WCER Working Paper No. 2002-3
April 2002

Turning Data Into Knowledge: Lessons From Six Milwaukee Public Schools

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The research reported in this paper was supported by a grant from the Joyce Foundation and by the Wisconsin Center for Education Research, School of Education, University of Wisconsin–Madison. Any opinions, findings, or conclusions expressed in this paper are those of the author and do not necessarily reflect the views of the funding agencies, WCER, or cooperating institutions.

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Project Introduction: Study of Electronic Information Systems in Schools

The overall goal of the *Study of Electronic Information Systems in Schools* project, which was funded for a 2-year period by the Joyce Foundation, was to study the efficacy of using an electronic information system to support continuous school improvement and school reform. The project was a collaboration of the Wisconsin Center for Education Research (WCER)[2] with UCLA's National Center for Research on Evaluation, Standards, and Student Testing (CRESST)[3] and the Milwaukee Public Schools (MPS). The WCER research team was led by Norman Webb, the project's principal investigator. Sarah Mason organized the project research and technical assistance and managed graduate research assistants Jeff Choppin, Jeff Watson, Latrice Green, and So-Young Park. Chris Thorn acted as technology and research consultant and participated in training and evaluation activities.

The project had three principal goals:

1. To increase the capacity of six schools in the Milwaukee Public Schools to collect, maintain, report, and use student, classroom, and school data for continuous improvement;

2. To conduct research on the processes schools use to electronically store, analyze, and retrieve data and information to support continuous improvement and school reform; and

3. To collaborate with CRESST in providing external feedback on the implementation of the Quality School Portfolio (QSP) software (National Center for Research on Evaluation, Standards, and Student Testing, forthcoming) in Chicago schools, to share in designing an evaluation, and to engage in joint problem solving and reflection.

During the past 2 years, the project focused on four research questions:

1. What are the data needs of schools?

2. How can schools use data effectively to meet their needs?

3. What level of data analysis is useful to schools?

4. How can the quality and flow of data to schools be improved?

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[1] A paper presented at the annual meeting of the American Educational Research Association, New Orleans, April 2002.

[2] See http://www.wcer.wisc.edu/.

[3] See http://www.cse.ucla.edu/.

Project Background and Methodology

The principal goals for the project were met by working with staff in two MPS schools in Year 1 (June 1, 1999, through May 31, 2000) and in an additional four MPS schools in Year 2 (June 1, 2000, through May 31, 2001). We formed teams at each school to learn more about data-driven decision making and to participate in field-testing QSP software, an analytical and reporting tool developed by CRESST at UCLA. At each of these schools, staff members were trained to use QSP to help make decisions leading toward school improvement and reform and were given ongoing support by WCER research team members. We studied the schools' implementation of QSP by gathering data from teachers, principals, and staff on their data needs, their use of QSP, and their evaluation of the usefulness of QSP for decision making.

Over the 2-year period, WCER and CRESST research teams met twice a year with outside consultants to evaluate the progress of QSP implementation in Milwaukee, Chicago, and Los Angeles schools and to advance a research agenda for studying the use of electronic information in achieving school improvement and reform. Several times each year, WCER researchers visited Chicago schools that were implementing QSP. Together, these visits to Chicago schools and the work with MPS schools formed the basis for WCER's feedback to CRESST on the development and implementation of QSP and on approaches to linking QSP to district databases and using it to inform teachers' classroom activities.

Upon selecting our first cohort (Phase 1) of two MPS middle schools in August 1999, we began to collect our baseline data and help the schools organize their QSP teams. At each school, the baseline data collection consisted of interviews with members of the QSP team; a thorough technology assessment of the school's hardware, software, and extant data; and a survey of the entire faculty. Analysis of this information gave us an understanding of the data environment of each school. We also were able to establish baseline information on each staff member's knowledge and use of data, technology, and processes for school improvement.

From February through June 2000, we conducted four daylong training sessions with each of the two participating middle school QSP teams. While using the CRESST training sequence as a foundation, WCER research staff members revised and upgraded the training program, adding additional sessions on data decision-making processes and analysis. Most notably, we developed a complete day of training on how to incorporate data into school planning, decision making, and improvement processes, and a session on ensuring the quality of data collection, analysis, and reporting.

In August 2000, we selected four additional MPS schools (Phase 2)—two middle schools and two high schools—to participate in the project and, over the next 4 months, provided training to each new QSP team. Team members at all four of the new schools were trained by the end of December 2000. Year 2 training emphasized the use of continuous improvement processes, analytical models, and evaluation approaches, as well as the training of team members on how to use the QSP software. Schools used their own school and district data in the training sessions, and the WCER team developed school-specific analytical and report samples for a revised training manual.

Early in the fall of 2000, we helped the Phase 1 Milwaukee QSP schools expand their use of data and build their use of QSP and conducted interim interviews and data collection. In October 2000, Derek Mitchell, the developer of QSP, came to Milwaukee to meet with the WCER team and the two MPS principals from the Phase 1 QSP schools. The principals provided feedback to Mitchell on the QSP software and spoke of the need for analytical tools to handle school-based processes and "real-time data" for evaluation and interim (rather than annual) school-based decisions. In January 2001, both of these schools submitted proposals for specific school-initiated action research using QSP. The WCER staff provided ongoing technical assistance to each school by obtaining and formatting district data, importing data into QSP, and troubleshooting database and software problems.

From January through June 2001, each of the six schools spent time collecting, analyzing, and utilizing data and the QSP software. We encouraged each school to schedule a QSP meeting at least once per month. The WCER team members either attended these meetings on-site or were available for consultation by telephone or e-mail. In preparation for the meetings, the WCER team helped school teams by obtaining, formatting, and sometimes even analyzing data. A WCER team member visited each school once or twice a month to assist staff members in exporting data from a variety of school and district databases. To facilitate future exporting of the data, we created a protocol of instructions for training school members to extract and reformat the data on their own.

In addition to the on-site technical assistance visits, the WCER staff conducted research observations, focus groups, and interviews. WCER staff documented on-site technical assistance and recorded observations of the Milwaukee school teams using QSP. In April and May 2001, we conducted focus group sessions at each school to obtain feedback on the school's use of data and QSP. At two of the schools, teaching staff members who were not members of the school QSP team joined the focus group to relate how the use of data at their school had changed and how the changes affected them and their students.

On May 4, 2001, we held a workshop to provide the team members of the six participating schools the opportunity to share their experiences in using data with each other and with district staff. Each school team prepared a presentation to demonstrate how it had used data. The workshop was attended by several staff members from the MPS Central Services Office. The school presentations were followed by an extensive question-and-answer session and informative dialogue about school data needs. District staff members talked about recent efforts to improve the data links to schools and asked personnel at the six project schools questions about their data use. In June and early July 2001, the WCER staff provided each school with an additional daylong technical assistance visit to help school team members use new district assessment data. The staff also provided a training session for several new QSP team members at three of the schools.

The remainder of this paper highlights both the successes and the challenges experienced by MPS staff in using data at the MPS schools. Based on a qualitative analysis of the information collected through interviews, focus groups, observations, and technical assistance during the 2-year project, lessons are formulated for other schools to consider as they take on the task of incorporating data into their decision-making and school reform efforts.

Lessons from Six Milwaukee Public Schools

When asked to define the term *data,* teachers and school administrators at the six MPS schools in our study did not hesitate to explain that, in their view, data have the potential to be more than just numbers, head counts, or test scores. These educators knew instinctively that effective data use would enable them to learn more about their schools, describe success, identify areas for improvement, evaluate programs and practices, and make informed decisions.

Two years ago, these educators volunteered to become part of a study on building the capacity of schools to use data more effectively for continuous improvement and decision making. The initial focus of the research was to interview team members at the six schools to develop an understanding of each school's data environment and establish baseline information on each team member's knowledge and use of data, technology, and processes for school improvement. The majority of QSP team members at each school admitted to a lack of experience and expertise with data and requested additional training in all aspects of data use and continuous improvement processes. When asked about their data needs, QSP team members consistently mentioned the need for developing a process, and acquiring the skills, that would better enable them to analyze and use data as a basis for decision making.

Our research staff and the school teams worked collaboratively to collect and create data and to learn about analytical models and decision-making processes, data management and analysis, and application of data. Together, we learned a great deal about what it takes for schools to successfully use data, and what the barriers are to effective data use.

Successes

Some of the QSP school teams experienced moderate success in using data. One MPS school conducted a longitudinal analysis of its in-house and state reading assessment data from the past 3 years and determined that the attainment scores and student reading performance gains needed improvement. The team also reviewed the placement of students in reading and language arts courses and investigated the relationship between student attendance and GPA. After reviewing the information, the principal and teacher leadership team decided on a course of action. For the 2001–2002 school year, they planned to reallocate school resources to improve reading, identify low-performing students to receive additional reading resources, and hire two new reading specialists. Team members planned to track these interventions over the year to see whether they effectively improved students' reading performance.

Another school team began to analyze *event-based data,* a term they used to describe data that refer to a specific incident or action rather than to a test score or student demographic variable. By tracking the pattern of events such as discipline referrals and attendance infractions, personnel learned more about where, when, and how often certain events occurred. The principal provided teams of teachers with summary information on a variety of events that occurred during the semester. These summaries were used to encourage discussion and create understanding about the patterns of student behavior and teacher behavior management practices at the school. The data were also used to support decisions about resource allocation. For the following year, the school planned to hire an additional counselor to help students who encountered difficulties in their lives outside of school that staff members believed affected their behavior at school.

Challenges

The successes described above did not come without a price. The QSP school teams learned some hard lessons and faced many barriers in developing effective data-use practices and applications to decision making. The teams came to understand that data do not magically appear, ready-made, to provide evidence of success and to solve all of the school's problems. They struggled to build the internal will, capacity, and organization to make data work for them. They had to learn how to obtain and manage data, how to ask good questions of data, how to accurately analyze data, and how to apply data results appropriately and ethically. Despite their progress and successes, by the end of the project the QSP school teams agreed that they still needed to learn how to incorporate data seamlessly into their everyday operations and how to build their capacity to use data for decision making school-wide and at various levels.

Clearly, the application of data to decision making presents an array of complex challenges for schools. These challenges must be both addressed initially and attended to continuously if a school is to make successful and effective use of its data. Through our research, we have identified six challenges schools need to contend with as they build their capacity for using data for decision making:

1. Cultivating the desire to transform data into knowledge;
2. Focusing on a process for planned data use;
3. Committing to the acquisition and creation of data;
4. Organizing data management;
5. Developing analytical capacity; and,
6. Strategically applying information and results.

Cultivating the desire to transform data into knowledge. In the MPS study, we were fortunate to work with six school teams that were eager to learn how to use data more effectively to improve school performance, increase student achievement, and demonstrate accountability. Yet, not all schools have a collective sense of purpose or school-wide support for using data. Many schools need to develop an understanding among school staff members about how data can and will be used, instilling a sense of trust and building the belief that data can positively contribute to improving teaching and learning. This effort will require leadership, time, and patience.

Strong leadership that supports the local use of data is conducive to creating a school culture that not only accepts the use of data, but looks upon data as a source of information that can contribute to problem solving and knowledge building. Whether it is key staff members or the school principal who provides the leadership, it is essential for a school to gather support, commitment, resources, and direction to ensure that its data efforts are a success. Building this type of data culture or environment within a school requires that data use be open, inclusive, and transparent to all staff. This may require significant professional development and frequent meetings with staff in which data play a role.

Of the schools in our project, those that had broad representation of administrators, teachers, and other staff members on the QSP team were more successful in establishing clear data-use processes and accomplishing more with their data in a shorter time than the other schools. Teachers at one of the QSP schools said that "modeling the use of data" made them feel more connected to decision making and encouraged them to contribute opinions and feedback to the administration. However, school teams that lacked leadership support and had fewer staff representatives struggled to get beyond the initial stages of collecting data and often failed to use data effectively or to create an environment among school staff that accepted and incorporated data in planning or decision making.

Focusing on a process for planned data use. It is important for schools to focus their use of data by linking it to their school planning and decision-making processes. A focused approach will save time and effort and allow for more efficient use of limited data. An approach that aligns data inquiry to school planning and decision-making processes from the start is more likely to produce answers to specific questions, evidence to support school goals, and information that can shed light on identified problems. Planned and targeted data inquiry can help to keep data analysis on track, as well as ensure that information is fed back into the planning process and that key decision makers get the answers they need.

One principal in our study attested that a more disciplined use of data helped his school refine its data collection to meet specific school needs. His staff members became capable of prioritizing the data they needed to address school goals and facilitate problem solving. Their use of data became less random, and the principal was thus able to use the more focused data sets to include teachers in the planning and decision-making process.

Committing to the acquisition and creation of data. For many schools, obtaining clean and timely data, in a useable format, is easier said than done. Commonly, schools collect and enter data on a daily basis into computer terminals that automatically send the data to district databases for accountability and compliance purposes. However, many older district information systems make it difficult for schools to retrieve and download the data once it has been compiled. Even when data can be downloaded from district databases, problems often remain: the district method of reporting data may be in the wrong units, or not match school needs (e.g., attendance data reported on a quarterly rather than daily basis); assessment data may be returned to schools months after test administration and often well after the school has closed for the summer; and data may be in a format incompatible with local school software.

The QSP schools found that acquiring the right data meant building new relationships with district personnel, becoming more involved in district technology and research planning, and, at the very least, becoming more familiar with their district's and their own school's information systems and databases. To get the specific data they needed, schools often created new data sources and conducted additional data collection and data entry. This extra work required the dedication of resources, time, and personnel. Two QSP teams made the commitment to increase their access to data by creating internal data collection processes and dedicating technology and personnel resources to the task. Yet both principals complained that collecting data independently was a burden and that "hand entry" of in-house data was too costly and too prone to human error. As a result, they continued to work with MPS to create new sources of data and to improve electronic data access, downloading, and formatting, while working

internally to build automated processes for school-level data collection, maintenance, and storage.

Organizing data management. There are significant problems associated with data management that require organization and additional resources and staffing to resolve. Schools need to answer questions such as: Who will do the work of data entry and data maintenance? How will confidential student records be secured? Where will the data be kept—in what computers, in what database? Who will export data from the district and import it into the appropriate software for analysis? These questions (and many more) need to be addressed initially, and continuously, if the school is to incorporate data seamlessly into its decision-making operations. There is a big gap between data collection and data application. In between, data must be cleaned, secured, updated, imported into analytical software, analyzed, and formatted for reporting. To prevent any interruption in this flow of data, the processes must be well defined and organized. Getting organized to better manage, maintain, and apply data, one principal commented, pays off in the end.

Developing analytical capacity. At the start of our study, each of the six school QSP teams told us that they desperately needed to learn more about how to approach and analyze their data. In response, we developed an analytical process model designed to connect to each school's individual planning and decision-making processes and style. The model was based on continuous improvement cycles through which data analysis was applied to problems and goals. Next, we provided a short course in research and analysis skills, in which we helped the teams learn how to frame questions, select appropriate data, and create focused inquiries.

Despite extensive training and assistance, all six QSP teams continued to struggle with their analysis of data and related to us that this aspect of using data remained the most challenging for them. Team members required additional training on how to ask better questions; how to select the appropriate indicators to identify strengths and weaknesses; and how to report, interpret, and use the results. Schools acknowledged that the learning curve was steep and might prevent more than a few people at each school from developing the essential analytical skills and ability. One school decided to concentrate its analytical tasks by training one key expert to do the work. Another school, after losing the one person it had relied upon to do the analytical work, recognized the need to train a small "technical and analytically savvy" team to carry out the analysis and reporting. Both of these schools stressed the importance of continuing to develop their analytical capacity and the need to keep the analytical process connected from start to finish with school-level planning and decision-making processes.

Strategically applying information and results. The final challenge for schools is to learn how to appropriately apply data results and make purposeful and ethical use of information for improving teaching and learning.

To say that a school makes appropriate and ethical use of data implies that the school has taken the necessary precautions to ensure that data are accurate, valid, and reliable and that the analytical process is complete, equitable, and fair. Inferences and conclusions reached through data analysis should be based on multiple sources and measures and reviewed by school staff for "face validity"—i.e., do the data results fit their own observations? Schools need to become

aware of these standards for appropriate and ethical use of data so that data are not applied in threatening or punitive ways.

If schools have followed a continuous improvement process for planning and decision making, the results will be easily linked back to specific questions, goals, and problems. By focusing the data analysis to target specific issues, schools will be poised at the end of the analytical process to make sense of and draw meaning from their results. The final step is to share the new information and results with staff members to inform school planning and decision making. The results can be used in a variety of ways—to identify progress, explore problems, and target strategies for change, to mention a few. In this manner, schools will have successfully transformed data into information and applied that information to create useful knowledge for improving the school.

Conclusion

During the course of the study, we learned that using data to support inquiry and inform the instructional mission of schools requires coordinated changes in school processes, data collection, data management, the use of analytical tools, and the analytical capacity of school personnel. These changes present challenges to schools interested in using data effectively. The school teams in our study found that the challenges they faced were difficult but not insurmountable. With hard work, each school made progress toward meeting many of these challenges and, in the process, learned a great deal about how to use data for decision making.

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