables and curriculum topic coverage. Specifically, NCREL will use the curriculum mapping Web site data to identify schools and districts throughout the nation with at-risk populations to research the relationship between student demographics (e.g., ethnicity, socioeconomic status) and curricular rigor.

Two avenues of expansion will soon begin. Early in 2001, NCREL will begin field research to expand the curriculum mapping Web site to include Grades 9 through 12. NCREL will also work with the U.S. TIMSS National Research Center to include mappings of state standards for most of the United States. This will significantly enhance districts' ability to align local curricula to state standards.

Evaluation. The curriculum mapping Web site will be piloted and formatively evaluated during the next contract period. The objective of this work will be to help NCREL and the U.S. TIMSS National Research Center understand how various stakeholders use the site and the impact it has on decision making regarding curriculum design. This feedback, in turn, will inform future development of the site.

Conclusion

As a result of our research, tool development, and dissemination to the field in various formats (e.g., conference presentations, articles), NCREL has acquired a reputation for significant expertise with data-driven decision making and education decision support systems. At this point, there is some consensus among researchers and policymakers regarding the need to use data better in schools. The accountability movement has apparently pressed this issue to the point of recognition, if not acceptance, by practitioners as well. Therefore, questions regarding "why" data should be used for educational decision making have been somewhat quelled. The lingering question is "How?" That is, *how* can practitioners come to make better decisions by accessing, analyzing, and using relevant data? Significant barriers exist, such as lack of training and time, existence of competing demands, and resistance to change, that inhibit the capacity of educators to move from problem recognition to the process of changing and improving practices.

NCREL may appear to be "ahead of the curve" in this area of educational research and development due to the high visibility and initial success of the DSSs we have helped to develop, but we remain acutely aware of the need for additional knowledge regarding issues such as:

- If, how, and by whom decision support systems are used
- The relationship between the use of DSSs and the style of decision making in schools
- Identifying effective professional development to complement launches of online DSSs
- Understanding the limitations of DSSs for particular users and specific types of decision making.

The development of DSSs in education is emerging and dynamic, fueled by the movements of accountability, assessment, technology, and management information systems. During the next 5-years, NCREL will work to respond to the above issues, and will consult, collaborate, and network in this area while considering partnerships that may benefit our constituents and help us pinpoint our contribution to the field.

NCREL's new signature area, Education Decision Support Systems (EDSS), has emerged from the work reported here and aims to make data more available and useful for educators. It will be important for this signature area to keep pace with the changing needs and capacities of educators and information systems, and to fine-tune the specifics of its overall objectives accordingly. One thing is clear: Educators and policymakers will continue to call for support in their efforts to improve the education system through informed decision making. Over the next

contract period, it will be important that we at NCREL expand our knowledge, link our work to others, apply, evaluate, and share our findings.

---

[1] SSAP continues to be updated annually, and is now maintained by the CCSSO alone. It can be accessed from the CCSSO Web site, http://www.ccsso.org.

[2] This representation has been adapted from a model developed by Judy Sargent, Ph.D., for NCREL's *Data Retreat Participant's Guide* and *Data Retreat Facilitator's Guide*, 2000.

[3] This year (2000), Evaluation Software Publishing, Inc. (ESP) and the Council of Chief State School Officers (CCSSO) worked together on behalf of the Office of the Chief Information Officer, U.S. Department of Education (OCIO) to host and summarize findings from several regional and national meetings addressing the status of decision support systems in education. Much of the contextual information offered here has been gleaned, with permission, from summary reports that are available at: www.EducationAdvisor.com.

[4] More details about the development process of ILSI can be found in Appendix 1.

[5] Further information at http://qsp.cse.ucla.edu.

[6] More details about the development process of WINSS can be found in Appendix 2.

[7] These data were collected by the Web trackers on the WINSS and ILSI sites.

[8] For a more comprehensive description, see *Characteristics of Current Decision Support Systems in Education* (ESP, 2000), available at: http://www.educationadvisor.com/ocio2000/4j_Characteristics_of_Current_DSSs.doc

[9] A detailed evaluation report is beyond the scope of this document. Instead, a summary of the evaluation goals, activities, and results are provided.

[10] Kroeze, Masini, & Aumiller. (2000). *GTTM Report: Mathematics and Science Curricula*. North Central Regional Educational Laboratory, Oak Brook, IL.

[11] The Web site will also provide for NCREL a database of the curriculum and demographic data entered by users.

[12] Illinois, Indiana, Michigan, Ohio, Chicago Public Schools (Illinois), Naperville School District (Illinois), SMART Consortium (Ohio), and Connected Mathematics Project (Michigan).

References

Bernhardt, V. L. (1998). *Data analysis for comprehensive schoolwide improvement.* Larchmont: Eye on Education.

Black, P., & Wiliam, D. (1998, October). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan,* 139-148.

Bushell, D., & Baer, D. M. (1994). Measurably superior instruction means close, continual contact with the relevant outcome data. Revolutionary! In R. Gardner, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. Eshelman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 3-10). Belmont: Brooks/Cole Publishing.

Dietel, R. J., Herman, J. L., & Knuth, R. A. (1991). *What does research say about assessment?* [Online]. Available at: http://www.ncrel.org/sdrs/areas/stw_esys/4assess.htm.

Fuchs, L., Fuchs, D., Hamlett, C., & Stecker, P. (1991). Effects of CBM and consultation on teacher planning and student achievement in mathematics operations. *American Educational Research Journal, 28,* 617-641.

Gandal, M. (1995). Not all standards are created equal. *Educational Leadership,* 52(6), 16-21.

Johnson, K. R. (1996). *Morningside mathematics fluency.* Seattle: Morningside Press.

Johnson, K. R., & Layng, T. V. J. (1994). The Morningside model of generative instruction. In R. Gardner, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. Eshelman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 3-10). Belmont: Brooks/Cole Publishing.

Lindsley, O. R. (1990, Spring). Precision teaching: By teachers for children. *Teaching Exceptional Children,* 10-15.

Lindsley, O. R. (1992). Precision teaching: Discoveries and effects. *Journal of Applied Behavior Analysis,* 25, 21-26.

McQueen, A. (2000, June 8). Data on school children questioned. *Associated Press.* [Online]. Available: http://dailynews.yahoo.com/h/ap/20000608/pl/poor_students_2.html.

National Center for Research on Evaluation, Standards, and Student Testing (1999). *Quality School Portfolio: Manual.* Los Angeles: Author.

North Central Regional Educational Laboratory. (1999). NCREL education issues analysis. [Online].Available: http://www.ncrel.org/policy/scan/analysis.htm.

Nichols, B. W., & Singer, K. P. (2000). Developing data mentors. *Educational Leadership, 57*(5), 34-37.

Schmidt, W. H., McKnight, C. C., & Raizen, S. A. (1997). *A splintered vision: An investigation of U.S. science and mathematics education.* Dordrecht, the Netherlands: Kluwer Academic Publishers.

Schmidt, W. H., McKnight, C. C., Valverde, G. A., Houang, R. T., & Wiley, D. E. (1997). *Many visions, many aims: A cross-national investigation of curricular intentions in school mathematics.* Dordrecht, the Netherlands: Kluwer Academic Publishers.

APPENDIX 1

Development Chronology for Illinois School Improvement Web site (ILSI) and Customized QSP for IL	
6/99	ISBE requests help to develop an "electronic reporting" DSS for state and local school data
6/99	NCREL proposes codevelopment partnership with ISBE and the Illinois Business Roundtable (IBR)
7/99	Initial partnership meeting
9/99	Matrix of responsibilities for ILSI and QSP project activities developed and disseminated to NCREL/ILBE/IBR partners
10/99	IBR hosts meeting with state educators to introduce plans for DSS development linked to Illinois Learning Standards
11/99	NCREL hosts pilot group of educators for School Improvement Planning Project, along with ISBE and IBR. • Project Overview • Demonstration of Maryland DSS and QSP • DSS development for IL
12/99	ISBE staff meeting with State Superintendent, Max McGee, Associate Superintendent, Bill Conrad, and NCREL Executive Director, Gina Burkhardt • ISBE and NCREL commitment to project • Progress of project • Subcontractors on project • Organizational responsibilities for next steps ✓ Training ✓ Site maintenance ✓ Site content ✓ Data sets ✓ Data Analyses
	Pilot group of educators for School Improvement Planning Project meets in Lexington, Illinois, along with NCREL, ISBE and IBR. • Demonstration of IL DSS framework • Pilot School feedback • Subgroup meetings ✓ Technical ✓ Site design ✓ Piloting/evaluation
1/00	ILSI password-protected Alpha Site posted
	IBR Presentation of Illinois School Improvement Web site to ISBE and IL Business Leaders' Education Summit.

2/00	Plans for Illinois School Improvement (ILSI) Web site pilot plan ✓ Field test Web site DSS ✓ Field test QSP tool with help from graduate students from Governor's State University ✓ Pilot school uses ILSI and QSP on own for several weeks ✓ Focus group meeting with pilot schools to evaluate success of these projects in helping schools review their school improvement plans Results used to create ILSI Beta Web site and customized QSP software
	Planning meeting: ISBE, NCREL, IBR • Updates: ILSI Web site and QSP piloting • Statewide rollout plans Fall staff development plans
7/00	ISBE hosts meeting with NCREL and IBR to discuss staff development plans for ILSI and QSP • Review of feedback from initial pilot groups • Training being delegated to Regional Offices of Education (ROE); ISBE to provide funding to 7 ROEs to form first training group with ILSI/QSP • ROE administrators will be aided by interns from Governor's State University
	Hosting of site transferred from subcontractor server to ISBE server
11/00	Press release announcing official public rollout of ILSI Web site

Appendix 2

Development Chronology for Wisconsin Information Network for Successful Schools (WINSS)	
1/00	WINSS requests help to develop an "electronic reporting" DSS for state school data
	Initial partnership meeting: WI DPI and NCREL, Madison, Wisconsin • NCREL presentation of DSS templates • Roundtable discussion to define roles and responsibilities • Timeline • Deliverables • Subcontracts • List of data elements
2/00	WI DPI defines cross-department Web workgroup
3/00	Matrix of responsibilities for WINSS project activities developed and disseminated to NCREL/WI DPI partners
	WINSS password-protected Alpha Site posted
6/00	WI DPI, along with NCREL, hosts 3-day meeting with pilot groups to introduce, use, and gain feedback on the initial version of WINSS. Pilot groups included: • Policymakers (Governor's office) • Administrators • Representatives from WI CESAs (Cooperative Educational Service Agencies) • Teachers • Community members • Parents Results used to create WINSS Beta Web site
9/00	Hosting of site transferred from subcontractor server to WINSS server
9/00	Press release announcing official public rollout of WINSS Web site

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

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

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