

TAKING DATA TO NEW DEPTHS

There's a ton of data being collected. The trick is to know how to use it effectively

BY NANCY LOVE

When educators in one Texas high school saw African-American students' performance drop slightly below 50% on their state mathematics test, putting the school on the state's list of low-performing schools, they reacted quickly. Decision makers immediately suggested that all African-American students, whether or not they failed the test, be assigned peer tutors (Olsen, 2003).

Based on one piece of data and one way of looking at that data, these decision makers made assumptions and leapt to action before fully understanding the issue or verifying their

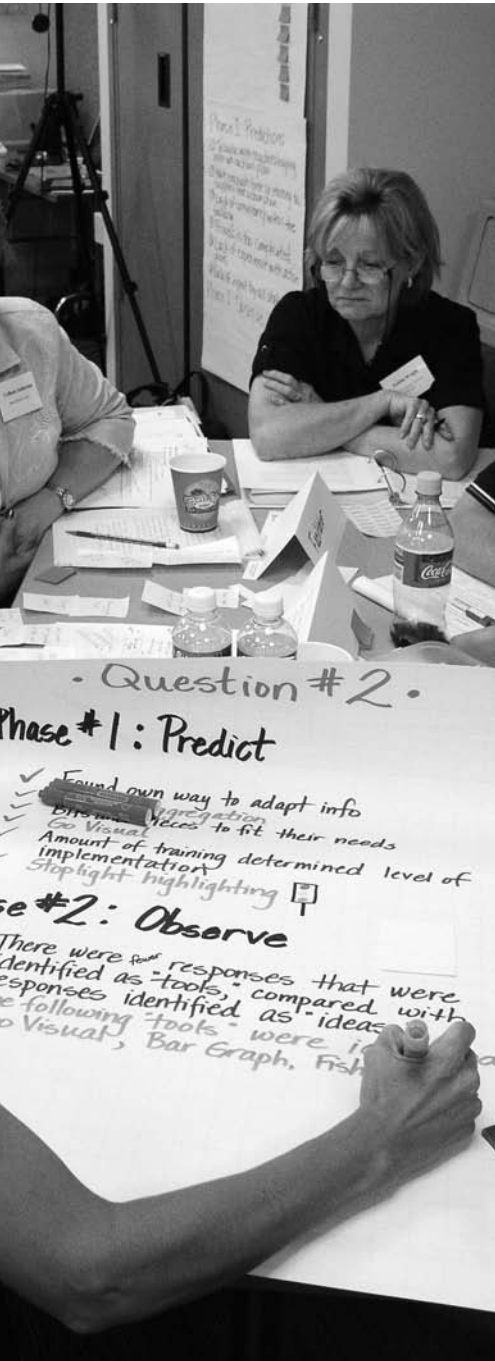
assumptions with other data sources.

They ignored past trends, which indicated that African-American students' scores were on an upward trajectory. They failed to consider that the decline was so small that it could better be explained by chance or measuring error than by their instructional program. They considered only the percent failing without digging deeper into the data to consider what students needed. Finally, their proposed intervention targeted only African-Americans students, while overlooking Hispanic and white students who also failed the test.

The Using Data Project, funded by the National Science Foundation (NSF), helps mathematics and science educators develop data literacy — the ability to examine multiple measures



and multiple levels of data, to consider the research, and to draw sound inferences. Teachers and administrators become data facilitators, leading school data teams to dig deeply into several data sources and, through reflective dialogue, learn to improve mathematics and science teaching and learning. And they learn, as the Texas example illustrates, that superficial data analysis can be worse than none.



Aileen Dickey writes a data report as team members contribute ideas. From left, Deb Chittenden, Colleen Anderson, and Debbie Wright. They participated in a Using Data workshop in Newton, Mass., in June 2004.

USING DATA DIFFERENTLY

Schools are gathering more and more data, but having data available does not mean the data are used to guide instructional improvement. Many schools lack the process to con-

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nect the data they have with the results they must produce. The Using Data Project focuses on developing professional developers, administrators, and teachers who can lead a collaborative inquiry process and strengthen the collaborative culture of their schools or departments. The aim is to influence school culture to be one in which educators use data continuously, collaboratively, and effectively to improve teaching and learning mathematics and science.

While collaborative inquiry is appropriate for any content area, it is particularly relevant for mathematics and science because the process mirrors for the adults what students experience in our best mathematics and science classrooms. Data teams investigate not scientific phenomena or mathematics problems, but how to improve teaching and learning. They raise questions, examine student learning and other data, test their hypotheses, and share findings with their colleagues.

The project stands for several shifts in how data have traditionally been used in schools. (See “Less emphasis, more emphasis” on page 24.)

Typically, one or two teachers,

one administrator, and one NSF project staff member become data facilitators for a school. They then convene school-based data teams to focus on improving mathematics and science. Sometimes team members are from the mathematics or science department or are existing grade-level teams. Other times, the team is schoolwide.

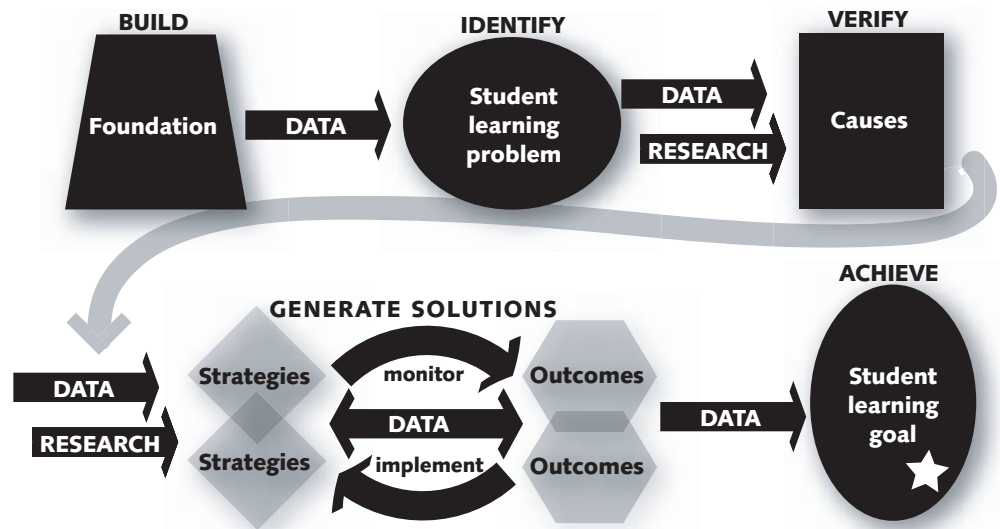
CREATING DATA FACILITATORS

Data facilitators learn to facilitate teams and to use data in a 12-day workshop series over 1½ to two years, with on-site follow-up and coaching several times a year for three years.

The professional learning program includes five segments: laying the foundation (committing to core values, establishing data teams, and working effectively in the school’s context); identifying the student learning problem; verifying causes; generating and monitoring solutions; and achieving student learning goals. In each segment, data facilitators conduct a sequence of activities and data experiences with their data teams, master relevant data concepts and tools, practice facilitation, and plan for implementation.

They then carry out those activities with their data teams with support from NSF project staff at the site and coaching from Using Data Project staff. They reconvene for the next segment of the workshop, reflect

The Using Data Process



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on their experiences, and learn how to implement the next segment of the program. (See the Using Data Process chart, above.)

For example, in the segment on identifying a student learning problem, data facilitators practice analyzing multiple levels of student learning data. They start with aggregate data trends, such as the percent of students proficient in state assessments in mathematics and/or science, then examine disaggregated data to understand how subgroups, such as African-American or Hispanic students, are performing relative to white students. They dig into the content strands, such as geometry, measurement, number sense, and problem solving, and analyze how students performed on individual test items. Finally, they collect and examine student work on items and strands of greatest concern to understand student thinking.

If data facilitators have only one source of data on student learning,

they collect additional data such as local assessments or common grade-level and course assessments for the next data facilitator session. The process emphasizes triangulating data, using three different sources of student learning data before identifying the student learning problem. By triangulating, data facilitators guide data teams to test hunches with other data instead of drawing conclusions from a single measure.

For example, when the Canton City, Ohio, data team looked at its state assessment results in science, team members were surprised to discover that students performed poorly in life science, even though life science is emphasized in their curriculum. The team suspected that this had more to do with the test than with their science program, but they held off drawing conclusions or taking action until they looked at additional data. When they saw a similar pattern in their norm-referenced data, they

decided to focus on the life science problem.

Data facilitators also learn to interpret data — learning to determine what differences in year-to-year or group-to-group test scores are meaningful statistically and educationally (Carr & Altman, 2002).

DATA SHIFTS

After analyzing data in their workshop sessions, the facilitators return to their schools and lead their data teams through the same kind of data analysis experiences they have had. Their job is not to analyze the data for everyone else, but to foster collaboration, build data teams, and facilitate powerful conversations about data — conversations that lead to improved teaching and learning.

To help bring about these cultural shifts, data facilitators learn a variety of tools and processes for making work with data a positive and collaborative learning experience for the data team. One tool is data-driven dialogue, a structured process for making sense of data (Wellman & Lipton, 2004). First, team members predict what they think they will see in the data. Predicting activates prior knowledge, surfaces assumptions and questions, and prepares and motivates the data team to learn from the data. For

LESS EMPHASIS

- External accountability
- Premature data-driven decision making
- Data use as specialty of a few
- Data as carrot and stick
- Data in isolation
- Data to sort

MORE EMPHASIS

- Internal and collective responsibility
- Ongoing data-driven dialogue
- Widespread data use and literacy
- Data as feedback for continuous improvement
- Data through collaborative inquiry
- Data to serve

example, a team member might say, “I predict that physical science will be our weakest content strand on our 4th-grade state test results.” Next, data team members make factual observations only, such as, “25% of our 4th-grade students were proficient in physical science in the state test in 2003.” This phase extends the opportunity to explore and discover the data before jumping to explanations or conclusions. Finally, data team members interpret the data. For instance, a team member might say, “I think our results in physical science are because our teachers do not feel comfortable with the physical science content they are supposed to teach.” Participants test their interpretations by collecting additional evidence to support them.

In their data facilitator workshops, data facilitators use the “go visual” principle, first developed by nonverbal communications expert Michael Grinder (1997). Grinder revealed the power of large, visually vibrant and color-coded displays of data in fostering group ownership and engagement. Data facilitators work with the team on one data report at a time to avoid overload and confusion. For each report, they create a colorful newsprint-sized graph displaying the results and post it on their “data wall.” Then they record their observations and inferences on additional pieces of newsprint that they post under their chart. As they work with additional data, they add more graphs and more observations and inferences to their data wall.

Stoplight highlighting is another “go visual” tool for color-coding that data facilitators learn to use with their teams (Sargeant, 2004). Based on No Child Left Behind Act requirements and/or state and district goals, data teams set criteria for high performance, performance below expectations, and performance that is urgent and in need of immediate improvement.

They then color code each graph using green (high performance), yellow (below expectations), and red (urgent) markers. With stoplight highlighting, urgent areas pop out across the multiple data sources on the data wall.

All this takes place before the team makes any decisions. Data-driven dialogue creates a more thoughtful decision-making process by bringing out multiple perspectives. Teachers embrace solutions because they own the student learning problems that emerge from their own data analysis.

Data facilitators learn how to facilitate data-driven dialogue through repeated practice, feedback from Using Data Project staff, and self-reflection both in workshop sessions and on site with their data teams.

ROOT CAUSE ANALYSIS

“Once you find out what your weak points are, you can begin to decide what is causing them and intervene in those areas,” explained Stark County Data Facilitator JoMarie Kutscher. Data facilitators learn that to uncover root causes of students’ poor performance, they collect and

analyze other kinds of data, such as disaggregated course enrollment data, interviews with students, classroom observations, and survey data.

In the TASEL-M Project, for example, mathematics teachers from four Orange County, Calif., high schools and their feeder middle schools cross-tabulated disaggregated student achievement data with disaggregated course enrollments. They discovered that subgroups performing poorly in mathematics often were those trapped in low-level mathematics courses. The data teams used the information as a catalyst and guide to expand opportunities to offer rigorous mathematics instruction to more students.

While local data can uncover achievement gaps and specific student learning problems, those data are not sufficient. To understand possible causes and solutions, teams must consider relevant research on mathematics and science achievement. The message in the research is that quick fixes like teaching to the test or tutoring a few students are unlikely to produce sustained improvement in student learning.

Making the time together count

If teachers don’t share a purpose and commitments, their time together can be wasted. Making commitments is fundamental to a collaborative culture and the work of the Using Data Project. Two core commitments underlie the work:

1. We have a collective and moral responsibility to close achievement gaps.

Teacher must feel shared responsibility — a moral obligation to be responsive to students and their needs and outrage about achievement gaps that have widened in the last several years (National Center for Education Statistics, 2001). According to Clifford Adelman’s research (1999), the greatest predictor for African-Americans and Hispanics completing college is access to higher levels of mathematics in high school. Mathematics is key to these students’ futures.

2. Closing achievement gaps is not just our responsibility, it is a real possibility.

We commit to doing this in three to five years. In the face of growing evidence (Briars & Resnick, 2000; Schoenfeld, 2002; Reeves, 2000; Education Trust, 2002), Mano Singham’s conclusion in his 2003 *Phi Delta Kappan* article rings true: “There are no genetic or other immutable traits that could conceivably be the cause of the gap. Thus the problem is manifestly one that can and should be solved.”

Data teams take the time to dialogue about multiple data sources and about the research so they can clearly define a student learning problem and its causes based on evidence, not speculation. Collaborative inquiry focuses on improving student learning. Once a student learning problem is identified and root causes are verified with data and research, data facilitators help the data teams set specific, measurable student learning goals and construct an action plan that specifies how the actions they propose will produce the results they intend. Data teams can then conceptualize a theory of action as a chain of events, starting with their input or action steps and ending with improved student learning. Along the chain are interim results such as increased teacher knowledge, changes in instructional



Willie McInnis, at left, listens as Gary Money makes a point at a Using Data workshop in June 2004.

practice, or the use of rubrics and performance assessments. Then they test their theory by monitoring the interim outcomes and final results. Unlike action plans generated from the top down, teachers are invested in the solutions they generated from their own collaborative inquiry.

As Richard Dinko, co-principal investigator of Stark County (Ohio) Mathematics and Science Partnership, said, “Until teachers started talking deeply about the data, they would create plans that never got implemented. The best thing about the Using Data Project is that it engages teachers in deep discussion of data.

“Using data used to mean rubbing teachers’ noses in poor performance,” he said. “But that didn’t get us anywhere. Now we have a process that gives teachers a voice and a lens for looking at data. With teachers as the change agents, we are starting to see real movement.”

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The project’s partners

The Using Data Project, funded by the National Science Foundation, gets teachers involved in rigorous data analysis and reflective dialogue to improve how math and science are taught and learned and to close achievement gaps. The project partners with five mathematics and science education improvement projects nationally that reflect a mix of urban and rural schools, most of which are high-poverty:

- Arizona Rural Systemic Initiative based in Mesa, Ariz.
- Mathematic and Science Enhancements (MASE) K-5 Using Technology, a local systemic change project in Clark County (Las Vegas), Nev.
- Stark County Mathematics and Science Partnership (MSP) in Canton, Ohio
- TASEL-M partnership between the Orange County Department of Education and California State University, Fullerton
- Education Development Center’s K-12 Science Curriculum Dissemination Center in Newton, Mass.