Transforming Data Into Knowledge

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Sir Arthur Conan Doyle

School systems are awash in data. So much so, in fact, that some principals feel like they are drowning in it. Unfortunately, although most schools are data rich, they often are also information poor. The task for school leaders is to put existing data into a format that lends itself to answering questions and improving outcomes for the students. Common barriers to transforming data into knowledge in education settings often include poorly designed or nonexistent data systems; disorganized record management; moody gatekeepers—data mavericks—who hold back data to preserve power; or personnel who simply fail to ask the right questions of the available data.

Fortunately, learning to deal with data does not require an advanced degree in statistics. In most cases, using data effectively simply requires a desire to improve outcomes for students, staff members, and schools and a willingness to stop doing the same old things while hoping for a different outcome. Educators also borrow best practices from data industry leaders to take advantage of state-of-the-art data management technologies to plan strategically for the future. Much has been written about what the public sector can learn from the business world, but many educators argue that schools are not businesses. The institutions are quite different, and although schools can replicate some of the best practices of leading corporations, school leaders must also be different from business leaders. Collins (2005) suggests that schools require very different leadership skills from those needed in corporations because true educational leadership only exists if people follow when they have the freedom not to. Collins claims that public schools need the nation's strongest leaders.

What Do We Need to Know?

I often joke with principals that as a former school psychologist, I may not be able to get all the answers from the data, but I can always tell them how I feel about it. But if we educators don't make factual data the basis of our discussions, we are merely discussing our opinions. The first discussion that must happen in a school consists of formulating questions, determining key areas of focus, and defining schoolwide goals. Clearly defined goals will prevent decisions from being made on the basis of preconceived notions and wishful thinking and will lead to interventions in areas that deserve focus. Holding a frank discussion with staff members about what the school's needs are is a good first step in defining goals. Boudett, City, and Murnane (2005) recommend starting to define goals by creating a data team, taking stock of data organization, and developing a data inventory.

In my district, I often compare this process to building a house. Imagine trying to build a house by looking at all of the disparate tasks involved instead of starting with a blueprint and...
input from buyers and contractors. The building would collapse around you and none of the buyers would want to live in it. If you first have a solid plan and build on a firm foundation, your work with data will add value to the school, rather than merely adding to your workload. Schools might start with a simple discussion of the primary instructional goals. What would success look like? What outcomes or information should be monitored to be successful?

The real work of managing data effectively involves getting representatives from all groups in a school. If everyone owns the data and the process, then the beliefs about its importance and usage will be much easier to address. In Wilson County (NC) Schools, the principals use their school leadership teams as vehicles to start this process. The principal's role at this stage is to build and focus support for the need to look at data. Encouraging open dialogue and brainstorming about the data needed are good techniques for this process. Participants need to know that it is the time to question practices and opinions to discern what the team should ultimately focus on. Questions to ask at this stage include, Who needs to own this data for the school to move forward? How can I establish the focus on the data we need rather than what we think? Which data are the most important or part of our foundation for improving student outcomes?

**Which Data Will Help?**

When most educators speak of data, they mention test scores and grades. However, numerous data sources should be a part of the discussion at the school level. My district has developed monitoring processes that look at other information, such as student and teacher attendance, disciplinary infractions, parental contacts, and maintenance requests for buildings and technology, to determine whether there are relationships among these factors. For example, it is difficult to achieve gains in academic performance when students and teachers are not in attendance. Having access to accurate attendance data is important, but the ability to align that data with other outcomes can lead to logical conclusions about the effectiveness of programs and practices. If you do not have access to the data for analysis, you are just guessing.

Finding the data and transforming them into knowledge take planning and commitment. Principals must be able to locate their data, determine if the data is reliable, and decide how best the data could be analyzed before proceeding. Many times, the biggest obstacle is simply finding the data and getting them into a format that allows them to be manipulated. Questions to ask at this stage include, Is the data current? Who is responsible for maintaining the information? What is its format (e.g., paper records, spreadsheets, or data management systems)?

**How Do We Look at the Data?**

In this age of accountability, the focus on student performance is warranted, but educators need to ensure that we do not use a microscope when the view from the balcony might be the best first step. Hefetz and Linsky (2002) suggest that leaders need to "get on the balcony" and view a system from multiple perspectives. A principal, for example, can view his or her data from the perspectives of students, staff members, and the community.

Well-designed tables and graphs are often a good format for identifying global needs because most people respond well to visual representations of data. Everyone has lots of exposure to this approach from marketing ploys and commercials that inundate consumers with colorful displays or icons that convey meaning. Excellent suggestions about developing expertise in this arena are available in *The Visual Display of Quantitative Information and Envisioning Information* (Tufte, 1983) and *Show Me the Numbers: Designing Tables and Graphs to Enlighten* (Few, 2004). Tufte cautions users...
to avoid all unnecessary elements in a chart so the focus is on what the data says. He decries the modern tendency to fill up charts with "chartjunk"—such as call-out windows, arrows, or flashy axes and grid lines—rather than focusing on the elements of the display that are needed to understand the data. As you begin the task of transforming data into information for decision making, questions to ask might include, What format for presentation provides the best insight for the viewers? Does the data presentation match the types of questions we are trying to address (e.g., can we use a graph in which the shape of the data tells the story)? Can everyone see the patterns or points of interest from the presentation format?

What Does It All Mean?
Once you have identified your data sources and the appropriate personnel are able to access them, the next step should be to develop a data management system. Although a data management system might sound complicated and costly, there are a variety of common applications that fit different needs, budgets, and technical expertise. For example, Microsoft Excel can be used to develop pivot tables of the data for an initial foray into online analytical processing (known in techspeak as "OLAP"), which allows for quick analysis of different aspects of multidimensional data. Pivot tables enable you to quickly dig deeper into your data to look for common themes or patterns that you might not see on the surface of a table of data. Jelen and Alexander (2005) liken pivot tables to a kaleidoscope that, when pointed at your data, allows you to look at them from various viewpoints and see a different picture with each turn. This interactive viewing allows you to segment and summarize your data by simply dragging and dropping the columns and rows of your spreadsheet to create new calculations and summaries.

My district provides all principals with pivot tables of their test data. They can then manipulate common demographic variables and drill down to find out which individual students need remediation in a particular instructional area. We also use these tools to examine our disciplinary data to look for ways to improve student behavior. This approach empowers each principal to examine the data for his or her own school because he or she can provide interventions as soon as he or she identifies problems.

The school system is also ramping up its efforts by working with SAS (www.sas.com/k12), one of the leaders in business intelligence and advanced analytics, to develop a district portal and a scorecard application to allow for real-time analysis of the most important data. This approach will allow principals and district administrators to see their data in a view that is customized on the basis of their roles and responsibilities. Each user can choose the reports that best answer his or her questions and then play "what if" with the possibilities. Such timely access to dynamic data will allow educators to analyze information about their schools and prepare for the future rather than react to snapshots of the past. Although this approach is clearly more comprehensive than spreadsheets and databases, the first steps remain the same. Schools still must identify the data they need and organize them in ways that will allow them to transform the data into information. SAS is helping us by providing a global view—rather like a view from the balcony with the ability to zoom in on key data points.

Now What?
Understanding what to do with school data might be compared to the old story of a dog chasing a car: What would the dog do if he caught it? Once school data is organized and turned into information, then what? Educators must process the information, consider the implications, and make informed decisions that are based on much more than data. This phase of data management involves selecting the appropriate interventions and applying the findings to change or refine administrative or instructional practices. For some educators, this step might be the most difficult, but it is also the most important. Collecting data for reports and accountability is not the final goal, but merely an important stage in an ongoing process.

The final step requires the principal to assume the role of instructional and data leader. At this point, discussion and planning are based not on feelings and opinions but on keen insight gained from what the data say. Sometimes, no one wants to hear what the data are saying. They may be saying that there is a lot more work to do in an area thought to be doing very well. In other cases, the process of leading with data might

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involve breaking tradition and doing jobs differently or changing the master schedule.

The principal's job is to lead this discussion and help the faculty develop an action plan that responds to information gleaned from the data. Helping the staff move beyond real or perceived barriers to implementation requires even more skillful leadership. Developing strategies to address student needs and providing effective instructional programs that will produce desired outcomes requires patience and persistence. Typical questions that could extend the discussion from the information you have gathered and start the discussion at this stage might include, How does our schedule align with our instructional needs? How are we spending our budget to support the areas that need our focus? What types of professional development focus on the skills that the data indicate we need to address? These types of open-ended questions can help ease staff members into a deeper discussion about what the data say. This stage of the plan requires constant monitoring and follow-up, but timely access to data can streamline the process.

Data management is a concept that many educators are just learning, but it is a requisite skill for leaders who must make sound decisions at the school and district level. Educators can learn much from corporations and providers who have used data to make informed decisions for many years. The similarities between a corporation's and a school's approach to data analysis are quite clear. Strong leaders must remember that the final goal is to analyze information and gain the insight to improve processes, procedures, and learning outcomes—and ultimately to make a difference in the lives of the students they teach.

**References**
