EDUCATION WEEK
SPOTLIGHT

On Data-Driven Decision Making

Editor's Note: Access to quality data provides district leaders with the opportunity to make informed instructional and management decisions. This Spotlight examines the potential risks and advantages of data systems and the various ways in which data can be used to improve learning.

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# Schools Find Uses for Predictive Data Techniques

By Sarah D. Sparks

The use of analytic tools to predict student performance is exploding in higher education, and experts say the tools show even more promise for K-12 schools, in everything from teacher placement to dropout prevention.

Use of such statistical techniques is hindered in precollegiate schools, however, by a lack of researchers trained to help districts make sense of the data, according to education watchers.

Predictive analytics include an array of statistical methods, such as data mining and modeling, used to identify the factors that predict the likelihood of a specific result.

They've long been a standard in the business world—both credit scores and car-insurance premiums are calculated with predictive analytic tools. Yet they have been slower to take hold in education.

"School districts are great at looking annually at things, doing summative assessments and looking back, but very few are looking forward," said Bill Erlendson, the assistant superintendent for the 32,000-student San José Unified School District in California. "Considering our economy survives on predictive analytics, it's amazing to me that predictive analytics don't drive public education. Maybe in
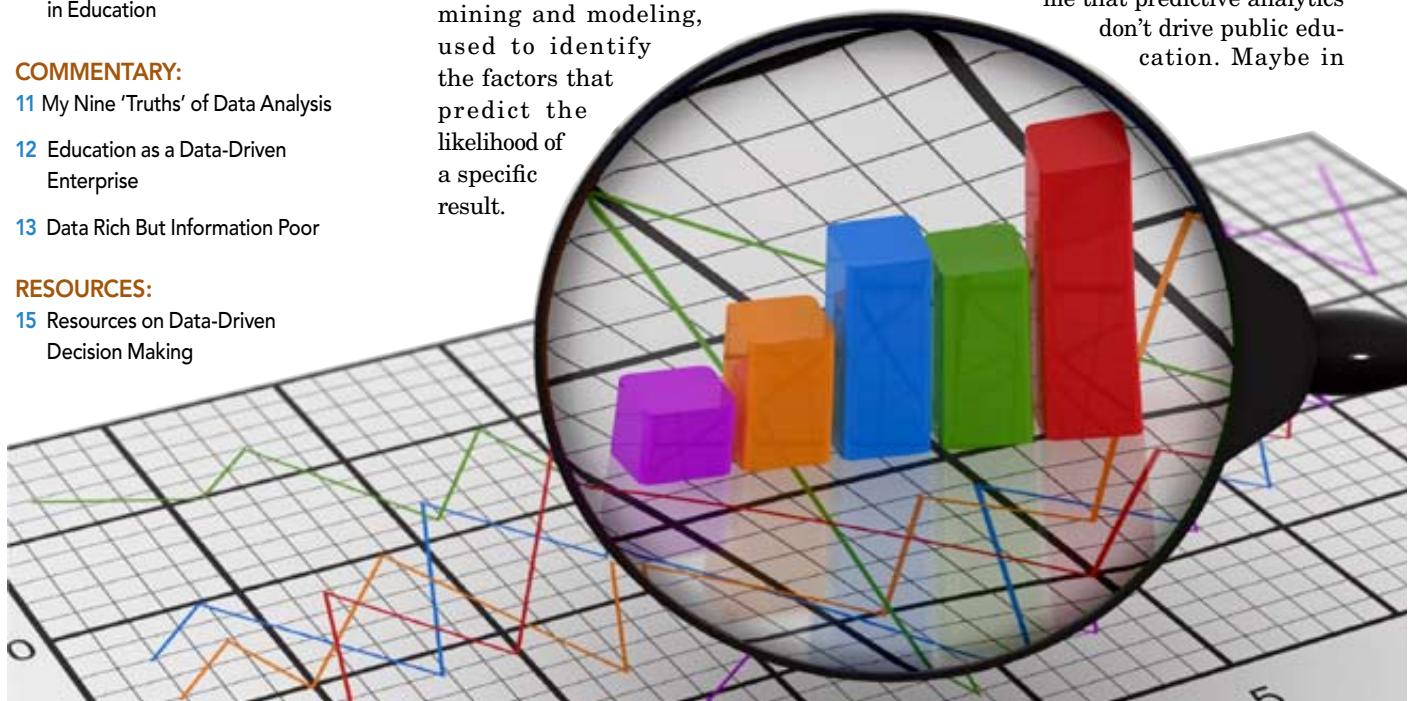
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education it's considered a luxury, but it shouldn't be; it should be a foundation for making decisions."

Experts in predictive analytics in higher education and business say education may have a long way to go to develop the data infrastructure and staff capacity to make the tools useful on a broad scale.

"Good quantitative researchers are as hard to find in academia as Farsi linguists are for the military; we do not train enough researchers to work with these methods," said Phil Ice, the vice president of research and development for the 90,000-student online American Public University System, in Manassas, Va. "There are plenty of numbers people, but they work in the corporate sector, and they don't know how to apply it to the education sector. You have to understand the pedagogy, the social issues around education, and you have to understand the numbers."

Mark D. Milliron, the deputy director for postsecondary improvement at the Seattle-based Bill & Melinda Gates Foundation, agreed. "I've heard again and again that there is a desperate need for funding data fellows and all sorts of people who can get out there in the field and do [education] research, but it's not just about doing traditional research; it's about doing more of this predictive modeling and analytics, because that's what's going to drive the scale and the implementation work to actually get people involved in the process. It's a different set of questions."

While predictive analytics cannot say definitively whether an intervention causes a particular outcome, they show potential for K-12 education, because they can be faster and provide more practical results than traditional experimental methods such as randomized controlled trials, Mr. Ice said. "If you compare one class of 30 students to another class of 30 students that's one thing, but with this you can take an entire school district, taking all the data, not just a sample of it," Mr. Ice said.

Predictive models might show the likelihood that a student with certain characteristics will excel in college or a teacher's credentials and instructional style will gel in a new school, but they aren't guarantees of specific results for individual teachers or children. Administrators have to walk a thin line between targeting support and changing expectations and opportunities based on predicted risks, according to Yeow M. Thum, a senior research fellow at the Northwest Evaluation Association, in Portland, Ore., who studies education growth modeling.

"Risk management and topics like that are really foreign to education research and management," Mr. Thum said.

Predicting Graduation

One district that is taking the plunge into using predictive analytics for policymaking is San José. The district is modeling high school graduation and college-going trends based on 15 years worth of student academic, behavioral, social development and health data, as well as information on school climate from teachers, parents and students. The district is finalizing a risk-assessment protocol that identifies changing issues that contribute to a student's risk of dropping out at different grades. Each student has an individual profile, including the status of key indicators like benchmarking and summative tests, behavior, attendance and health. Student data will be updated daily and monitored for accuracy, Mr. Erlendson said, but is not used for student report cards.

"It's not quite a credit score, but it could be" like that eventually, as more indicators are added to the mix, he said. "Right now we're on the cutting edge of what a student dashboard looks like. The indicators will be very clear: test scores, behavior, academics, health. The data there are going to be pretty solid. If the student is failing or is not showing up, that will be pretty obvious."

Similarly, in 2007, Hamilton County schools, which serve 41,000 students in and around Chattanooga, Tenn., used districtwide data on student demographics, test scores, attendance and other information, comparing the graduation and dropout rates of students with different characteristics at each grade level to develop an "on-track" predictor of each student's likelihood to graduate. Kirk Kelly, director of accountability and testing for Hamilton County schools, said individual schools have been focusing on the risk factors that carried the most weight at their schools.

For example, some elementary schools found that their students who failed early grades such as kindergarten or 1st grade ended up likelier to drop out in high school. "We found one of the factors was being over-age for their grade and separated from their peers," Mr. Kelly said. "The student fails twice in elementary school, and then they get to high school at 16. A 16-year-old is not likely to stay in high school until they are 20."

As a result, elementary schools began more-intensive monitoring and remediation for students at risk of failing an early grade, and the district started "adult" high school programs for students considered over-age for their grade.

It's been four years since the district started using the tool to target interventions, Mr. Kelly said, and "the predictors have been good in how they play out. We've seen the tool starting to bear fruit." The four-year graduation rate has increased steadily from 70.9 percent in 2008, the first school year of implementation, to 80.2 today, and the rate of students dropping out in each school year tumbled from 6.4 percent in 2008 to 1.8 percent today.

San José, along with the Dallas, Pittsburgh and Philadelphia school districts and the New York-based New Visions for Public Schools charter school network, are now participating in a three-year project analyzing school feeder systems to identify the elements at each school level that predict a student's understanding of college entrance, readiness for college content, and ability to complete a degree.

Data System Demands

Yet both Mr. Erlandson and Mr. Kelly cautioned that school districts must have a well-developed data system with several years' worth of data in multiple areas to get a nuanced prediction.

"We had to look at many things that could be predictive at different times," Mr. Erlandson said. For example, he said, "in 9th grade the most predictive factor is attendance—it really jumped out at us—but in sophomore year, the most predictive factor is grades. Public education is such a fluid thing, it's like trying to lasso an amoeba."

That complexity causes problems when trying to connect a child's experiences in elementary school with success in college 15 years later, Mr. Thum said. "We know that predictions on the near term are very use-

ful; predictions in the far term are fraught with problems," Mr. Thum said. "In any prediction you assume that the future will be like the past, and that's a very large assumption to make."

Moreover, many predictive analytics systems in the business world, like that which provides a credit score, use the data to rank people based on the likelihood of a specific behavior, something Mr. Thum said generally is not appropriate for education.

"How people couch the accountability question will affect the results" of an analysis, he said. "Very often the folks hired into key policymaking positions probably do not have as much patience as they ought to have. Often ranking is all they are after; they're not looking at measuring student learning."

Finding Candidates

Yet sometimes, ranking can be useful, such as when a principal is trying to pick the right new teacher to fit into a school staff.

Teresa Khirallah, the senior director of Peak Preparatory, a K-12 charter school in eastern Dallas, has seen the hiring process work with and without predictive tools. When she took the administrative reins of the school four years ago, principals found new teachers by receiving personal applications from teachers or combing through the central candidate pool for the school's parent organization, Uplift Education of Dallas.

"There was always some lag time, and you might be juggling seven to eight people. We spent a lot of time weeding people out, not really knowing from a five-minute phone conversation or email if they were the right person to continue this process," Ms. Khirallah said. "There was just a lot of time spent on individuals who by the end of the hiring process you realized did not match the mission or would not be a good fit with your kids."

Two years ago, with the 17-school network growing 25 percent or more a year, Uplift's Chief Executive Officer Yasmin Bhatia overhauled the network's hiring process in advance of hiring 160 teachers in a staff of 400. Uplift, working with the Emeryville, Calif.-based 3D Group, analyzed 44 different tasks that Uplift teachers perform, using a combination of surveys and interviews and classroom observations with the teachers considered to be exemplary based on qualifications, experience and recommendations.

The teachers rated each task on its importance to their daily job, the equipment or materials needed, and whether a new teacher should enter able to do the task or expect to learn on the job. Teachers also related specific examples of their biggest successes and mistakes in performing different teaching tasks.

After crunching the data, Uplift had a list of 29 ranked tasks in five teaching areas which formed the backbone of a new teacher hiring process. A potential candidate's written email and application essay questions can be rated according to those indicators, and principals follow formal interview questions, with answers also rated to make it easier to compare candidates.

"These are very specific situations we are asking candidates to describe for us; you cannot fluff our questions," Ms. Bhatia said. "If you see that this person is only a 2.5 out of a 5 [in one of the five areas], it forces the discussion of, 'Am I going to make the trade-off or am I going to hold off and keep looking for someone who is a better fit?'"

For principals, the change has clarified the hiring process, Ms. Khirallah said. "What I'm able to do as a principal is to spend more time talking with and training the right people, rather than spending a lot of time weeding people out."

While Uplift is still measuring the achievement effects of the teachers hired under the new system, Ms. Khirallah said she has already seen a decline in teacher turnover. "We've noticed teachers are not only staying but are stronger and higher-performing teachers, and we've got a lot of like-minded individuals who share the same philosophy of education, so you have fewer issues at the end of the year about how people fit."

Ms. Bhatia said the network has already started to use the initial task scores to tailor professional development based on a teacher's areas of strength and weakness, and said the schools hope to eventually have more fine-grained data that will help match teachers to specific subjects or grade levels within schools. The May issue of the Harvard Education Letter noted Uplift's predictive analytics show promise in helping districts match educators to the schools where they will be most effective in teaching.

Analyzing Personnel Policy

Hamilton County doesn't use predictive analytics to hire or place teachers as the Uplift charters do, but it does use the tool to analyze personnel policy. For example, Mr. Kelly said he was able to track the broader-than-expected effects of teacher absenteeism on student performance throughout a building. "If you see a teacher is out and there's no substitute, that may not just affect that teacher, but might also affect ... other teachers, because we might have to split a class and not be able to do the lessons we had planned."

As a result, the district has moved to a 95 percent teacher attendance goal and is putting into place more support structures to account for teacher absences.

Next year, the district plans to expand the system to provide online accounts at each school so that principals and teachers can run small-scale predictive studies or simply get more frequent updated reports on their students.

Higher education has started to explore the validity of using predictive analytics for long-term goals like college success. For example, the Western Interstate Commission for Higher Education has won a $1 million grant from the Seattle-based Bill & Melinda Gates Foundation to develop a Predictive Analytics Reporting Framework using data from more than 400,000 students in six college systems with online students: the American Public University System, Colorado Community College System, Rio Salado College based in Tempe, Ariz., University of Hawaii System, University of Illinois Springfield, and the University of Phoenix.

The online colleges are looking at 34 different factors that may contribute to a student's ability to enter, stay and succeed in college.

"The methodology we're applying could certainly be used in the face-to-face campus and in the K-12 arena as well," said Mr. Ice, the principal investigator for the study. "I think that the K-12 environment may even be a richer source of material than the university setting; in K-12, we know so much more about what our students are doing and where they are coming from," he said.

"It takes a lot of computing power and there's some pretty high-level math," Mr. Ice said, but, "it's a matter of political will more than math or statistics." With the right resources and access to the data, he predicted, widespread use of predictive analytics could become a reality in K-12 education within four years.

Leading the Charge for Real-Time Data

An Oklahoma district earns praise for its number sense.

By Dakarai I. Aarons
Oklahoma City

Well before the idea of using data to manage schools gained prominence on the national stage, Oklahoma's Western Heights school district had made the ideal of real-time, data-driven decision-making a reality.

Back in 2001, Superintendent Joe Kitchens was already being spotlighted for his focus on creating a longitudinal-data system that would give teachers in the 3,400-student district the ability to make quick decisions to improve student learning, while reducing the time spent compiling reports.

"If I'm the lead administrator in the district and I know [what's happening], I can galvanize people and ask questions. If you ask people in this district if they think I know when something is happening with a student in a detrimental way, they will tell you yes," Mr. Kitchens said in a recent interview. "It's not so much that I know, but it's that I can begin to galvanize people to take actions on behalf of these kids."

Mr. Kitchens, who has led the Western Heights district for 15 years, sees improving instruction as the main reason to invest in data systems. But the high-poverty, majority-minority district, which includes Oklahoma City's airport in its boundaries, uses data to manage other operations, including transportation and food service.

"Getting the right information in the teacher's hand at the right time is critically important," Mr. Kitchens said. "That's the main reason in my mind for having this kind of information."

While the ability to gather information in real time improves district operations, Mr. Kitchen says the technology itself is only a piece of the solution. Vital to the process is using the "schools interoperability framework," or SIF, which is a set of rules and specifications that allows different school software applications to exchange information with one another. *(See Education Week Feb. 2, 2005.)*

Rather than purchase outright a data system from a single vendor, Western Heights found SIF-compliant commercial products it felt best fit its needs and integrated them into a system. Its largest expense was creating the data warehouse, which the district was able to pay for with federal e-rate funding.

Today, the district uses 11 software systems that are bound together using what is called a zone-integration server. It serves as a router, sending data back and forth between the various software programs. Business rules have been put in place that determine who gets access to what information and who "owns" each piece of data, said Daryl McDaniel, the district's chief information officer.

A practical sign of the district's focus on data is its central enrollment office, where all families must come to register children for school. What this arrangement has allowed for is a single point of entry for all data in the district, an approach that maintains integrity and helps ensure that the information being shared by the different users is accurate.

Because that student-information system is able to share information with other software, by the time a family leaves the enrollment office and enters a school, the district's transportation department usually already knows where to drop that student off at the end of the day.

Information entered at the central enrollment office also has allowed the district to find cases in which not all of the children in a low-income family were receiving the free or reduced-price meals they qualified for. In the past, cafeteria workers would just add students to their lists as they came through the line.

Mr. McDaniel said the key to making the system work is training employees to understand how valuable the information they collect is.

"They can't just take those records and sit them on a desk," he said. "There are other systems waiting on this data."

Larry L. Fruth II, the executive director and chief executive officer of the Washington-based SIF Association, a 2,200-member organization of school districts, software vendors, state education departments, and other education groups, said Mr. Kitchens is the most passionate advocate in the nation among superintendents for using the SIF process to make efficient progress operationally and academically.

"He's been for a long time a showcase of what you can do with data when you get it to the right person at the right time," he said. "Joe was ahead of the curve and wholly committed to it."

The Austin-based Data Quality Campaign, which promotes the development of longitudinal data systems, named Mr. Kitchens its 2008 District Data Leader of the Year "for transforming his district into a continually improving organization that is informed by real-time, accurate data."

Mr. Kitchens has also found a supporter in the Inasmuch Foundation, an Oklahoma City-based philanthropy that has pledged $1.5 million to the district to help it in its efforts to create a common language for school

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> Superintendent, Oklahoma's Western Heights school district

accountability with partners across the country.

Robert J. Ross, the foundation's president and chief executive officer, said he was impressed by the district's capabilities and hopes that other school districts can learn from Western Heights. "They did this when no one else in the state, and few in the country, were looking at this investment," Mr. Ross said.

Kim Race, coordinator of elementary curriculum for the Western Heights district, said having a wealth of data at teachers' fingertips has proved useful for them. Without leaving their classrooms, teachers can look and see how each of their students has performed over time on a variety of assessments. The test-score information they see is not just aggregate scores, but is broken down by content area, so that teachers know where to target interventions.

"You can't do that on paper," Ms. Race said.

Districtwide, the ability to analyze data from multiple sources at once has led to a focus on the issue of student mobility. In examining test scores and high school dropout rates, district officials found the lowest achievement was among students who kept moving from school to school and district to district throughout their education careers.

"For our population of students, what matters is if they attend school," Mr. Kitchens said. "Mobility is a big issue. We have a highly mobile society, and our schools may not be tooled up to manage this. We've got to develop ways to deal with this data."

The district has found the difference between mobile and nonmobile students to be the most distinct when it comes to completing high school. The dropout rate among mobile students is nearly twice as high.

Through a campaign to help the community understand such data, the district has seen its four-year cohort dropout rate decline from 40 percent in the 2006-07 school year to 29 percent in the 2008-09 school year.

That number is still too high, said Mr. Kitchens, who looks at the latest dropout information every day. "If you don't understand the scope of the problem, to me, it's hard to know if you are making any headway against the problem," he said.

To help address the issue, the district has used technology to create an elaborate set of codes for tracking enrollment. Oklahoma uses 10 codes to explain why students enter and leave school; the Western Heights district has 56. The additional codes came about as school-level staff members found state codes inadequate.

For example, Oklahoma has one code that encompasses not only students who leave the state, but also those who "age out" of school

and those who die, said Assistant Superintendent Lisa McLaughlin. "When a child leaves, we know it, and somebody's going to be answering some questions about it," she said.

The district's attendance secretaries were first daunted by such a system, she said, but have since become fans.

"It's given them a lot of information that makes their jobs easier," Ms. McLaughlin said.

Amy J. Cody, a 5th grade teacher at Winds West Elementary School, said having longitudinal data available has helped her in the classroom. "If we see everyone in 4th grade struggled with charts and graphs last year, we incorporate that into our teaching," she said.

When preparing for a parent-teacher-student conference, Ms. Cody goes to her computer and prints out a variety of student-performance data to share with the parents. She's able to show parents the concepts their children have struggled with the most, and provide activities families can do at home to help boost the interventions done during the school day.

"The parents are grateful, because they get test scores in the mail and they are hard to read. We try to break it down so they are easy to understand," she said.

Having such data has also changed conversations among teachers, Ms. Cody said. She can get together with her peers who teach 6th grade and share the progress her 5th graders are making and get feedback on what will best help them prepare for the next grade.

Teachers also work in smaller groups with students who have trouble with certain content areas.

Jennifer Colvin, the co-principal of Western Heights Middle School, said a data analysis this year allowed the school to figure out that some teachers and students were missing classes too often for extracurricular activities. Class schedules for next year have been rearranged to minimize such disruptions.

Ms. Colvin said such an analysis would have taken forever in the past, as it would have required digging student records out of filing cabinets and looking through each file to find the information needed.

Ms. McLaughlin said even more difficult than setting up the technology has been building a staff committed to using the data systems. To get teachers on board, each school has developed professional learning communities made up of teams that examine the data thoroughly and help pinpoint strengths and weaknesses for the schools.

"The idea being that leadership emerges among the actual people involved at the point of attack," said Cindy Heupel, an educational consultant who works with Western Heights.

"One of the things you will feel in this district like I never have before is a tremendous amount of trust."

That trust, she said, has been crucial in having honest conversations about data.

"It always comes back to 'What does the data tell us?' If we know what's real," Ms. Heupel said, "we can make good decisions about students' instruction that support their needs."

Proposed Data-Privacy Rules Seen as Timely for States

By Sarah D. Sparks

Proposed changes to federal privacy rules likely to take effect this summer couldn't be more timely for education systems: They offer first-time guidance on managing student privacy in gathering education data just as states and districts put the finishing touches on federally mandated longitudinal-data systems.

The rules would guide education officials on the delicate task of how to make use of these data systems, while also holding researchers and others responsible for protecting the information they use.

Under grants received through the American Recovery and Reinvestment Act, better known as the economic-stimulus law, states have until Sept. 30 to complete comprehensive longitudinal-data systems that can trace a student's academic career from preschool through college. Experts say the linked data will be an unprecedented boon both to researchers and educators looking to pinpoint academic problems and successes.

The U.S. Department of Education proposed regulatory changes last month to the Family Educational Rights and Privacy Act, or FERPA, intended to help states ensure the longitudinal-data systems are used safely.

"We think that the newly released guidelines around FERPA are critical for states to truly go from building [state data systems] in a technical fashion to actually using them to improve student achievement," said Aimee R. Guidera, the executive director of the Data Quality Campaign. The Washington-based nonprofit late last month released a white paper on protecting student privacy.

"For the first time ever, these regs acknowledge that there is a role for the state data system, and that has been the biggest problem with FERPA to date," Ms. Guidera said. "This outdated statute was trying to be applied to a longitudinal-data system that was not even around when FERPA was written, and [the law] had never caught up to it."

Among the changes, high school and college administrators would be allowed to share individual student-achievement data to track graduates' postsecondary performance—flexibility Ms. Guidera said states have been requesting for years.

Feedback for Pre-K-12

Donald J. Houde, the president of the Houde Consulting Group in Fountain Hills, Ariz., and a former chief of information, technology, and security for Arizona's state longitudinal-data system, agreed. "Data always flowed upstream from school to district to the state, and giving it back was problematic," he said.

For example, Kathy Gosa, the director of information technology for the Kansas education department, said her state is putting the final touches on a system linking data from preschool through grade 12 with higher education data. With support from the economic stimulus and a grant from the Institute of Education Sciences, the state is unifying student-tracking numbers across both systems, but has been operating so far under memoranda of agreement cobbled together among different agencies.

"We've only been able to share the progress of a student in postsecondary in the aggregate; this version of FERPA allows us to share back information with teachers about individual students," Ms. Gosa said. "This will also allow us, on our high school feedback reports, to allow the districts and schools to drill down … to evaluate the programs and processes they have in place and allow them to know where they succeed or shore them up."

Held to Account

Yet the new rules also would ensure that anyone who uses a student's information must be responsible for protecting it and could be held accountable if data are misused. Under the current rules, while states and districts can certainly be held accountable for data leaks, it has been unclear how researchers, contractors, and other data users could be accountable for protecting students' privacy. Under the proposed rules, violators risk having their federal grants withheld or getting barred from sharing student data for

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> Executive Director, Data Quality Campaign

five years.

"It's a different level of scrutiny when we are talking about children's information; it's very sensitive information and it's a core value of our nation to protect that information," Ms. Guidera of the Data Quality Campaign said. "While they may be giving out [information about] what bread they're buying, people are much more reluctant to have information about their children's academic progress being available."

One Maplewood, Minn. parent, Arianna Chapman, went further in a written comment to the Education Department expressing support for the proposed FERPA rules. "I mean, as a parent," she wrote, "I would prefer that nobody extra is accessing my child's records, but if it benefits her in the long run by helping to get grants or programs added that could be useful to her, then why not allow it? However, I only agree if they are sure that the information would only be going to official people on an absolute need-to-know basis and not just to anyone."

That's the crux of the issue for states, which are now hashing out how to give customized

access to the data based on individual roles, from a 2nd grade teacher, to a district mathematics coach, to a legislator or special education researcher.

The increasing flexibility of school systems can make data privacy trickier, said Mr. Houde, the consultant. In Arizona, many secondary students—particularly those in rural schools—are jointly enrolled in their home and virtual schools for distance courses, and part-time career and technical education programs. Many more educators may need access to a student's data, and it can become more difficult to sort out who actually needs to see specific information.

"For some of the districts, they only need [the state] to get out of the way" to conduct their own analyses using state data, "but that's only maybe 2 percent of the schools in the state," Mr. Houde said.

For the rest, he said, staff members have not had the time or training in how to use data-system information safely. "These data have tremendous value, and we need to maximize their use, but … as the utility of the data increases, the security profile of the data also increases," Mr. Houde said. "We have to build understanding that the highest risk to this data is internal—that someone will send out an email with identifiable information or lose a thumb drive."

Ms. Gosa agreed. Kansas has developed free, customized data-certification training for district and school staff members based on their particular roles, from a secretary submitting accountability data to a teacher analyzing achievement information about her class.

"We basically go over the FERPA regulations and customize it to situations they might have encountered, that might be more meaningful to them than just reciting regulations," she said.

"They may not understand how critical it is not to lay down a piece of paper with a Social Security number, or to shred everything immediately, or not to walk away from your desk if there is information showing that someone might see. All those things, when you're trying to get your work done, they seem like distractions but they really are critical."

States Make Swift Progress on Student-Data Technology

By Sarah D. Sparks

After a big influx of money from the federal economic-stimulus law, states have made "unprecedented progress" in building the technology needed to collect statewide data on students' academic progress from year to year, according to the latest report on a project that promotes the use of such data. Yet it still will take a political push to ensure all states have fully operational student-data systems by September.

The Data Quality Campaign, a Washington-based nonprofit group that promotes and tracks the use of education data in policymaking, released Wednesday its sixth annual report on state data systems. The report says nearly half the states now have systems that meet what the campaign deems the 10 critical elements for collecting longitudinal data on individual students and teachers from kindergarten through college.

All states and the District of Columbia, it says, have put into place four of the 10 elements: a unique student-identification code that links information from various agencies through the years; student-level data on enrollment, demographics, and participation in specific programs; the ability to match student test data from one year to the next to calculate growth in achievement; and the ability to track each year individual students who graduate or drop out of school.

In addition, nearly all states now have auditing systems to check the accuracy and validity of data and information on the number of students not included in assessments.

Idaho made the most progress of any state in the past year, moving from a data system that met only three of the campaign's essential elements to one that met all 10.

"We recognized we were one of the states that were far back in the pack and not making any significant progress for a number of years," said Tom Luna, Idaho's superintendent of public instruction. He won support for a $2.5 million state data initiative, which along with a $6 million federal longitudinal-data-system grant financed the fast-track

development of the data system. With most of the low-hanging fruit harvested in the form of technology infrastructure, the report says, states must now grapple with more politically delicate issues, such as tying student test scores to individual teachers and their preservice-preparation programs and ensuring educators and policymakers understand how to appropriately use the data collected.

Technology vs. Political Will

"What we're finding across these states is this isn't a technical issue at this point; it's a question of political will and changing behaviors," said Aimee R. Guidera, the executive director of the Data Quality Campaign.

"States were looking at these 10 elements as a checklist and saying, 'OK, we can collect these 10 things; we're done,' " Ms. Guidera said. "We're saying, 'No, you're just beginning.' "

Seventeen states cannot link teacher and student data, the most common weak link in state data systems, even as more districts move to use student data to review teacher effectiveness. Only nine states regularly link K-12 and postsecondary data systems, making it hard to use data to improve preservice teacher-training programs.

Officials in Maryland, where Gov. Martin O'Malley has been chosen as the DQC's state leader of the year, realized early in the development of the data system there that policy problems would trump technical challenges. Last year, the state launched a longitudinal data-system governing board, with representatives of teachers, principals, and other stakeholders, to iron out the kinks in the evolving system. The state also is using part of its Race to the Top grant for data training for administrators and teachers.

"There's a very strong recognition that you don't want to have data for data's sake," said John D. Ratliff, the director of policy for the governor, a Democrat. "We don't want to build a Porsche and park it in a garage."

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Data Systems to Make a Difference

How Winston-Salem/Forsyth County Schools provides fast access to meaningful data to make a difference in student achievement

■ "We need summary-level data – for instance, to know that 93 percent of students are getting what they need – but we also need to know that Johnny is not being effective in Reading 3 during this quarter. That was a goal, to find a way to focus in on the detail."

Betty Weycker, Assistant Superintendent for Technology for Winston-Salem/ Forsyth County Schools

An administrator is standing in your doorway, asking for yet another ad hoc report that was needed yesterday, but not requested until today. Can you deliver it today or tomorrow? You know it will take a week to find the data, validate and integrate it and create the report. What do you do?

If you're the assistant superintendent for technology for your school district and perhaps the only person in the state who holds that role as a senior staff member – you have to make some big changes in how data is managed and used.

That's just what Betty Weycker and her colleagues did for Winston-Salem/ Forsyth County Schools in central North Carolina. Starting with a hodgepodge of disparate data sources and ad hoc processes, the team created a unified information infrastructure that now delivers meaningful, interactive, visual reports to support data-driven decisions.

"Until a few years ago, school officials stored data in two-inch binders," Weycker recalled. "Principals frantically flipped through binders to make sense of the data for their schools. They literally had their hands on the data, but struggled to find the information they needed."

With better access to consistent data, enabling more data-driven decisions, the school district could serve its constituents better in many ways, from assessing the effectiveness of learning processes to ensuring data quality for compliance reporting.

However, a redesign of the district's information systems had some inherent challenges:

- **It is a large school district, and growing** – the fifth largest system in the state and 83rd largest in the nation, with 80 schools, 52,000 students and 8,000 staff members.

- **The district serves a diverse student population** – making it more important to have detailed views of student achievement to meet adequate yearly progress (AYP) goals.

- **Distribution of students changes** – because the district still operates on a choice system, which creates continual flux in managing student records.

- **Various departments maintained their own data resources** – causing difficulties with incompatible and uncoordinated systems.

To be able to use data for decision making and improving school performance – not just issuing reports for reports' sake – a more holistic and real-time information architecture was needed.

Redefining the Information Environment

"After researching data warehousing solutions, we determined that SAS® could provide the tools and resources we needed," said Weycker. The school district's solution includes the following components:

- A menu- and wizard-driven tool for efficient, visual data analysis and publishing of results.

- A data integration tool to easily build workflows for accessing and processing data from virtually any hardware platform or operating system.

- A query and reporting application that enables general business users to create, share and explore reports in a Web browser environment.

- An information mapping tool that shows data sources, transformations and outputs in terms business users can understand.

Starting with nearly two dozen, unrelated data sources – some of them just spreadsheets – the data team created a unified information infrastructure that brings together data from across the district and makes it available to users in interactive, self-service, Web-based reports.

Weycker described the various activities the team undertook in implementing their SAS solution.

Find and evaluate the current data sources.

"We spent a year studying the different data sources that were out there," said Weycker. "The result was scary. Our data was everywhere. It was fragmented and overlapping, and that was really concerning.

"We had to figure out a way to pull all of this together and determine which data system would be considered the authoritative data source. Homegrown databases are often no better than the person growing the data. In some cases that was excellent data and in other cases it was not usable. We had to eliminate some databases."

Determine what information is needed, in what form.

"As we were building out this process, we were continually asking administrators to identify the reports and data they needed," said Weycker. "We didn't assume we knew what they needed most – or needed first." Their top request? Clean data with drill-down capabilities – right down to individual student performance.

Cleanse and validate the data.

Once the school district selected SAS to consolidate data islands, the foremost question was how to resolve issues with duplicate records, inconsistent data entry and missing data. "If Johnny went to School A for three days and then went over to another school, and the records didn't transfer efficiently, you would find overlaps of data," said Weycker. "We couldn't have those types of things happening."

In addition to improving the quality of analysis and reports, data cleansing brought ancillary benefits:

- By ensuring that address information conformed to USPS requirements for mass mailings, the school district dramatically reduced the number of returned letters and saved $5,000 on one mass mailing alone.

- Matching siblings in the database reduced the mailing list from 52,000 to 41,000 households and helped with both the Free/Reduced Lunch Program application process and identifying siblings for the Parent Assistant program.

"When you look at some of this data, you find simple ways to achieve great gains," said Weycker. "SAS puts all our data in one location, so we can focus more on data quality and getting information to our constituents more effectively."

Create repeatable data integration routines.

With SAS, data integration jobs are defined in a Gantt-type graphical display, with each box representing a discrete job in the total process. "The power of the tool is that once you have captured what needs to be reported on, you can come back to it tomorrow, next month and next year, and it's there," said Debbie Harman, NC WISE Coordinator for Winston-Salem/Forsyth County Schools.

Automated data integration proved its value for repetitive tasks – such as bringing in a nightly data set from the North Carolina Department of Public Instruction – and for large-scale jobs, such as the data collection for reporting to the Office of Civil Rights. "Four years ago,

I would have been stressed about meeting the federal reporting deadline, but with the intuitive nature of the SAS tool, we made it happen," said Harman.

Publish the data in an easy-to-use, easy-to-understand format.

"Users shouldn't have to know where to go to find the data," said Harman. "We put it out there so they can get the information they need with the click of a button. It is real time, it is what they need, and it is effortless on their part. We're very excited about the possibilities."

The first reporting initiatives with the new data warehouse focus on school improvement and rapid program evaluation.

Interactive reports with drill-down capabilities. For example, choose a course from a course enrollment report to display course enrollment by teacher, then zoom in to see enrollment detail for a specific teacher, and from there zoom in to a complete profile for an individual student. Or, choose an AYP report for any day or date range to display a bar chart that shows subgroups relative to the AYP threshold, then click to drill into the detail for any subgroup and see which students might need more help.

■ "This isn't just putting data in the hands of some people. It is putting information that could impact student achievement *inside* the school."

Betty Weycker, Assistant Superintendent for Technology for Winston-Salem/ Forsyth County Schools

Districtwide student locator application. "We had to give administrators a way to quickly and easily look up a phone number for any student from any school," said Weycker. "What a simple concept, but with our previous data islands, how difficult that was. Now any administrator across the system can pull up a list of all the students, drill down to get contact information and get that student the help or care he/she needs. This is huge. This report is probably our most used report. It seems so simple, but it required compiling so much data for 52,000 students."

Closing Thoughts

"There's still more to be done," said Weycker. The data team is continuing to build more reports to support data-driven decision making, automating data integration for other recurring requests and bringing quarterly test data into the data warehouse.

"We are going to make a real difference when we can monitor in near-real time," said Weycker. "Not looking back at what happened a year ago or at trends from three years ago. That's all value-add, but for classroom teachers and administrators, what is important is what is happening on a day-to-day basis.

"We're not just producing reports to say we've got this report or to turn it in for this grant, but so we can make a difference in student achievement. Administrators are using these reports, and they're hungry for more, which is a good thing.

"With our data warehousing tools, we are right where we need to be, and we feel like we are making a difference. We now feel like we are a critical piece of making all of our students and partners successful."

Surviving a Data Crash

Anticipate. Protect. Recover. Creating a comprehensive plan to protect and recover school data is critical. But backup options are varied and potentially costly.

By Ian Quillen

The range and unpredictability of threats to your school district's data system can be unnerving: Natural disasters, leaky pipes, computer viruses, and electrical surges can all imperil school districts' servers—the computers that collect and deliver data to other computers on a network or over the Internet.

And while the not-so-secret formula of properly backing up data on remote servers and anticipating risks appears a simple one, it can be difficult to achieve. Budget pressures, a misunderstanding of data priorities, and a lack of communication between technology officials and other school and district administrators can all lead to more risky data-housing practices.

But education technology experts agree that creating a comprehensive plan to protect school data should be as commonplace as executing a school fire drill. Because, while the reporting of state and federal test scores drives much of the national conversation around school data, a major system crash can paralyze basic and essential school functions like teacher gradebooks, class schedules, library catalogs, and even school lunch operations.

"I always use the analogy of the pyramid of the educational data world," says Larry Fruth, the executive director of the School Interoperability Framework Association, a Washington-based nonprofit that fosters the sharing of educational software information. "The bottom third of that pyramid is the data you need to really run a school."

While data experts all support basic data backup, there are different approaches for how often data should be backed up, ranging from once every several days to once every few minutes. More frequent backup uses more server space and comes at a higher cost to the district if it's done by an outside party.

"You have to ask, what is a day of data worth in your district?" says Robert Kilian, the director of technology services at Infinite Campus, a Blaine, Minn.-based vendor of student-information systems. Basic-level services, including daily backup of student data, costs approximately $1 per student per year with Infinite Campus, Kilian says, and a more constant live backup that can restore data compiled only minutes before a server crash costs an additional 75 cents per student.

"I started [offering data backup] nine years ago. At the time, it was kind of a hard sell to get districts to buy into it," Kilian says. "What districts have seen now is it's one less thing to worry about. It's not a big deal anymore."

Routine Testing

School systems should also make sure there is routine testing of the backup server's capabilities for restoring lost data, say experts. If they're using an outside vendor for their student-information systems or other data systems, they shouldn't just assume the vendor is handling information securely.

"One of the things I think people fail to do sometimes is contact the providers and vendors," says Linda Sharp, the project director for cybersecurity and crisis-preparedness initiatives for the Washington-based Consortium for School Networking, or CoSN. "They need to make sure those they work with also have backup plans."

But Sharp says no amount of backup can ensure 100 percent against a potential server crash. Sharp says school districts should be

Tips

1 DECIDE THE BEST METHOD FOR BACKUP: It's pretty self-explanatory that backing up data onto a remote server is the easiest way to avoid losing data in the event of a server crash. But not every district has the financial or hardware resources to do up-to-the-minute backup on every piece of data recorded. Therefore, the data most essential for running day-to-day district operations should be the focus of the most extensive backup measures.

2 MAKE SURE YOUR BACKUP WORKS: Many districts assume that their backup procedures work despite rarely testing their backup servers' restore capabilities. This is something that should be done regularly, say experts, and if the data is housed by an outside vendor, the district should demand that the vendor do similar testing.

3 ANTICIPATE CRISES AND CONCEIVE A PLAN: Some threats to data servers are pretty common across the nation, and some are more specific to a region. While nothing will completely eliminate these threats, having a plan of action for if and when they occur may save hours or days in restoring a data system.

4 TAKE SIMPLE MITIGATING STEPS: Threats can be reduced in many ways, from moving server computers to a less vulnerable room of a building, to constructing a network in ways that it is not reliant on the survival of any single server for its function. Much like data backup, using some of these solutions will depend on a district's resources, but they are worth thinking about even for smaller districts.

5 KEEP YOUR OPERATING SYSTEM AND DATABASE SOFTWARE UPDATED: Makers of operating systems and software typically issue patches, or updates that help fix vulnerabilities within their products. Making sure to install these updates is crucial, because viruses typically prey upon the vulnerabilities the patches are designed to cover.

aware of potential threats based on everything from the local weather and geography to a district's electrical grid, and potential for theft, vandalism, and hacking. And while data-system vendors often offer published guides to data-disaster recovery, Sharp thinks it's important for individual district officials—and especially district technology officials—to think independently of vendor-provided literature when crafting a data crisis-response plan.

"I think what is the most critical thing to do is for schools to work through these scenarios themselves," she says, "because then it becomes personal." She adds that district technology personnel have a better understanding than others about the demands different threats may put on their data system, and need to offer input during the plan's conception.

While a crisis plan is important because it is impossible to eliminate data threats, it is possible to diminish the threat level.

A very simple way to do this is to consider the physical location of the servers, Sharp says. How susceptible is the location to storm damage? Are the electrical grid and the communication infrastructure in the building dependable and up to date?

Protective Measures

Meanwhile, Kilian from Infinite Campus says keeping your operating system and data software updated with the latest patches—updates sent out by the makers to fix a vulnerability in the system or the software—can halt viruses that prey upon those vulnerabilities.

Beyond that, how a network is constructed can help minimize the effects of a server crash. For example, using clustering, or a network where the server is hosted on multiple computers, means that there is more flexibility for how to restore specific data functions if one computer fails.

And many districts are virtualizing servers, says Darryl LaGace, the chief information and technology officer for the 132,000-student San Diego Unified School District, meaning that the server hard drive is broken into partitions to create a local backup for the program. If a coding error were to harm the partition that is acting as live host of the data, a duplicate partition could be activated in its place to undo the damage.

But virtualization may be a better measure for preventing smaller losses—such as the deletion of a single data set—than for preventing more catastrophic data losses. And as with all preventive measures, this one is no good if you think of it after the worst-case scenario.

"You can pick up those virtual servers on someone else's server and get them back up and running rather quickly," says LaGace, but it is not "something you can do after a crash has occurred."

'Data Mining' Gains Traction in Education

By Sarah D. Sparks

The new and rapidly growing field of educational data mining is using the chaff from data collected through normal school activities to explore learning in more detail than ever before, and researchers say the day when educators can make use of Amazon-like feedback on student learning behaviors may be closer than most people think.

Educational data mining uses some of the typical data included in state longitudinal databases, such as test scores and attendance, but researchers often spend more time analyzing the detritus cast off during normal classroom data-collection practices, such as student interactions in a chat log or the length of responses to homework assignments—information that researchers call "data exhaust."

Analysis of massive databases isn't new to fields like finance and physics, but it has started to gain traction in education only recently, with the first international conference on the subject held in 2008 and the first academic journal launched a year later. Experts say such data mining allows faster and more fine-grained answers to education questions and ultimately might change the way students are tested and taught.

"Data resources you wouldn't necessarily think would be useful can turn out to be very powerful for making inferences," said Ryan S. J. d. Baker, an assistant professor of psychology and learning sciences at Worcester Polytechnic Institute in Massachusetts. For example, research from the Pittsburgh-based Carnegie Mellon University found small changes in the length of time a student took to answer individual test questions signaled the student was struggling, cheating, or had given up in favor of filling in answers randomly.

"I can easily imagine just a little bit of classroom observation data could do a lot to contextualize the other information about student achievement" in state accountability databases, Mr. Baker said.

In centers like the Pittsburgh Science of Learning Center's DataShop, researchers can use advanced computers to analyze 238 data sets of online and classroom data, comprising 49 million individual student actions.

Expanding Data Universe

"You might be collecting thousands of data points for a single student—in some areas virtually millions—whereas the traditional qualitative methods in education psychology might have dozens or even a hundred measures," said Arthur C. Graesser, a psychology professor at the University of Memphis and editor of the *Journal of Educational Psychology*.

"That changes the quantitative methods enormously," Mr. Graesser said. "Not only can you look at unique learning trajectories of individuals, but the sophistication of the models of learning goes up enormously."

This data hasn't been studied in such depth before because it's only possible to find significant results when researchers can study a huge amount of data points. For example, Mr. Baker studied a topic that has frustrated teachers for generations: students who try to get through a task without actually learning the material.

"Students spend on average 3 percent of the time gaming the system, maybe 15 [percent of students] will do it at least once," Mr. Baker said. With only a few dozen students, it's almost impossible to tell exactly when and how it happens, he explained, "but when you have data from thousands of students, you can."

Studying hundreds of thousands of data points on students working through an online tutoring program, Mr. Baker created a model to allow the program to recognize when a student was attempting to complete a task without mastering the material, and then present the missed material again in a new way.

Research that draws on educational data

mining may also compress the lag time between undertaking a study and getting usable results, addressing a common critique from educators.

"I think this is escalating the speed of research on many problems in education," Mr. Graesser said. "In the past, somebody runs an efficacy study where they spend five years trying to study a sample that may include more than one classroom, and it takes a lot of time and a lot of money, whereas [an] EDM [educational data mining] study provides a far richer set of data on students in a matter of weeks or months. It's a whole different style."

Imitating Amazon

For practicing educators, the question educational data mining raises is: Does this mean researchers could create tools for teachers that collect information in the same way that Amazon.com, the online retailer, collects information on customers' buying habits? Could systems be developed that can track whether a student is excited about some topics but not others, struggling with decimals but not long division, and suggest interventions accordingly?

"Oh yeah, no problem! We have done that already," said Greg Chung, the co-principal investigator of the Center for Advanced Technology and Schools at the University of California at Los Angeles. In the early 2000s, his team developed a program for the U.S. Marines that tested which soldiers were likely to have trouble with different aspects of marksmanship based on their understanding of trigger-control and then automatically assigned soldiers study materials. By the end of one week on the program, the participating Marines developed better marksmanship skills. Dr. Bror Saxberg, chief learning officer at Kaplan, Inc., said at a Dec. 7 discussion at the Washington D.C.-based think tank Education Sector that his firm is piloting similar rapid-feedback systems.

In fact, Mr. Chung and other researchers said, the technology and research can be developed faster than it takes to teach practitioners how to use it.

"Actually trying to do this in the classroom, it's like, ugh," Mr. Chung said. He recalled giving teachers electronic clickers that would allow every student in a class to answer a question—as opposed to only two or three in a classroom—and would allow the teacher to analyze their responses. But the sudden flurry of responses—and their range—quickly overwhelmed the teachers. "The teachers said, 'Yeah, this is interesting, this is cool, and we learned a lot about our students, but what do you do in a class with so many different levels?'" Mr. Chung said. "They couldn't address every kid."

As data systems and the tools to analyze them become more ubiquitous, experts say we will need more research into how much and what kind of data are most helpful to teachers trying to improve their classroom instruction. Mr. Baker envisions within a generation preservice teachers will study data analysis as a matter of course, and researchers will develop easier-to-use tools to help them compare their own students' behavior and performance to models based on hundreds of thousands of similar students.

Several states, including Louisiana and New York, are already experimenting with data tools that allow teachers and principals to track daily attendance, behavior and academic performance of each student.

In fact, a 2009 study by a team of researchers from Carnegie Mellon and Worchester Polytechnic found in the process of creating an online tutoring program that its underlying data model for tracking student progress could predict students' year-end academic performance better than scores on the state's standardized test.

"If we could show that a student's work over time was a better predictor of student success than these state exams that everyone complains about anyway, wouldn't that help us get a lot farther along?" said John C. Stamper, a systems scientist in the Carnegie Mellon Human-Computer Interaction Institute and technical director of the DataShop.

Moving Forward

Educational data mining is catching federal attention, too. The National Science Foundation this month opened a new $30 million grant for studying cyberlearning that is intended in part to expand computer-based educational data mining projects, said Joan Ferrini-Mundy, the acting assistant director for NSF's Directorate for Education and Human Resources. "It's fascinating and potentially very productive," she said.

Likewise, Aneesh P. Chopra, the nation's first federal chief technology officer, argued at the EdSector panel that new types of data and analysis will allow researchers to use more than "static" standardized test scores to identify best practices.

"Having a debate about whether that single data point moves here or here or here sounds like a silly conversation in the face of millions of data points," Mr. Chopra said. "We need to understand at far more granulated levels of performance what works and what doesn't."

COMMENTARY

My Nine 'Truths' of Data Analysis

By Ronald S. Thomas

For over 20 years, I've been a data coach for hundreds of teachers, first as a top-level official in two Maryland school districts and now on the faculty of a university leadership center. I've had mountain-top experiences with school teams whose members really get what it means to use data to inform their instruction, and I've led sessions that were disasters.

Over the years, I have accumulated a set of what I first called "My Ten Commandments of Data Analysis." Then, I reconsidered one, and "nine commandments" just didn't sound right. So I now call them "My Nine Truths of Data Analysis." They are not necessarily the truths, but they are definitely my truths. I would be interested in how they compare with the thoughts and experiences of others.

My first truth. We don't need "data driven" schools. We desperately need "knowledge driven" schools. There is a big difference. Data are ways of expressing ideas, such as in numbers, sounds, and images, and they have very little value and usefulness in and of themselves. Data are merely the building blocks of the information age.

Data are useless unless they are first organized into meaningful patterns called information. This transformation is, largely, a technical process of summarizing and putting the numbers into usable forms like charts and graphs. Schools are acquiring some skill at this, and commercially developed instructional-management systems (or data warehouses) are facilitating this process. But many schools are still drowning in data and information.

The real breakthrough in increasing student achievement is to transform information into knowledge. Knowledge is applying information appropriately and productively in a contextual situation. In his classic text *Leading in a Culture of Change*, Michael Ful-lan maintains that generating knowledge is primarily a social process. This means that, in a school setting, knowledge emerges through a collaborative process as teachers and administrators engage in conversation, primarily in school teams. When knowledge is used sensitively and humanely to enable the school to continually improve, schools are becoming—as business guru Peter Senge envisioned—true learning organizations.

My second truth. Data analysis is not about numbers. It is all about improving instruction. All educators can be involved, whether they are number wonks or number phobics. I am a former middle school social studies teacher. If I can "do" data, anybody can "do" data.

My third truth. Data are not best analyzed alone, while you are sitting in front of a computer screen staring at Excel spreadsheets or colorful graphs. Data analyses are most effective when they are performed with other teachers who share the same standards and assessments, and who can discuss concretely and specifically, based on student results, what is working and what is not working to increase student learning in their context.

My fourth truth. Teacher teams need to be able to meet in "data dialogues" during the school day for 45 minutes to an hour at least once every two weeks, and more often, if possible. This time must be held sacred for data dialogues and not used for other purposes.

My fifth truth. The most productive data-driven teams follow established analysis protocols and enforce clear procedural and relationship norms. The Center for Leadership in Education at Maryland's Towson University, where I work, has developed the Classroom-Focused Improvement Process, an inquiry-based protocol for classroom teachers to use to analyze the results of district benchmarks and ongoing classroom assessments. These collab-orative dialogues result in identifying class-wide patterns of strengths and weaknesses for possible reteaching, students ready for enrichment and those needing interventions and what the focus of those interventions should be, and plans for improving instruction in the next unit. The protocol is being used successfully by teams throughout Maryland.

My sixth truth. The most important questions in data analyses are not "What did the students score?" and "How many passed?" The most important questions are: "What do the students know?" "What do they not know?" and "What are we going to do about it?" These questions are the focus of the Classroom-Focused Improvement Process.

My seventh truth. If educators are going to have a significant, long-term impact on student achievement, we must change the nature of the ongoing work of the adults in a school. We have achieved maximum impact from using student interventions as the primary improvement strategy. There is just no more time left in the school day, and no more energy left in the children. For accelerated progress, we need to center faculty members on strengthening the alignment of their curricula, instruction, and assessment around the standards—be they the current state standards or the common-core national standards on the horizon.

My eighth truth. We need to build the capacity of teacher teams to reflect on their work and to make ongoing instructional adjustments based on their analysis of what does and does not work for their students. Professional development alone is not enough to build this capacity. We will need greater program coherence, often called "increased focus," and the cultivation of educator learning communities dedicated to practicing collaborative inquiry.

My ninth truth. None of these steps is

going to have any impact unless, as educational leaders, we clearly articulate compelling reasons why teachers should invest time and effort in data analysis. The message to teachers must be that their work is not about abstract concepts of state accountability or school improvement. We did not get into this business to increase state test scores or to implement federal mandates. We are here to help children learn.

So, let's end the talk of AYP and Race to the Top. Let's talk instead about our moral purpose, which is, as Fullan reminds us, twofold: to increase the achievement of all students and to eliminate learning gaps.

Daniel Pink's recent research in *Drive: The Surprising Truth About What Motivates Us* confirms that each of us yearns to be of service to something larger than ourselves. What better moral purpose can there be than increasing achievement and reducing gaps? After all is said and done, isn't that why we are here?

Ronald S. Thomas has been an assistant superintendent in the St. Mary's County, Md., and Baltimore County, Md., public schools. He is currently the associate director of the Center for Leadership in Education at Towson University, in Towson, Md.

COMMENTARY

Education as a Data-Driven Enterprise

By Laura Sanford

We all agree our nation's future success depends on the ability of our students to compete and achieve in the global economy. For the United States to remain a world leader, we must ensure that our students graduate from high school prepared for the future challenges of continuing education and the workplace. But, frankly, we will not succeed in transporting every child to that destination if we don't invest in better data to guide our education policies and practices.

No one is watching this move toward using data to improve student achievement more closely than America's business community. We know firsthand that no organization—for profit, nonprofit, governmental—can reach its goals without data to inform its decisions at every point. Our future hinges on the ability of our schools to produce the talent and leadership that our companies will require in the next generation. Business leaders see the value of data in our own worlds and know how promising it can be when data is put to use to make real and positive change. Data brings to light our successes and failures. We can't afford to not use this information—in the corporate world and the education sector.

The importance of data is a key topic for the policymakers, educators, and business and community leaders gathered this week in Washington for the Building a Grad Nation Summit. As the summit aims to inspire a national movement to reach the goal of a 90 percent high school graduation rate by 2020, it is clear that much recent progress has been made, thanks to a greater commitment at multiple levels—local, state,

> **"** Our country still does a better job of tracking a package than it does a student, but we're on the cusp of transformation."

and federal—to creating a more data-driven education system. Attaining the double-digit growth necessary to reach our goal will be closely tied to fully implementing and utilizing data systems to foster individual and collective student achievement.

The last five years have seen unprecedented progress at the state level in building data systems that collect rich and vital information on student academic progress—from the courses taken and grades received to assessment scores and attendance rates. Almost every state now has the technical infrastructure to collect high-quality data; however, most states don't fully utilize this information. To fully leverage the systems in place, we need to change from a culture of collecting data for compliance and evaluation to a culture of using data for constant student improvement. As Aimee Guidera, the director of the Data Quality Campaign, says, "We need to use data as a flashlight, not a hammer."

As a new white paper—commissioned by AT&T and written by the Alliance for Excellent Education, Civic Enterprises, and the Data Quality Campaign—emphasized, three developments in education data are positive

signs that the education sector is in the midst of this transformation into a data-driven enterprise: longitudinal student data; early-warning data and intervention systems; and college- and career-readiness indicators. It is clear that data collection and use don't exist solely for the benefit of faceless statistical studies, but that they can have an immediate impact on those on the front lines: teachers, parents, and students.

Imagine the possibilities. A group of middle school teachers can develop individualized intervention programs for incoming students pre-identified as at risk for dropping out because effective data systems are in place to track attendance, behavior, and performance. Parent-teacher conferences can take on new meaning as teachers gain the ability to show parents how their child's academic progress compares with that of others in the same grade at that school, in the same state, nationally, and even internationally.

The AT&T Foundation has monitored this topic very closely. We've seen a lot of improvement, but as with all of the important topics touched by this week's summit, there is still work to be done. Our country still does a better job of tracking a package than it does a student, but we're on the cusp of transformation. We must maintain the momentum. The data systems are now largely in place; the next frontier is making sure they are fully utilized to provide accurate, actionable, and consistent data—and to ensure it becomes part of the culture in our schools.

Ultimately, data serves as a vital gauge to inform our journey in preparing every child for success in the global economy. This information alone is not the answer; it is valuable only if used by those charting the trip. Students, educators, parents, and policymakers can't be informed stakeholders unless they understand how to access this information and use it. This is our challenge: to build demand and use of this valuable information now that it has been collected. We will never meet the goals of the Grad Nation campaign unless we utilize all the information at our fingertips. What a lost opportunity if we do not.

Laura Sanford is the president of the AT&T Foundation, in Dallas.

COMMENTARY

Data Rich But Information Poor

By William J. Slotnik & Martin Orland

How do you get a healthier chicken? Do you weigh it more often, or do you improve the quality of the feed? These questions, once the exclusive domain of agriculture, are now front and center in education reform circles.

Over the past decade, there has been a quiet revolution in the quality of education data systems. Forty-eight states can now track a student's gains in academic performance from one year to the next, and many school districts are starting to link such gains with particular teachers. On top of this, the U.S. Department of Education will soon be making $250 million in federal stimulus funds available to states to make further improvements in their data systems, plus an additional $350 million to improve the quality of their tests.

But what will all this mean for improving learning in America's classrooms? Will we just be doing a better and more accurate job of weighing the chicken, or will we be improving the quality of the feed? Leveraging this data-systems investment into sustainable gains in student achievement requires a parallel investment in strengthening the capacity to use data to improve teaching and increase learning. Without this capacity, student achievement will continue to stagnate, and we can all expect the next flurry of reports indicating that America's schools are falling short.

Let's look at what capacity-building needs to entail. At root, it has to develop the ability to convert "data," which by itself is meaningless, into "information," which can lead to better decisionmaking. This means systematically probing the patterns revealed by data about students, teachers, schools, and policies, so that educators and policymakers make more-informed judgments about student achievement and where and how to improve it.

> " Data just don't leap off the page and convert themselves to high-quality, useful information."

Converting data to information is relevant at every level of the education system. Teachers, for example, need to know how to examine student performance if they are to understand which parts of their instruction are getting through, and to which students. They can then use this information to adapt their teaching strategies—revisiting areas of the curriculum that are not being learned, targeting attention, and incorporating new techniques for students having difficulties. Without this knowledge and capacity, the test data are useless to them.

Similarly, school principals need to be able to look at data across their buildings to learn which teachers and programs are having success and which are not. Using this knowledge as the basis for action, they can focus on the weakest subjects and instructors, make better classroom-support decisions, modify initiatives that are not working, and expand those that are.

District officials need to know how to convert data into information to better understand the reasons for differences in results and then make better decisions when addressing challenges, such as how to have the most impact with limited resources and which curriculum and technical-assistance strategies to use. State education leaders need this capacity to better determine initiatives to pursue in the state's lowest-perform-

ing schools and districts, standards for entry into the teaching profession, and policies on school choice.

While these needs may seem patently obvious, study after study shows that most educators and policymakers make only the most limited use of data to inform their decisions. This is not surprising. Data just don't leap off the page and convert themselves to high-quality, useful information.

It takes time and skill to organize, analyze, and interpret data properly, and these assets are in short supply in today's educational landscape. The implications of raw data reports are rarely intuitive or obvious. For example, a school report may show higher achievement scores in one class compared with another. But to what extent is this due to better teaching, as opposed to the assignment of higher-achieving students? Principals, teachers, and parents need the capacity to answer this kind of question. Otherwise, such reports are largely useless for school improvement, or worse, lead to the wrong conclusions and actions.

Improving the nation's schools requires breaking the pattern of being data-rich but information-poor. Building the capacity to convert data to information would give educators and policymakers the tools needed to probe for causes of underperformance, analyze the conditions that are contributing to varying levels of student achievement, and develop and implement improvement strategies based on these analyses. Teachers, administrators, and policymakers critically need these capacities. They are essential if we're really serious about improving the feed, so that our students grow and succeed.

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http://www.dataqualitycampaign.org/resources/details/1258
Alliance for Excellent Education, Civic Enterprises, and the Data Quality Campaign, March 2011

Inasmuch Foundation
http://www.inasmuchfoundation.org/

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