Data Tools for School Improvement

These strategies will help schools select an appropriate and effective data system.

Victoria L. Bernhardt

Imagine starting the school year with historical data about each student in your class—even a student just assigned to your class that morning. The data could include the student's achievement test results, information about what standards he or she has mastered, the student's teachers in previous grades, absences, discipline referrals, and more—all easily accessible electronically.

Imagine a diagnostic testing process that automatically records what each of your students already know or still needs to master to meet all district and state learning standards by the end of the year. This process would not only suggest lessons to assist the students with their learning needs as a whole, but it would also indicate which students need additional, individualized support.

At the school and district levels, imagine knowing the impact of a particular school's efforts on behalf of students. Imagine knowing where and how you need to strengthen a school's instructional systems, provide new programs, add new or different professional development activities, offer technical assistance, or allocate resources to achieve the mission of the school and district. Imagine being able to electronically report data required by state and federal agencies at the touch of a key.

Imagine how much smarter educators could work with the help of data tools.

Which Tools Do Schools Need?

If a school wants to improve student learning, it has to use data. Using data effectively requires data tools—particularly student information systems, data warehouses, and instructional management systems. Such tools are necessary to get student data into teachers' hands when they need it, without their having to wait for the district's data guru to provide an analysis. Without data tools, our vision of data-smart schools is merely a dream.

Excellent tools to keep track of data and to ensure that all students meet learning standards are available now; the hard part is figuring out what you want data tools to do, which tools do what you want, and which tools you need first. These choices can get confusing. Technology companies claiming they are devoted to education spring up every day. Some companies focus on student information and data warehousing products; others specialize in instructional management. Although some companies claim to do it all, few truly do.

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Bernhardt, V. L., (2005). Data Tools for School Improvement. *Educational Leadership.* 62(5), 66-69.

As school districts take steps to acquire and effectively use data tools for school improvement, it is interesting to watch their typical buying patterns. Most school districts first purchase a student information system. The product a school buys next often depends on who is on the committee to investigate data tools. Teachers will always want instructional management systems first; data gurus and some administrators often want the data warehouse management system first. Next, schools generally buy either a data warehouse or an instructional management system, and finally they go back and buy whichever of these systems they did not buy in the first place. It is pretty inevitable that school districts will want all three types of data tools eventually.

Let's look at these three different types of data products to improve student learning to understand what these products do and what to look for when purchasing each of them.

Student Information Systems

Student information systems are databases that mainly house demographic data collected throughout the school day. Many student information systems are networked and automate the repetitive collection of such data as class attendance, tardiness, discipline referrals, and enrollments.

Before the advent of networked student information systems, teachers used paper and pencil to tally student absences. They sent the paper to the office secretary, who at some point entered the information into a database or spreadsheet. The data were used to figure out the school's average daily attendance but were seldom used for anything else.

Now student information systems electronically link classrooms to the overall school database for instant updating, practically taking class roll on their own. Some systems show the class lists in alphabetical order (or a graphic layout of students desks) on the computer screen. The teacher clicks on each student name or desk to take attendance, and the system enters into the database the name of the student and the class period for which attendance is being recorded. Teachers and administrators can see trends in absences by student; by school or district; and by time of day, day of the week, or day of the month. A well-designed student information system enables school personnel to study important measures of student engagement, such as attendance, discipline, and suspensions, and to fully analyze problems before attempting a solution.

For example, one year, Eastern Elementary School's[1] discipline referrals tallied in at twice the number of the previous year's, and the principal was about to establish a firmer discipline policy. Eastern's assistant principal suggested that they more closely review the numbers on discipline referrals in their student information system. This closer look revealed that a large proportion of the referrals were for the same group of boys being reprimanded on the playground only on Monday, Wednesday, and Friday mornings—and always by the same part-time supervisor. This close analysis of the data revealed that a new schoolwide discipline program would not be an appropriate solution.

The hard part in selecting data tools is figuring out what you want the tools to do, which tools do what you want, and which tools you need first.

When buying a student information system, make sure you are clear on how many years of data the system will hold and what the system does with data at the end of each year. Some systems automatically erase the previous year's data as the new year's data are entered. Many districts that assumed their information system was storing years of student demographic information were surprised to find only the current year's data available when they tried to access information from past years.

Data Warehouses

Data warehouses enable school districts to analyze data across different databases, such as student information systems, databases of test results and school programs, and databases of information about students' and teachers' perceptions. Schools use data warehouses to perform such statistical procedures as analyzing longitudinal data, disaggregating data, and following cohorts of students over time. Data warehouses are wonderful for following students' education histories backward. For example, administrators can identify all the students who dropped out of a particular high school in a given year and then compare factors in these youths' education histories for all previous years, noting any common characteristics. Such information could be invaluable in lowering a school's dropout rate.

Do not be timid about asking to see data tools at work.

With a data warehouse, schools can analyze the impact of instructional programs and processes on students. For example, Evergreen School District used its data warehouse to break down and analyze student achievement results by demographics, by instructional methods, and by preferred student learning styles. Using this tool, Evergreen teachers could quickly see that their students from low-income backgrounds learned more effectively when teachers presented content in an active format. Teachers could also see that high school girls in the district were enrolled in more advanced placement classes and were getting significantly higher GPAs than were high school boys. In-depth analysis might indicate teaching strategies that would be more successful with boys.

Instructional Management Systems

Instructional management systems help analyze student performance on ongoing assessments and reveal how closely student learning matches the content a teacher has presented in class. Such systems

- provide standards-based lesson plans and resources to help students and teachers raise test scores;
- help teachers align classroom curriculum to content standards; and
- help teachers align curriculum between grades.

For example, teachers in Western School District use an instructional management system to create their own pre-assessment from a huge selection of test items that are similar to those found on their state standardized assessment. Teachers get the results soon after all students take the pre-assessment online so they can quickly see which standards students know and which standards need further clarification. The instructional management system suggests lessons for covering material that most students answered incorrectly on test questions. It also links to education web sites for material that a smaller group of students failed to master. Teachers can assess students as many times as they wish throughout the year.

Tips on Enlightened Buying

Selecting the right data tools requires planning and research. Many school districts hope to discover one company that will provide a student information system, a data warehouse, and an instructional management system all in one. Few companies, if any, offer all three, although some students information systems offer a partial instructional management system, and some data warehouse companies partner with instructional management companies to include these capabilities with their product. School personnel can become frustrated as they seek tools with which all three components work together.

Here are some suggestions for selecting effective data tools:

Be clear about what you are looking for. Inevitably, as you begin to shop for one kind of data tool, vendors will talk about the other two as well. Be clear about what tools you're interested in purchasing when you start looking. Do you want an instructional management system, a student information system, a data warehouse—or all three? Do you want to buy them all at once or one at a time? Don't feel as though you have to buy all pieces from the same company. A collaborative vendor should help you secure partnerships with other vendors. If your school district cannot afford all three systems, do not be afraid to talk with the vendors about your dilemma. They may be able to adjust prices or propose cost-saving strategies, such as collaborating with other districts in your area to share a server, which would decrease the per-pupil cost of a data system. One data tool company might also join forces with another company you are considering buying from to offer your district incentives to buy both products.

Be sure the tools can talk with one another. The Schools Interoperability Framework (SIF) is a collaboration of school data stakeholders that sets data exchange standards to enable software packages to communicate with one another. SIF-compliant data tools (which should have this term on the label) interact as one system; data that are entered into one of the data tools will be entered into the other tools automatically. For example, with a SIF-compliant student information system, data warehouse, and instructional management system, a student's name and identification number would only have to be entered once. The name and identification number would automatically be entered in all the other systems. (Visit www.sifinfo.org for more detailed information on SIF compliance.)

Involve a team with broad membership in the process. Include teachers, administrators, and information management personnel. Be sure the people who will use the particular product most are represented. One district made the mistake of buying a data warehouse preferred by the teachers on the buying committee, who were the majority. The district's data analysis person was left with a product that did not do what she needed. Many extra hours were spent customizing the data warehouse, and it was still so cumbersome that the district eventually replaced this tool. Another district had administrators purchase an electronic "lesson planning tool" without consulting teachers. That tool was never used.

Research possible vendors—and have them come to you. Look into potential vendors' stability and financial status. Invite them to

Data Tools Defined

A database is a system of organized information that is easily retrievable—preferably electronically. Telephone books and dictionaries are common databases that are organized alphabetically to make information easy to find.

Student information systems are databases that electronically collect and organize data concerning characteristics of the student population and school processes. Such a system makes it easy to collect and consolidate data about many factors, such as student attendance; discipline referrals; number of students of a certain gender, ethnicity, or family income; student course assignments and schedules; and specialized school programs.

Educational data warehouses allow the manipulation and integration of multiple databases connected to one another through individual student and teacher identification numbers, and through class schedules that link students to teachers. An excellent educational data warehouse will link together student demographic and grading data from your student information system to standardized student test scores that might come from a testing company and to program data in a separate database. One could access these different types of data for an individual student without needing to reenter the basic student information each time. Data warehouses allow longitudinal and comprehensive data analyses with multiple variables from multiple sources.

Instructional management systems help teachers align lessons to standardized learning objectives, provide instructional resources and assessments, and measure student performance on learning objectives.

meet with you at your school. Do not be timid about asking to see data tools at work. Such tools are a big investment, and you want to know that they will do what you need in your environment.

Don't automatically go to the lowest bidder. Stay aware of what you need a data tool to do. If a company with a less desirable product offers a lower price, go back to the company you really want to work with and talk with them. Often a reduced price also reflects a reduced product that will entail other costs later on.

Talk with current users. Ask lots of questions, not only about the products, but also about the people with whom you will be working. Will these vendors follow through with their promises and be there to support you through all parts of the process?

Data can make the difference in improving student learning. With effective data tools, teachers and administrators can pinpoint which students are meeting—or falling short of—learning objectives, and what strategies will help each learner succeed. Educators need tools that get data directly into their hands and ease the process of interpreting data. The strategies outlined here should speed schools toward that goal.

[1] All names of schools and districts are pseudonyms.

About the Author

Victoria L. Bernhardt, Ph.D., is Executive Director of the *Education for the Future Initiative,* a not-for-profit organization whose mission is to build the capacity of all learning organizations at all levels to gather, analyze, and use data to continuously improve learning for all students. She is also a Professor (currently on leave) in the Department of Professional Studies in Education, College of Communication and Education, at California State University, Chico. Dr. Bernhardt is the author of the following books:

- *Translating Data into Information to Improve Teaching and Learning* (2007) helps educators think through the selection of meaningful data elements and effective data tools and strengthens their understanding of how to increase the quality of data and data reports at each educational level.
- A four-book collection of using data to improve student learning—*Using Data to Improve Student Learning in Elementary Schools (2003); Using Data to Improve Student Learning in Middle Schools (2004); Using Data to Improve Student Learning in High Schools (2005);* and *Using Data to Improve Student Learning in School Districts (2006)*. Each book shows real analyses focused on one education organizational level and provides templates on an accompanying CD-Rom for leaders to use for gathering, graphing, and analyzing data in their own learning organizations.
- *Data Analysis for Continuous School Improvement* (First Edition, 1998; Second Edition, 2004) helps learning organizations use data to determine where they are, where they want to be, and how to get there—sensibly, painlessly, and effectively.
- *The School Portfolio Toolkit: A Planning, Implementation, and Evaluation Guide for Continuous School Improvement,* and CD-Rom (2002), is a compilation of over 500 examples, suggestions, activities, tools, strategies, and templates for producing school portfolios that will lead to continuous school improvement.
- *The Example School Portfolio* (2000) shows what a completed school portfolio looks like and further supports schools in developing their own school portfolios.
- *The School Portfolio: A Comprehensive Framework for School Improvement* (First Edition, 1994; Second Edition, 1999). This first book by the author assists schools with clarifying the purpose and vision of their learning organizations as they develop their school portfolios.
- Currently in press: *Questionnaires Demystified: Using Perceptions Data for School Improvement* describes how to create, administer, analyze, and use questionnaires as a tool to improve teaching strategies, programs, and learning organizations.

Dr. Bernhardt is passionate about her mission of helping all educators continuously improve student learning in their classrooms, their schools, their districts, and states by gathering, analyzing, and using actual data—as opposed to using hunches and "gut-level" feelings. She has made numerous presentations at professional meetings and conducts workshops on the school portfolio, data analysis, data warehousing, and school improvement at local, state, regional, national, and international levels.

Dr. Bernhardt can be reached at:

Victoria L. Bernhardt
Executive Director, *Education for the Future Initiative*
400 West First Street, Chico, CA 95929-0230
Tel: 530-898-4482 — Fax: 530-898-4484
e-mail: vbernhardt@csuchico.edu
website: *http://eff.csuchico.edu*