

WORKING P A P E R

Data Driven Decisionmaking in Southwestern Pennsylvania School Districts

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Preface

In Spring 2004, the RAND Corporation initiated a study of data-driven decisionmaking in Southwestern Pennsylvania school districts. The purpose of the study was to examine the preparedness of school districts in the region for the data challenges associated with improving school performance to meet state and federal standards. The study examined the stages of progress that districts go through in developing capabilities for data-driven decisionmaking, assessed where regional districts currently stand, and identified next steps toward more fully developing data-driven decisionmaking capabilities.

This report, the final product of this study, should be of interest to education policymakers at the state, regional, and school district levels; organizations and funding agencies that support school districts' data capabilities; and researchers studying school districts' data driven practices. It presents a review of relevant literature; findings from interviews of state and regional representatives with key knowledge of, or responsibility over, data-driven decisionmaking matters in education; case studies of six regional school districts and one independent charter school; and a survey of 26 regional superintendents. The report concludes with recommended actions for various stakeholders to help advance the implementation of data-driven decisionmaking in Southwestern Pennsylvania.

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Summary

This report describes the capacity of school districts in Southwestern Pennsylvania (SWPA) to use data and analysis to inform instructional, policy, and evaluation decisions in support of improving student achievement. Specifically, it examines current practices of a sample of school districts in SWPA with respect to the following three research questions.

1. How do school staff members use data to make classroom- and school-level decisions about improving instruction to reflect diagnosed student needs?
2. How do district staff members use data to evaluate the effectiveness of schools, teachers, and programs?
3. How do district staff members use data to create reports for external stakeholders, including the state and federal government and the local public?

For each of these facets of data-driven decisionmaking (DDDM), the report also investigates factors that help or hinder the use of data. These include the human capital, technology, and other resources that are available for DDDM; the roles of education support organizations such as the regional agencies in Pennsylvania known as Intermediate Units (IUs); and state policies that shape the needs and demands for DDDM and influence what data are available and when the data become available.

Finally, informed by the findings regarding existing capacity, needed supports, and obstacles, the report recommends actions that schools, districts, and other stakeholders can take to improve DDDM in SWPA.

This study began in Spring 2004 after the Heinz Endowments and the Grable Foundation approached RAND Education, offering to sponsor an investigation of these DDDM topics in their region of focus, Southwestern Pennsylvania. The foundations indicated they are interested in helping to support the development of DDDM capacity in SWPA, and requested this study to provide strategic guidance to funding agencies and other stakeholders on the most productive uses of support resources.

Data collection and methods

The study employed a qualitative case study approach, sampling six school districts and one independent charter school in Southwestern Pennsylvania that represent a wide range in terms of capacity for using data to inform decisionmaking, and that vary according to other demographic factors. Within districts, the study sampled schools to target for site visits. In each district, researchers interviewed the district superintendent and district office staff members with responsibility for data and technology issues; and at each school, the researchers interviewed the principal and approximately three teachers representing a mix of grade levels and, especially in the case of high schools, a mix of subject areas taught. District staff and principal interviews were approximately 30 minutes in length, and teacher interviews ranged from 20 to 30 minutes in length.

In addition, to gather information on the policy context and important state and regional issues impacting DDDM in Pennsylvania districts and schools, the research team conducted telephone interviews with officials at the Pennsylvania Department of Education (PDE) and local IUs with special knowledge of, or responsibility over, matters pertaining to DDDM. In addition, the study team interviewed a DDDM consultant to several schools and districts in the region. Finally, RAND administered a written survey for district superintendents in Southwestern Pennsylvania, designed to collect much the same information gathered during the interviews with superintendents, but intended for a larger number of superintendents whose districts were not included in the case study sample.

In sum, the research team interviewed more than 100 individuals, including teachers, principals, superintendents and other district office staff, IU representatives, state officials, and consultants; and surveyed 26 superintendents.

Limitations of the study

The study presents a snapshot of the status of DDDM in a sample of SWPA school districts during the 2004-05 school year. DDDM is a rapidly evolving field, and the snapshot will become less accurate over time. Further, conclusive statements about all districts in Southwestern Pennsylvania cannot be made on the basis of the small number of districts visited (6) or surveyed (26). These 32 districts comprise about 30 percent of the 108 school districts in the SWPA region.

For the case studies, a group of districts was selected that varies in terms of locale, enrollment, racial composition, socioeconomic status of the student population, and capacity for DDDM. However, districts that have placed a relatively high priority on pursuing DDDM were deliberately chosen. Thus, conclusions from this study may not apply to districts with relatively little interest in DDDM. It is worth noting, however, that based on interviews with state and local education officials and consultants, virtually all districts in Pennsylvania are becoming increasingly interested in DDDM, largely because of the accountability requirements of the federal No Child Left Behind Act.

Superintendents who responded to the survey were attendees at a semi-annual two-day professional development program. Attendance at such an intensive program may indicate a strong commitment to improvement, and may be correlated with strong interest in DDDM. If so, the respondents may represent districts that are at a relatively advanced stage of DDDM compared to other districts in SWPA. Caution is warranted in generalizing the responses from this sample of districts.

Conclusions

Given the study's limitations, several broad conclusions can be drawn. First, the case study districts have a strong interest in DDDM, and district leadership has made DDDM a high priority. Nevertheless, the schools and districts in the study are generally in the early stages of systematically using data to drive decisionmaking.

Second, most teachers and principals also value data and are actively seeking ways to use data to improve instruction. However, many of them lack sufficient data analysis skills and a process for systematically using data. In addition, because most of these districts do not have comprehensive, integrated data systems, teachers and principals lack easy access to all of the existing data.

Third, schools and districts are using data to evaluate and adjust curriculum and programs, but generally not for evaluating teachers. They are taking significant steps to align their curricula and instruction with the state standards and improve their performance on Pennsylvania's standardized achievement test, the Pennsylvania System of School Assessment (PSSA). DDDM plays a large role in these activities. Districts have made less progress in offering a sufficient amount of professional development or training in DDDM, such as how to interpret data and use it for instructional planning or how to use the available data systems effectively.

Fourth, the case study districts recognize the limitations of annual assessments and are making greater use of more frequent, interim and formative assessments to inform instructional decisions. Nevertheless, the case study districts are still finding their way in determining the best strategies for regularly administering these assessments and using the results.

Finally, lack of time presents perhaps the biggest challenge to schools and districts in Southwestern Pennsylvania as they pursue DDDM. Teachers and principals struggle to find the time to study and think about the data that are available to them. They lack adequate time to collaborate in analyzing and interpreting data, and to develop interventions to address students' learning needs.

Based on a review of the literature and the findings of this study, several recommendations can be made for actions that schools, districts, and other stakeholders can take to help advance the implementation of DDDM in SWPA.

Recommendations regarding state and district policy

- The state, possibly with the help of external funding agencies, should expand its efforts to build the capacity of the intermediate units to assist districts with DDDM.
- The state should create a statewide student achievement data system, with longitudinal student-level data.
- School and district office staff should send clear and consistent signals to teachers concerning expectations for DDDM.
- Schools and districts in the early stages of DDDM should focus first on setting goals and objectives for using data and on taking an inventory of data they already have.
- District curriculum planners must ensure that instruction, the curriculum, assessments, and the state standards and assessment anchors are well aligned.
- Districts should ensure that schools have the tools they need for effective DDDM.

Recommendations regarding data sources

- Schools, districts, and the state should make better use of the Pennsylvania Value-Added Assessment System.
- Schools and districts should combine assessment data with demographic information and data on student behavior and school processes.
- District staff should focus more on the quality of the data than on the quantity.
- In adopting interim assessments, schools and districts should recognize that they are designed to be used for diagnostic purposes, not high-stakes purposes.

Recommendations regarding technology resources

- Districts should adopt integrated student-level electronic data systems.
- Districts should invest in technology that allows teachers to give more frequent, formative assessments.

Recommendations regarding development of a data-driven decisionmaking culture

- Schools and districts should either develop or adopt a process for DDDM.
- School leaders or data teams should identify a specific list of questions they want to answer with data.
- Schools and districts should ensure that teachers receive useful feedback reports on interim and other assessment data they provide to the data system.
- Districts should invest heavily in professional development in DDDM for teachers and principals.
- Districts should make greater use of curriculum specialists such as math and reading coaches to instruct teachers on how to use student achievement data to guide instruction.
- Schools and districts should seek creative ways to give teachers time to examine data and collaborate.
- District and school leaders should consider teachers' input in the selection of assessments, technology, models of continuous quality improvement or other processes for routinely analyzing data, and other key decisions related to DDDM.
- School and district staff should encourage teachers and parents to use the web-based and paper resources provided by the Grow Network.
- Schools and districts should investigate ways to share more data with parents.

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Many individuals contributed to this report. The research team is grateful to the leaders of the school districts and charter school who allowed RAND to conduct this research in their schools. The researchers are deeply grateful to the more than 100 individuals who participated in interviews, including teachers, principals, superintendents and other district office staff, guidance counselors, IU representatives, state officials, and consultants. The team is grateful to all of the superintendents who completed the survey, superintendents outside the region who pilot-tested the instrument, and the Western Pennsylvania Superintendent's Forum for providing the research team with access to a large gathering of regional superintendents. The project could not have been completed without significant support from RAND colleagues, especially Brian Gill and Cathy Stasz, who provided valuable input at various stages of the study. Finally, the research team thanks the Heinz Endowments and the Grable Foundation for their generous support of this research.

Abbreviations

AIU	Allegheny Intermediate Unit
CDA	Comprehensive Data Analysis
CDDRE	Center for Data-Driven Reform in Education
DDDM	Data-driven Decisionmaking
DIBELS	Dynamic Indicators of Basic Early Literacy Skills
FAIS	Fast Access Information System
IEP	Individualized Education Plan
ITBS	Iowa Test of Basic Skills
IU	Intermediate Units
NCLB	No Child Left Behind
PaTTAN	Pennsylvania Training and Technical Assistance Network
PDE	Pennsylvania State Department of Education
PSSA	Pennsylvania System of School Assessment
PTC	Pittsburgh Technology Council
PVAAS	Pennsylvania Value-Added Assessment System
SWPA	Southwestern Pennsylvania

1. Introduction

National and statewide implementation of high-stakes, performance-based accountability systems have increased the necessity for schools to develop effective, integrated methods for using student achievement data to guide administrative and educational decisions. The federal No Child Left Behind (NCLB) Act ultimately requires school districts to bring all of their students to proficiency in reading, math, and science. Meeting state standards as they are ratcheted upward over the next decade to comply with NCLB places greater demands on schools than they have ever seen in the past. To be successful in bringing all students to proficiency, districts will need data and assessment systems that provide timely diagnostic information to teachers, principals, superintendents, and school boards.

The purpose of this report is to describe the preparedness of school districts in Southwestern Pennsylvania (SWPA) ¹ for the data challenges associated with improving school performance to meet state and federal standards. Specifically, it examines current practices of a sample of school districts in SWPA with respect to the following three research questions.

1. How do school staff members use data to make classroom- and school-level decisions about improving instruction to reflect diagnosed student needs?
2. How do district staff members use data to evaluate the effectiveness of schools, teachers, and programs?
3. How do district staff members use data to create reports for external stakeholders, including the state and federal government and the local public?

For each of these facets of data-driven decisionmaking (DDDM), the report also investigates factors that help or hinder the use of data. These include the human capital, technology, and other resources that are available for DDDM; the roles of education support organizations such as Pennsylvania's Intermediate Units (IUs)²; and state policies that shape the needs and demands for DDDM and influence what data are available and when the data become available. The report examines the stages of progress that districts go through in developing DDDM capabilities, assesses where SWPA districts currently stand, and recommends actions that schools, districts, and other stakeholders can take to help advance the implementation of DDDM in SWPA.

This study began in Spring 2004 after the Heinz Endowments and the Grable Foundation approached RAND Education, offering to sponsor an investigation of these DDDM topics in their region of focus, Southwestern Pennsylvania. The foundations indicated they are interested in helping to support the development of DDDM capacity in SWPA, and requested this study to provide strategic guidance to funding agencies and other stakeholders on the most productive uses of support resources. Over the following 20 months, RAND employed several qualitative research methods to address these

¹ This study defines Southwestern Pennsylvania as following counties: Allegheny (including the city of Pittsburgh), Beaver, Butler, Fayette, Greene, Washington, and Westmoreland.

² Intermediate Units are publicly funded educational service agencies that act as regional intermediaries between local school districts and the Pennsylvania Department of Education.

questions, including case studies of six SWPA school districts and one charter school, where 101 individuals were interviewed by telephone or in person³; a survey of 26 superintendents in SWPA school districts; and telephone interviews with five state and IU personnel. The bulk of this data collection took place during the 2004-05 academic year.

In order to answer the three main research questions, the study gathered data on a number of related topics, including:

- What does the existing research literature say about DDDM? What is known about the factors that facilitate or impede DDDM?
- What is the current policy context of DDDM at the state and national levels? What support, guidance, and incentives do state policymakers provide to assist districts in implementing DDDM? How might state policy be shaped to more effectively promote DDDM?
- What are the attitudes of district administrators, principals, and teachers toward adopting DDDM? Are they embracing DDDM as an important and long-term strategy for improving their schools? What district-level policies have been implemented regarding DDDM? What kinds of investments have been made in technology and personnel?
- What technologies are districts currently utilizing to support DDDM? How were they selected? How well are they working?
- What key challenges and barriers are districts encountering in their attempts to implement DDDM?
- What people within districts are using the district's DDDM resources for analysis and planning? How are these resources accessed? What kinds of analyses are being performed? What kinds of decisions are being driven by these analyses?
- What professional development is available to teachers and other district staff to learn about data analysis, interpretation, and use?
- To what extent are districts relying on external organizations, such as intermediate units, for support and training in implementing DDDM?
- What roles can intermediate units play in providing DDDM expertise, technological resources, and professional development opportunities to districts?
- What can funding agencies do to assist districts or intermediate units in providing these resources or otherwise supporting DDDM?

Limitations of this study

The study presents a snapshot of the status of DDDM in a sample of SWPA school districts during the 2004-05 school year. DDDM is a rapidly evolving field, and the snapshot will become less accurate over time. Further, conclusive statements about all districts in Southwestern Pennsylvania cannot be made on the basis of the small number of districts visited (6) or surveyed (26). These 32 districts comprise about 30 percent of the 108 school districts in the SWPA region.

³ Eleven of these interviews were by telephone and 90 were in-person.

For the case studies, a group of districts was selected that varies in terms of locale, enrollment, racial composition, socioeconomic status of the student population, and capacity for DDDM. However, districts that have placed a relatively high priority on pursuing DDDM were deliberately chosen. Thus, conclusions from this study may not apply to districts with relatively little interest in DDDM. It is worth noting, however, that based on interviews with state and local education officials and consultants, virtually all districts in Pennsylvania are becoming increasingly interested in DDDM, largely because of the accountability requirements of the NCLB Act.

Superintendents who responded to the survey were attendees at a semi-annual two-day professional development program. Attendance at such an intensive program may indicate a strong commitment to improvement, and may be correlated with strong interest in DDDM. If so, the respondents may represent districts that are at a relatively advanced stage of DDDM compared to other districts in SWPA. Caution is warranted in generalizing the responses from this sample of districts.

Organization of this report

The remainder of this report is organized as follows. The next chapter provides a review of the literature on data-driven decisionmaking in education. Chapter 3 details the data collection and methods used in the study. Then the next two chapters summarize the findings of the study: Chapter 4 presents an overview of districts' current DDDM practices related to the three research questions listed above, and Chapter 5 explores in detail the various factors that help to enable DDDM. Chapter 6 concludes the report with a set of recommendations for various stakeholders interested in helping to advance the implementation of DDDM in Southwestern Pennsylvania.

2. Literature Review

This chapter reviews the major themes and lessons that have emerged from the existing research literature on data-driven decisionmaking (DDDM) in schools and districts. It discusses the types of data that schools and districts are using, the ways in which they are using data, factors that facilitate DDDM, and barriers to DDDM. This literature review was conducted to help frame RAND's data collection instruments and analyses, and is presented here to provide the reader with a context in which to interpret the findings of the current study.

Notions of DDDM in education are modeled on successful practices from industry and manufacturing, such as Total Quality Management, Organizational Learning, and Continuous Improvement, which emphasize that organizational improvement is enhanced by responsiveness to performance data (e.g., Deming, 1986; Juran, 1988; Senge, 1990). Schmoker (1996) applies these theories to the education context, arguing that attention to short-term, measurable results will lead to long-term school improvement. The broad implementation of standards-based accountability under NCLB has presented new opportunities and incentives for data use by providing schools and districts with new sources of data for analysis, as well as increasing the pressure on them to improve student test scores (Massell, 2001).

Despite the increased interest in DDDM, there has been little research on the precise effects of using DDDM on student achievement and other important educational outcomes. There is some limited evidence that DDDM can have a positive impact on student achievement and on other aspects of schooling. For example, although they do not systematically track outcomes, a few case studies offer anecdotal evidence of increased test scores and improved student learning as a result of increased data use (Feldman & Tung, 2001; Schmoker & Wilson, 1995). In addition, the effective schools literature includes several studies that identify planned and extensive use of data as a common characteristic among schools and districts that are high performing or successfully closing racial achievement gaps (e.g., Council of Great City Schools, 2002; Snipes, Doolittle & Herlihy, 2002; Viadero, 2004). Nonetheless, use of data for decisionmaking in education is ubiquitous, and the continued study of DDDM will likely improve those uses.

Types of data used by schools and districts

Bernhardt (1999) defines four categories of data that districts and schools may collect and analyze and argues that the most powerful data analyses arise from merging and intersecting data across these categories:

- *Demographic data* that has been successfully used by schools and districts include not only standard categorizations such as gender, socioeconomic status, and ethnicity, but also information on students' prior schooling, participation in special programs such as gifted and talented education or Title I, language proficiency, attendance and tardiness, and discipline records (Herman & Gribbons, 2001).

- *Data on instructional processes* encompass aspects such as course-taking patterns, the quality of the curriculum, the quality of professional development, teachers' use of time, and parent involvement (Herman & Gribbons, 2001; Thorn, 2001).
- *Perceptions data* provide insight into the views, values, and beliefs of individuals regarding their own practice and their school environments, and may be collected through questionnaires, interviews, and observations.
- *Student achievement data* are most commonly thought of as test results from state-developed standardized assessments, especially in the current era of standards-based accountability. However, schools and districts also frequently use other sources of achievement data such as classroom assessments or non-test data such as portfolios, writing journals, running records, or conference logs (Supovitz & Klein, 2003; Thorn, 2001; Young, 2005).

Another potentially useful category of data that falls outside of Bernhardt's model is post-school data, such as type of postsecondary education institution attended or type of employment obtained (Mooney and Phelps et al., 2002). These data can inform decisions concerning curriculum and related matters.

Ways in which schools and districts are using data

Individual teachers often use various combinations of these data sources to track their students' progress and alter instruction in attempts to improve student learning. Much of the literature on DDDM focuses on the growing importance and use of formative assessments that provide teachers with frequent, ongoing information on how well students are mastering certain content areas. These typically low-stakes assessments may be developed by the individual teacher, at the school or district level, or may be curriculum-based (Black and Wiliam, 1998; Supovitz and Klein, 2003; Thorn, 2001; Young, 2005). Increasingly, this approach involves the use of computer-based software programs—sometimes referred to as rapid online assessment tools or decision-support tools—that use item banks to quickly create and score assessments or quizzes. Although these tools are most efficient when students have access to desktop or hand-held computers, they typically offer an integrated paper-based option if the technology is unavailable. The systems print paper answer sheets for students to complete, which are automatically scanned, and then scored and analyzed online. By facilitating closer tracking of students' progress, such technologies can also help teachers more quickly identify students with special needs (Chen and Heritage et al., 2005).

Recent studies have focused on how data is used by an entire school community to guide decisions at the school level (Feldman & Tung, 2001). Indeed, group-based inquiry around data seems to be especially effective. Mason (2002), for example, found that schools that are most successful in implementing DDDM have broad participation in the inquiry process from teachers, administrators, and other staff. There is some research that suggests that the establishment of “collaborative data teams” within schools to analyze data and develop improvement plans can be an effective means of practicing DDDM (Wayman, Midgley, and Stringfield, 2005).

There has also been an increased interest in value-added assessment models, which take advantage of the growing availability of longitudinal student achievement data. These models estimate the contributions of school and classroom environments, or individual teachers, to growth in student achievement, distinguishing these educational contributions from non-educational factors such as family background, and controlling for students' prior levels of achievement (McCaffrey et al., 2003). The most prominent example of value-added assessment is the Tennessee Value Added Assessment System (Sanders and Horn, 1998). More recently, several additional states including Pennsylvania have implemented value-added systems.

Herman and Gribbons (2001) offer three basic kinds of questions that schools can answer with data: How are we doing? Are we well serving all students? What are our strengths and weaknesses? Schools may assess how they are doing in reference to goals or standards, to past performance, or to other schools. Once these questions have been answered, schools can turn to considering why things are as they are, how to make them better, and the implications for teaching and learning. Studies of schools that have successfully implemented DDDM emphasize that most of these questions can be answered by simple descriptive statistics, and that sophisticated statistical analyses are generally unnecessary (Choppin, 2002; Herman & Gribbons, 2001; Schmoker, 2003).

Studies have documented numerous purposes towards which schools have successfully applied DDDM (Bernhardt, 2003; Choppin, 2002; Feldman & Tung, 2001; Mason, 2002; Supovitz & Klein, 2003). Most commonly, data are used for tasks such as setting annual and intermediate goals as part of the improvement process. Data may also be used to visually depict goals and visions, motivate students and staff, and celebrate achievement and improvement when it does occur. Schools use data for instructional decisions such as identifying objectives, grouping and individualizing instruction, aligning instruction with standards, refining course offerings, identifying low-performing students, and monitoring student progress. School structure, policy, and resource allocation may be informed by data. Schools have also used data for decisions related to personnel, such as evaluating team performance and determining and refining topics for professional development.

Factors that facilitate DDDM

Case studies of schools attempting to enact DDDM reveal that implementation of data-driven inquiry is not always successful, and may depend on several enabling factors, including strong leadership, adequate resources, and upfront planning for data collection and use.

Nearly every empirical study of DDDM has found that strong school leadership is a necessary factor for successful implementation. As Supovitz & Klein (2003) note, "Virtually every example of innovative data use in this study came from the initiative and enterprise of an individual who had the vision and persistence to turn a powerful idea into action" (p. 36). These individuals are usually principals (indeed, most studies find principal support for a DDDM initiative to be a necessary condition for its success), but can also include assistant principals, department chairs, or other teacher leaders. Leaders in schools that were able to effectively use data for inquiry and decisionmaking were

knowledgeable about and committed to data use and built a strong vision for data use in their schools (Choppin, 2002; Detert and Kopel et al., 2000; Feldman & Tung, 2001; Lachat and Smith, 2005; Mason, 2002; Herman & Gribbons, 2001).

Successfully incorporating data into school decisionmaking also requires resources, including time and technology. Teachers in several studies complained that they were challenged by a lack of time for data analysis, and in some cases felt that they faced a trade-off between data-driven inquiry work and their teaching (Feldman & Tung, 2001; Ingram, Louis & Schroeder, 2004). However, a study of schools implementing the Breaking Ranks comprehensive school reform model found that when schools were able to provide adequate time for collaborative decisionmaking, the result was better instructional and curricular decisions. Adequate technology to support data collection and aggregation is also a prerequisite to effective data use in most schools and districts.

Finally, upfront planning for DDDM has helped make data collection and use more efficient by clarifying what data were needed, aiding with integration of multiple data sources, increasing buy-in, and ensuring that data collection processes are on track (Keeney, 1998; Lachat, 2001). Milwaukee schools that were able to successfully implement DDDM used upfront planning to address data management, storage, and confidentiality issues, and to ensure that processes for data use would be equitable and fair (Mason, 2002).

Barriers to DDDM

Case study research on DDDM has identified several barriers that schools and districts must overcome in order to successfully incorporate data use into the school decision making process, including a lack of quality data, a lack of human capacity for analysis and inquiry, cultural barriers that may limit the degree of teacher buy-in, and conflicting mandates.

Schools clearly need accurate, timely, and relevant data in order to successfully implement data-driven inquiry. Yet the quality of the data that schools are able to collect or obtain is often low. In Milwaukee, for example, schools relied on data collected for district purposes, but found that technical incompatibilities limited their access to the district systems and that the timeliness and level of aggregation of the data did not suit their needs (Choppin, 2002; Mason, 2002). As a result, schools were forced to expend time and effort creating new datasets or altering old ones. Herman & Gribbons (2001) found that data analysis was often hampered by inconsistent or problematic indicator definitions such as course names that varied across schools and did not indicate rigor, or attendance rate data that failed to account for differences in the length of the school year across schools or across years. In their case study of three urban districts, Kerr and Marsh et al. (2005) discovered that a lack of easy access to achievement data, the perception that data were not timely enough, and teachers' doubts about the validity of the data limited its use in instructional planning and other decisions.

Lack of human capacity to support data-driven inquiry has frequently been noted as a barrier to effective data use in schools. Supovitz & Klein (2003) were "shocked" by the

limited technical capacity of faculty even in schools that had been identified as innovative data users; just 19 percent of teachers and administrators in the study's schools felt that they had the skills to manipulate data to answer the questions of interest to them. Similarly, school faculty in six Milwaukee schools implementing the Quality School Portfolio consistently acknowledged their own lack of skills and capacity, and still felt that they lacked capacity after a year of training (Mason, 2002). Capacity issues relate not only to the technological capacity of staff and their ability to use computer software to complete analyses, but also to their skills in inquiry, such as formulating research questions and interpreting results, and their ability to effectively develop and use classroom assessments (Herman & Gribbons, 2001; Kerr and Marsh et al, 2005; Mason, 2002).

Insufficient buy-in from teaching staff and cultural barriers have been identified as significant challenges to DDDM in several studies (Feldman & Tung, 2001; Herman & Gribbons, 2001; Ingram, Louis & Schroeder, 2004; Kerr and Marsh et al., 2005). Ingram, Louis & Schroeder (2004) interviewed teachers in nine schools that were implementing Continuous Improvement models of data use, and identified a number of widely held attitudes and beliefs that were incompatible with data-driven inquiry. For example, teachers often discounted assessment data because they had developed their own personal metrics for determining their success that had little to do with their students' test scores. They frequently articulated goals for student learning that incorporated numerous unmeasured outcomes such as moral development, career success, and life satisfaction. Teachers who had a weak sense of efficacy and did not believe that they had an influence over their students' achievement data were also unlikely to support DDDM.

The political context of data use can make a difference as well. Herman & Gribbons (2001) found that teachers in a high-performing school found data use empowering, while teachers in a more diverse and poverty-ridden, low-performing school felt devalued and disenfranchised by data use.

Finally, another potential barrier to DDDM is competing or conflicting school or district mandates. In their case studies of three urban districts pursuing DDDM initiatives, Kerr and Marsh et al. (2005) found that teachers in two of the districts felt that they were receiving conflicting messages from the district office. On the one hand, they were told to revise their teaching based on assessments of student achievement results. But on the other hand, they were instructed to strictly follow the district-mandated curriculum. Teachers believed that they had little flexibility to alter the sequence or pace of the curriculum, actions that might be called for by an analysis of student achievement data. However, the extent to which this is a problem in other districts implementing DDDM is unknown.

In summary, although DDDM practices have been applied and studied in an education context for more than a decade, best practices are still being defined and the causal effects of DDDM practices on educational outcomes are still to be determined.

3. Data Collection and Methods

This chapter of the report details the methods that were used to select school districts to participate in the study, and describes the data collection instruments and activities that were employed.

Case study sample selection

The research team set out to define a sample of school districts in Southwestern Pennsylvania in which to conduct site visits to learn about plans and activities regarding DDDM. The team sought to represent the variation in SWPA along several dimensions:

- *Locale.* SWPA districts serve urban, suburban, and rural communities.
- *Enrollment.* The median enrollment in SWPA districts is approximately 2,300 students. One moderately large district has an enrollment of about 35,100 students; excluding this district, the range of enrollment is from approximately 350 to 8,400.
- *Race/ethnicity.* Minority enrollment in SWPA districts ranges from 1% to 98%, with a median of 5%.
- *Socioeconomic status.* The percentage of students who are economically disadvantaged, as measured by eligibility for free or reduced-price lunch, ranges from 0% to 97%, with a median of 25%.

In addition, the research team sought to identify districts that vary in their capacity for using data to inform decisionmaking, seeking to include districts that appear to have relatively high interest and capacity to implement DDDM, as evidenced by the availability of resources to adopt new technologies and processes and the existence of initiatives to make DDDM a priority; as well as districts that appear to have less internal capacity to pursue DDDM (e.g., fewer resources) but have nonetheless placed a high priority on making broader use of DDDM. Finally, at the request of the study's sponsors, the research team made a special effort to include at least one district in the Monongahela River Valley, an economically depressed area south and east of Pittsburgh.

To identify potential districts, the research team sought recommendations from several state and local education officials and consultants with special knowledge of districts' efforts to implement DDDM. These officials and consultants helped the team identify districts with "high", "medium", and "low" capacity for implementing DDDM, based on their assessments of the resources available to districts and knowledge of district initiatives that involve DDDM. The team also used information on districts' involvement in the Math-Science Partnership of Southwest Pennsylvania to help assess capacity.⁴

Fifteen candidate school districts in SWPA were identified, with the goal of narrowing this list to six districts. The research team called superintendents at all fifteen districts to

⁴ The Math-Science Partnership of Southwest Pennsylvania is a regional initiative to train math and science teachers in new instructional practices. Many districts in Southwestern Pennsylvania are involved in the project, and they have made varying progress in implementation. RAND is evaluating the project, and provided data on districts' varying levels of implementation as an indicator of capacity to implement a resource-intensive program.

inquire about their interest in participating in the study. Some districts declined to participate, while others did not respond to the telephone calls. Nevertheless, the goal to secure the participation of six school districts was met.

In addition, a representative of an elementary public charter school approached RAND and expressed an interest to participate in the study. The research team agreed to include the charter school in the study, even though the school is independent of any school district and none of the other schools in the sample are charter schools. The team believed that inclusion of the school might provide some interesting comparative data. For example, in contrast to school districts in SWPA, charter schools may have independence from local politics, are more likely to have a non-unionized workforce, and are often operated like businesses. Factors such as these might facilitate or hinder the adoption of data driven decisionmaking practices.

Table 1 summarizes the sample characteristics. In this report, school districts and the charter school are assigned fictional names to protect their identities. The research team was satisfied that this sample represents the spectrum of SWPA districts on the characteristics listed above.

Within districts, the research team sampled schools to target for site visits. The objective was to visit at least one elementary, one middle school, and one high school in each district. Due to the large size of Wilson School District, the sample included more schools and was weighted to reflect the proportions of schools in the district at each level (53 elementary, 17 middle, and 10 high schools). Ultimately, the sample from Wilson included three elementary schools, two middle schools, and one high school. In two of the sample districts, Madison and Adams, the research team visited all schools because the districts have only one school at each level.

Table 1. Sample Characteristics

School District	Total Enrollment	% Minority	% Low Income	Capacity for DDDM*
Buchanan	2,000	11	13	High
Lincoln	4,600	6	10	High
Madison	1,800	7	10	Medium
Wilson	35,100	60	60	Medium
Adams	1,500	17	50	Low
Eisenhower	2,000	16	35	Low
Kennedy [^]	300	80	78	Medium

*State and local education officials provided this assessment of DDDM capacity to the research team for use in the case study selection process.

[^]Kennedy is not a school district; it is a charter school serving grades K-4.

Note: Fictional names are used, and total enrollment has been rounded to the nearest 100, to help protect the identities of these districts.

Sources: National Center for Education Statistics, www.nces.ed.gov/ccd; greatschools.net; Pennsylvania Department of Education, www.pde.state.pa.us

Case study interviews

During the spring of 2004, the research team drafted separate interview protocols for teachers, principals, and district office staff. The interview questions asked respondents what data systems they use; how frequently and in what ways they use data; and what kinds of data on student performance or other student characteristics they have access to. Teachers were asked whether they use data systematically on a schoolwide basis; whether data are used to evaluate their performance; and to describe professional development they have received on DDDM, the support from principals and others in using DDDM, and what they need to make better use of data. Principals were asked about the kinds of data on teachers they have access to; the kinds of support they and other staff provide to teachers on DDDM; the receptivity of teachers in their school towards DDDM; the kinds of reports on student achievement and instructional performance that are generated for teachers, district office staff, board members, and others; and what they need to make better use of data. Superintendents and district office staff were asked about the kinds of data on the performance of school and programs they have access to; the kinds of support they provide to schools on DDDM; the kinds of support they receive from the state or from the Intermediate Units; the receptivity of principals and teachers towards DDDM; the kinds of feedback or reports schools receive from the district office; the kinds of reports on student achievement and instructional performance that are generated for the public, the state Department of Education, or otherwise to comply with state and federal mandates; and their future plans with regard to DDDM.

At five of the districts in the sample (all but Wilson), the research team conducted one-day visits, during which two members of the team visited one elementary school, one middle school, and one high school in the district. In Wilson, the site visits with each school lasted approximately two hours. At the charter school, the team conducted a half-day site visit.

At each school, a RAND researcher contacted the principal by telephone to arrange the site visit. In addition to requesting the principal's participation in an interview, the researcher asked the principal to select three teachers for interviews, representing a mix of grade levels and, especially in the case of high schools, a mix of subject areas taught. In some cases RAND was only able to interview two teachers, while in other cases interviews with a fourth teacher were obtained. Most teachers interviewed were regular classroom teachers; in some cases, specialists such as special education teachers or mathematics and reading coaches were interviewed. (Coaches are typically district office staff with specialized knowledge of the district's math or reading curriculum who visit schools periodically to model lessons and otherwise assist teachers with the curriculum.) At the charter school RAND interviewed the chief academic officer (akin to the superintendent), the principal, a principal's intern (akin to an assistant principal), and two teachers.

In addition, usually before the site visit, the research team conducted telephone interviews with the district superintendent. In five districts, the team also conducted interviews with another district office staff person with a special responsibility for data and technology issues. This person was usually the chief technology officer or someone

with a similar job title, but in some cases the person with this responsibility was an assistant superintendent or federal programs coordinator. In one district, the team interviewed only the superintendent because the district office staff is very small, and no one other than the superintendent has responsibility over data and technology issues. In one district a union leader was also interviewed because after a number of site visits it became apparent that getting the union’s perspective on DDDM would be useful.

District staff and principal interviews were approximately 30 minutes in length, and teacher interviews ranged from 20 to 30 minutes in length. During the interviews, one member of the research team conducted the interview, while the other took notes using a laptop computer. Within 24 hours of conducting each interview, the note taker reviewed, consolidated, and otherwise “cleaned” the notes. Electronic files containing the interview notes were shared with all members of the research team and were stored on team members’ computers in password-protected directories.

The first district site visit occurred in the spring semester of 2004. During that visit the interview protocols were pilot tested, and some minor adjustments were made for subsequent site visits. Site visits at the five other districts and the charter school took place in the fall semester of 2004.

Table 2 summarizes the case study interviews. In total, across the six districts and one charter school, 101 interviews were obtained. This included:

- *District level.* Six superintendents, one charter school chief academic officer, five district office staff members with responsibility for data and technology issues, one district special education coordinator, and one union leader;
- *Principals.* Nine elementary principals, one elementary charter school principal’s intern, seven middle school principals, and seven high school principals; and
- *Teachers.* Twenty-eight elementary school teachers, 18 middle school teachers, and 17 high school teachers.

Table 2. Case study interviews

		Buchanan	Lincoln	Madison	Wilson	Adams	Eisenhower	Kennedy	Total
District	Superintendent	1	1	1	1	1	1	1*	7
	Other staff	1	1	2	1		2#		7
Principal	Elementary	1	1	1	1	1	3	2^	10
	Middle	1	1	1	1	1	2		7
	High	2	1	1	1	1	1		7
Teacher	Elementary	3	4	4	3	3	9	2	28
	Middle	3	2	3	3	2	5		18
	High	3	4	2	3	2	3		17

* Chief academic officer.

Includes one union leader.

^ Includes one principal’s intern.

Policy context interviews

In addition, to gather information on the policy context and important state and regional issues impacting DDDM in Pennsylvania districts and schools, RAND researchers conducted telephone interviews with officials at the Pennsylvania Department of Education (PDE) and local Intermediate Units. The team interviewed two PDE officials and two representatives of IUs. Each of these individuals has special knowledge of, or responsibility over, matters pertaining to DDDM. In addition, RAND conducted one telephone interview with a DDDM consultant to several schools and districts in the region. These interviews were exploratory in nature and did not follow a protocol; topics discussed varied according to the specialized expertise of the interviewees. For example, PDE interviews focused on state policies and services, while IU interviews focused more on the DDDM-related services provided by IUs. These interviews tended to last approximately one hour.

Survey of superintendents

Finally, RAND administered a survey to district superintendents in Southwestern Pennsylvania. The survey was designed to collect much the same information gathered during the telephone interviews with case study superintendents. The survey was first pilot tested by superintendents in two Pennsylvania districts outside of SWPA that have been aggressively pursuing DDDM. After minor revision, the survey was then administered to a group of superintendents participating in a semi-annual two-day professional development program known as the Forum for Western Pennsylvania School Superintendents. The Forum organizers reserved time on the Fall 2004 agenda for RAND to administer this survey, when a member of the research team briefly described the study and then invited superintendents to participate. Twenty-six superintendents responded. This survey was anonymous; it did not collect the names of the superintendent or the school district. Two superintendents from case study districts opted not to participate in the survey.

Chapters 4 and 5 of this report present the study's findings from the case studies survey of superintendents, as well as insights from the interviews with PDE and IU staff and consultants. Chapter 4 presents an overview of districts' current DDDM practices, and Chapter 5 explores key factors that enable DDDM.

4. Current DDDM Practices in Southwestern Pennsylvania School Districts

This chapter of the report provides an overview of districts' current practices related to the three research questions presented earlier—uses of data for classroom- and school-level instructional decisions, to evaluate the effectiveness of schools, teachers, and programs, and to create reports for external stakeholders.

In response to a survey question asking about the district's current overall status with regard to DDDM, the majority of superintendents (17) described their district's current status with respect to the use of data for decisionmaking as “willing and able to analyze data, but with limited capacity to plan from and utilize it.” Eight respondents described their district's status as “willing to use data, but with limited capacity to analyze it.” Six respondents classified their district's status as “high level of capacity for both analysis and planning/utilization.”⁵

The site visits in six districts generally match these assessments, though it is important to note that most of the case study districts are in the early stages of systematically analyzing student data. The study found that districts are grappling with the problem of how best to analyze student data, while simultaneously trying to figure out how they want to use it for instructional, evaluative or reporting purposes. The process of implementing DDDM for these six districts is an evolving one.

Approaches to analyzing and reporting achievement data

Districts vary in terms of who analyzes and reports data on student achievement. In some districts, data analysis and reporting are done in a centralized fashion, while in others they are done in a more decentralized fashion. In districts that follow a centralized approach, such as Adams and Madison, a key data/technology staff person or an assistant superintendent in the central office conducts or oversees most analysis of assessment results such as PSSA (Pennsylvania System of School Assessment – Pennsylvania's standardized achievement test), other standardized tests, and district-developed assessments. Typically, this person analyzes the data and presents his or her analysis to principals and teachers in each school. This may take the form of a formal, large-group presentation, separate meetings with teachers by grade level or department, or some combination of the two.

Other districts employ a decentralized approach. For example, in Lincoln teams of teachers in each school analyze student performance data, share their results with the other teachers in the school, and prepare reports for district office staff. These teams generally consist of teachers from all grade levels representing a mix of subjects, and

⁵ On this survey item, superintendents were asked to select only one response, however five selected two choices. Three superintendents selected both “willing and able to analyze data, but with limited capacity to plan from and utilize it” and “willing to use data, but with limited capacity to analyze it”; and two of them selected both “willing to use data, but with limited capacity to analyze it” and “high level of capacity for both analysis and planning/utilization”.

usually include the principal, or an assistant principal or guidance counselor. The teams deliver a formal presentation of their results to the rest of the teachers and administrators in the school, often on an annual basis. In some cases, they prepare separate reports for teachers in each grade level. These reports include summaries of PSSA and other standardized test results (e.g., summary tables for reading and math scores by grade level, charts showing trends in scores over time, etc.).

In other districts that follow a decentralized approach, it is more common for principals to take on the tasks of collecting and analyzing data themselves. These principals assess PSSA results and the results of district tests (usually at the classroom or grade level), and share those results with teachers through department meetings, grade level meetings, one-on-one meetings with certain teachers, or large-group formal presentations. The study found that in some districts the extent to which principals or teachers were assuming responsibility for gathering and analyzing data varied from school to school. For example, at Eisenhower, principals at the middle and high schools do most data analysis and share findings with teachers. At the elementary school⁶, however, teams of teachers have taken on these tasks themselves, with the support and encouragement of the principal. The particular culture of each school and the skill sets of teachers and principals seem to account for these differences in approach.

In those districts employing a centralized approach, district office staff would generally like to see more principals and teachers analyzing the data themselves. They see themselves as gradually moving in that direction. They are currently attempting to provide principals and teachers with the training and tools they need to analyze student achievement data. Similarly, in those schools in which principals, assistant principals, or guidance counselors assume responsibility for analyzing data, many indicated that they would prefer to see teachers doing more of this work themselves. In general, administrators are seeking ways to empower and motivate teachers to analyze their students' PSSA scores and other assessment results, rather than continuing to depend on administrators to do this for them. Administrators believe that if teachers become more involved in interpreting and analyzing data, they will be able to make more frequent and effective changes in instruction.

The survey also asked superintendents where they thought the locus of responsibility for data analysis and planning should rest (with district administration, building administration, teachers, or district support staff). Their responses do not permit drawing clear conclusions. Most respondents (16 of 26) strongly agreed that district and building administrators, as well as classroom teachers, should all have responsibility for data analysis and related planning. Moreover, virtually all survey respondents agreed that it is important for teachers and building administrators to be able to access, manipulate, and analyze data for themselves. A large majority also reported that they do not think these tasks take too much time away from instruction or from building management.

⁶ The elementary school in Eisenhower consists of grades 3-6. The district has a separate primary school for grades k-2, which was not visited as part of the case study of this district.

Uses of data for classroom-level and school-level decisions

Teachers reported they use student achievement data to make adjustments to teaching at three levels. At one level, a teacher adjusts instruction for a whole class. Alternatively, the teacher divides the students into small groups, and provides differentiated instruction to each group. The third level is to individualize instruction, differentiating it for each student or for particular students.

Whole class instruction

Many teachers reported they use prior-year results from the state's standardized achievement test, the PSSA, to make changes in teaching practices for their current students. Some of these teachers identify content areas in which the prior year's students performed poorly on the PSSA in order to determine topics on which to spend more class time in the current year.

Teachers also make use of more frequent assessments to identify classroom-wide deficiencies, and adjust instruction accordingly. At Adams, teachers use mid-year results from a district assessment to identify areas where students are deficient, and re-focus the curriculum at the classroom level on those areas during the spring. Teachers and administrators find the mid-year assessment to be more useful than the PSSA because the results are turned around quickly enough to make adjustments with their current classes.

Group instruction

The study found that teachers most commonly use achievement data to differentiate instruction for small groups. This is especially the case at the elementary level, where there has been a strong emphasis in recent years on creating small groups for differentiated instruction. In the case study districts, small group instruction is also becoming more frequent in middle schools; high schools are reportedly the furthest behind on this trend. A few principals and superintendents remarked that the concept of small group instruction is more foreign to high school teachers, who are accustomed to teaching the whole class. Nonetheless, several administrators stated that they foresee differentiated instruction, and the use of student performance data to determine groupings, becoming more common in high schools.

In general, district office staff appear to be driving the emphasis on small-group instruction, and principals are increasingly encouraging teachers to use student performance data to determine groupings. In some cases, teachers group students homogeneously, so that students who are further behind in a particular area can work on one task while more advanced groups perform a different, higher-level task. In other cases, teachers group students heterogeneously, so that higher achieving students can assist lower-achieving ones. The study found that the use of each type of grouping varied widely, even within districts and schools. Teachers often have discretion in determining how to group students, and may simply prefer one form of grouping over the other. In either case, teachers reported that they are increasingly using their assessments of student achievement data (e.g., PSSA results, alternative standardized test results, or data from more frequent assessments) to create these groupings. In addition, these groupings are

typically flexible, in that teachers can move students from one group to another as they master certain skills.

Teachers and principals reported that they are increasingly using the results of district-developed assessments and other assessments to predict how students will perform on the PSSA. Many teachers and principals in Wilson and Adams, for example, believe that their district-made assessments are well aligned with the state standards, and therefore are valid predictors of performance on the PSSA. Students who perform poorly on these district-made assessments, especially in grades in which the PSSA is administered, are often targeted for more intensive instruction in reading and math. The expectation is that more intensive instruction (e.g., in a pullout program or through small group instruction) will raise the likelihood that they will score at the Proficient level or higher on the PSSA. Madison Elementary School's teachers are using the results of curriculum and teacher-made assessments to predict students' performance on the third grade PSSA. This is especially the case in reading, where students are identified for reading pullout programs. Eisenhower also makes use of pullout programs. Teachers use curriculum-based and teacher-made assessments to identify first and second grade students who are struggling with reading for placement in a two-hour daily reading class. The instruction is intensive, with a teacher and one aide teaching 18 students (as of the time of the site visit).

Individualized instruction

Least prevalent is the use of data to individualize instruction. While some teachers are using data for this purpose, especially at the elementary level and for special education, most teachers are not doing so. Several teachers reported that while tailoring instruction for individual students might be ideal, doing so is not feasible, often because they lack the time to adequately plan instruction for individual students or they feel their class sizes are too large.

As mentioned above, some districts use the results of local assessments to identify students for pullout programs. Some of these programs are individualized, such as after-school tutoring programs. At Eisenhower, there is a major emphasis on improving students' reading and math skills through tutoring. This is the case at all levels. All teachers in grades K-12 are required to stay after regular school hours two days per week to tutor. The district reached agreement with the teacher's union on this, and the requirement is currently written into the union contract. Teachers and principals in Madison, at all levels, also analyze PSSA and local assessment data to identify students who need after-school tutoring.

Three of the districts in the sample (Madison, Lincoln, and Adams) are using a state-sponsored program for frequently assessing the reading fluency and/or math skills of special education students. This program is called Progress Monitoring. For example, Madison makes heavy use of this program in reading. Special education teachers at all levels (elementary, middle, and high school) assess students' reading skills once every two weeks, and results are entered into a computer program that plots each student's progress over time and forecasts future performance. Teachers compare actual with expected performance and adjust instruction for each student accordingly. If actual

performance falls below expected performance four consecutive times, the teacher is expected to try a different instructional approach; and if performance consistently exceeds expectations instruction is adjusted to make the reading lessons more challenging. The Progress Monitoring results are an important component of each student's IEP, and teachers and central office staff report that it is a very useful tool for communicating students' progress to parents. Madison reported plans to expand Progress Monitoring to the math curriculum.

Uses of data to evaluate the effectiveness of schools, teachers, and programs

To varying extents, all of the case study districts are analyzing PSSA data and making adjustments to curriculum and instruction based on those analyses. For example, some districts are using analyses of PSSA results to modify their reading, math, or writing curricula. Assessment results are also used for school wide adjustments. Some districts and schools have adopted new curricula and supplemental programs based on their analysis of PSSA or other student assessment data. For example, the high schools in Adams and Eisenhower adopted the Cognitive Tutor math program (an online math tutorial and assessment program) out of concern over low scores on the PSSA and the district-made math assessments.

Eisenhower makes curriculum adjustments based on the results of the district assessments in reading and math given at the beginning of the school year, and makes further adjustments based on the mid-year assessments. These adjustments are generally made at the grade and school levels, and typically involve making changes in sequencing or devoting more class time to certain content or skill areas. Most of this curriculum adjustment is happening at the elementary school, but middle and high school teachers are beginning to follow suit.

Teachers and principals in case study districts reported that student achievement and other student level data are not formally used to evaluate teachers. Teachers seemed uncomfortable with this idea, partially because they recognize that student achievement depends on many factors beyond their own classrooms. Principals agreed with this concern, but some expressed interest in moving towards using student achievement data for teacher evaluation in the future, as value-added analyses and more frequent PSSA administration enable more accurate measures of student growth while under the tutelage of specific teachers.

Uses of data to create reports for external stakeholders

All respondents to the superintendent survey reported producing state- and federally-mandated external reports on performance in their districts. All but two reported supplementing those reports with specialized internal reports. All but five also produce a limited number of voluntary reports for parents and the community, while only five indicated that they produce a wide variety of these voluntary reports for stakeholders.

The superintendents who were surveyed expressed positive views toward voluntary reporting to the community. Most respondents agreed that voluntary reporting to parents

and communities encourages them to think more creatively about their work as a district, and allows them to connect and communicate more effectively with parents. Often this communication is done via district websites and other web-based tools. While 12 respondents agreed that such reporting requires a duplication of effort, only one agreed that it is an unnecessary burden.

Summary

Overall, districts have a keen interest in DDDM, but are in the early stages of implementation. In some districts, responsibility for data analysis is performed by central office staff, but those districts are moving towards a more decentralized approach, where principals and teachers are engaged in the analyses, as seen in other districts. Teachers use data to adjust classroom instruction in three ways: whole class instruction, group instruction (most prevalent), and individualized instruction. All districts are using data to evaluate and adjust curriculum and programs, but generally not for evaluating teachers. In addition, districts use data to produce a variety of reports for external stakeholders, notably mandated reports for state and federal government agencies, but also increasingly to share more data with parents.

5. Factors that Enable Data-Driven Decisionmaking

This chapter discusses findings from the study regarding factors that enable data-driven decisionmaking. These include federal, state, and local policies, data sources, financial and technical resources, and several aspects of developing a culture of DDDM in schools.

Policy context

Federal, state and district policies shape the needs and demands for DDDM and influence the availability and timeliness of data. Many policies at the state and local levels are driven by the provisions of NCLB, which requires school districts to bring all of their students to proficiency in reading, math, and science.

Reporting requirements

All districts are required to submit an annual report card to the PDE, and to make the report card available to the community. All districts and schools designated as being in need of improvement or corrective action under NCLB must develop and submit detailed improvement plans to PDE. Among the six districts in the study, only Wilson has been designated as such (as of the 2004-05 school year). One other district, Eisenhower, has received a warning from PDE that it is at risk of being flagged for improvement. In addition, three of the case study districts had at least one school in improvement or warning status in 2004-05. Among schools visited for the case studies, only the high school in Adams School District has this status—it has received a warning. Districts are increasingly making data available to the community via district websites, and some are adopting web-based tools for communicating with parents such as ParentConnect and Dashboard. In particular, parents in Buchanan and Wilson can use these tools to access information online on their child's attendance, homework assignments, and grades.

The survey asked superintendents about the pros and cons of mandated reporting to the state, federal government, or community. Respondents agreed or strongly agreed that mandated reporting requires duplication of effort in data entry and analysis, and that it focuses attention too narrowly on standardized testing. Superintendents revealed a strong preference for better-coordinated reporting requirements. Eleven of 26 superintendents rated better-coordinated reporting requirements as essential, and another 12 felt they are greatly needed. However, most also agreed that such reporting encourages them to think more carefully and creatively about their work. Only six respondents agreed that this reporting is an unnecessary burden; the rest disagreed or strongly disagreed with that statement.

State assessment systems

Pennsylvania's NCLB accountability test, the PSSA, is a standards-based, criterion-referenced assessment used to measure students' attainment of the Pennsylvania academic standards. For many years the PSSA was administered to students in grades 5, 8, and 11 in reading and mathematics. A writing test was added in 2002 in grades 6, 9, and 11, and more recently reading and mathematics tests have begun to be administered in grade 3. By 2006, the PSSA will cover grades 3 through 8 and grade 11, in reading and mathematics. A science PSSA is scheduled for 2008, to be administered in grades 4, 8,

and 11. The reading and math PSSA is administered in the spring, and results are available to school districts the following summer; the schedule for the writing test is about two months earlier.

Pennsylvania is currently pilot testing the Pennsylvania Value Added Assessment System (PVAAS), providing participating schools with value-added assessment data on their students. These are longitudinal data, based on PSSA and other standardized assessments, which show an individual student's progress over time. The system also generates a forecast of how the student is likely to perform (e.g., in reading or math) in the future, based on past performance. Results can also be aggregated at the classroom or school level. The Pennsylvania Department of Education (PDE) contracts with a private company, SAS inSchool, to collect and analyze the data from districts and to generate analytical reports. SAS inSchool uses proprietary software to conduct these value-added assessments of student achievement. Once these analyses are complete, each participating district's results are made available to the superintendent at a password-protected website. The superintendent then decides whether to share the results with other staff in the district.

State efforts to support DDDM

The Pennsylvania State Department of Education (PDE) makes several resources available for schools and districts, particularly for those designated as in need of School Improvement or Corrective Action under the federal NCLB law. The interviews with state officials and district stakeholders brought to light four key state resources to help schools and districts pursue DDDM. One major resource is a set of customized reports of PSSA results (at the district, school, and student levels) that PDE staff developed with assistance from The Grow Network. These reports are available to all schools in Pennsylvania via a password-protected website operated by The Grow Network. Several of the schools in the sample are accessing these online reports and have received PDE-sponsored training on how to use and interpret them. The reports provide teachers with detailed analyses of their students' PSSA assessment results in a user-friendly format. Teachers can view achievement profiles for individual students. The system can also assist teachers in creating flexible student groupings and offers some suggestions for instructional practices.

A second key resource is PDE's framework for school improvement planning, called *Getting Results!* The framework consists of an overall, suggested planning approach for schools designated as being in need of Improvement or Corrective Action, as well as a set of online tools designed to help them identify priorities and use data to inform instructional and curriculum planning. These tools, which include a set of instructional best practices, are available on PDE's website (see <http://www.pde.state.pa.us/>). Use of the framework and these tools is voluntary. None of the teachers or principals who were interviewed mentioned that they use *Getting Results!*

A third resource is the annual Governor's Institute, a training seminar on DDDM hosted by PDE in Harrisburg during the summer. Schools throughout Pennsylvania have sent teams of teachers and principals to the Institute. Principals and teachers in a few schools

mentioned that they have participated in this program, and stated that they found it to be highly useful. Much of the emphasis of these seminars has been on analyzing student data and using the analysis to develop concrete action plans.

The fourth key resource sponsored by PDE is PVAAS (see above). Since the program began in the fall of 2002, district participation in PVAAS has been voluntary. Any district wishing to do so and with at least three years of consecutive standardized test data has been eligible to participate. In 2004-05, 93 districts of the 501 districts in the state participated. PDE plans to eventually have all 501 districts participating in 2005-6, coinciding with the initiation of annual PSSA testing in grades 3-8. Many stakeholders who were interviewed at the state, district, and school levels mentioned that they are interested in the PVAAS concept of tracking student achievement growth over time.

Since PVAAS's inception in 2002, Intermediate Unit 13, which is under contract to PDE to manage much of the implementation of the program, has hosted several training sessions. These sessions cover basic information on the value-added assessment concept, information on the kinds of data that districts must submit, and training in how to access and interpret PVAAS reports. Districts have wide discretion over who will attend these sessions. Some districts have sent a single person (e.g., the superintendent), while others have sent teams of administrators or other central office staff and, in some cases, teachers.

In addition to these four key resources, the state promotes other data-driven student assessment and intervention tools, such as the DIBELS (Dynamic Indicators of Basic Early Literacy Skills) program and Progress Monitoring for special education students (both of these systems are described below). PDE, working with the Intermediate Units and Pennsylvania Training and Technical Assistance Network (PaTTAN) provides a number of training opportunities for schools and districts using these programs. For many of these programs, PDE utilizes a train-the-trainers approach, in which schools send a team of teachers and/or administrators to a training seminar, and the team returns to train other personnel. Finally, the PDE recently contracted with the Center for Data-Driven Reform in Education (CDDRE) at Johns Hopkins University to provide training and technical assistance to intermediate units and PaTTAN to help them become better equipped to assist schools and districts with DDDM. CDDRE is also working directly with eight districts in Pennsylvania to implement its own DDDM reform program, and plans to begin working with an additional six districts in January 2006.

Notably absent in Pennsylvania is a statewide data system for tracking student information over time. Systems in other states have proven to be of great value to districts in tracking longitudinal student information. Such systems are also helpful in the transfer of student records when children move across districts. Student mobility is always present but can become a major education issue when there is a large-scale student displacement due to a disaster. For example, Louisiana Department of Education's data system was invaluable in the aftermath of Hurricane Katrina, which displaced over 180,000 students in August 2005. The state officials who were interviewed noted that such a statewide system is part of their vision for DDDM in Pennsylvania, and the PDE

has recently received a \$4 million grant from the federal Institute of Education Sciences for this purpose.

District policies and mandates

In most case study districts, the degree to which teachers in different schools are using data to inform instruction or curriculum is uneven. In some cases this is the result of a deliberate strategy to test an intervention or approach in one school first, modify it, and then introduce it in the other schools in the district. For example, much of the effort to pursue DDDM in Adams has focused on the elementary school. Use of the DIBELS program began there⁷, as did district-made interim assessments in reading and math and their use in driving instructional changes. These interventions began several years ago in the elementary school, but are only now beginning to be implemented in the middle and high schools. Eisenhower employed a similar strategy. Three years ago it began to implement new curricula and local standards-based assessments in its elementary schools serving grades K-2 and grades 3-6. These changes have been regarded as successful, and the district is now beginning to implement them in the middle school, with the high school to follow.

Some teachers and principals reported they receive confusing and sometimes conflicting signals from the district office. For example, at Wilson the district office has encouraged schools to experiment with creating individualized instruction plans for each student, but recently ordered schools to halt their efforts in this area. In a similar vein, teachers at Buchanan mentioned frequently changing signals from the district office. They reported receiving a significant amount of professional development related to using various technologies, including online rapid assessment tools. However, they complained that after receiving training and becoming accustomed to a particular program, they would often be informed that district was replacing the program with another. This has reportedly occurred, for example, as the district moved from an online assessment tool called Blackboard.com to Homeroom.com, and most recently to Study Island. A few teachers felt that the district officials sometimes decide too quickly that a particular program or tool is not working well.

In addition, the Wilson union official noted that the teachers' union was largely left out of the decisionmaking process when the district was developing or specifying requirements for data systems now being used in the district. The official maintained that union involvement in the process could have narrowed the gap between the data entry demands placed on teachers and the amount of feedback or information teachers receive in return, and could have ensured greater receptivity among teachers to using these systems.

Data sources

The report now turns to the assessment and other data sources available for classroom- and school level DDDM.

⁷ It should be noted, however, that DIBELS is applicable to grades K-6 only.

PSSA and other annual assessment results

PSSA results are viewed as the most important source of data to teachers, principals, and district office staff because schools and districts are judged on the basis of those results. In all case study districts, superintendents, principals, and teachers are beginning to make substantial use of the annual PSSA results. Using PSSA results to adjust the curriculum or instruction is the most common type of DDDM taking place in this sample of districts.

The results of the superintendent survey corroborate these findings. All but two of the respondents reported using PSSA scores as an element of their decision-making system. The majority of respondents (17) reported that PSSA scores are “essential” or “very important” in most areas of decisionmaking, with the exception of assigning or terminating staff. Only four respondents rated the PSSA as only somewhat important for individualizing instruction, monitoring use of curricula, and monitoring the effectiveness of curricula. Only three reported that the PSSA is not at all important in identifying schools in need of assistance, and only one reported that scores are only somewhat or not at all important in all areas of decisionmaking.

Most of the case study districts administer various alternative standardized tests, such as the Iowa Test of Basic Skills (ITBS) or Terra Nova, in grades where the PSSA is not administered. Interviews and survey results suggest that standardized test results are used to varying extents for instructional and curriculum planning. Of the survey respondents, only two reported that their districts are not using other standardized tests than the PSSA. Of those who reported using them, nine indicated that analyses of these scores are essential or very important to most of their decisionmaking processes, with the exceptions of assigning and terminating staff. Seven respondents, however, reported that these tests are only somewhat or not at all important in most of their decisionmaking, while the remainder were mixed in their assessment of the tests’ importance. There was no clear pattern across respondents of areas in which these tests are most important to decisionmaking.

The extent to which teachers find the PSSA results to be useful varied, but most teachers reported that they do find the results, and the state assessment standards and anchors, to be helpful. Teachers in the elementary and middle grades were somewhat more likely to find the PSSA results to be useful. This may be because they have more time to focus on reading, math and writing (the subjects currently tested by the PSSA) than high school teachers, while high school teachers may be more likely to specialize on topics that are not covered by the current PSSA tests. Another possible explanation is that elementary and middle school teachers may be relatively more receptive to using assessment data for decisionmaking in general.

However, teachers and principals (and to a lesser extent superintendents) across all the districts in the sample reported three major problems with using the PSSA results for instructional purposes. First, there was wide consensus among superintendents, principals, and teachers in the sample that the PSSA assessment is not administered frequently enough to be sufficient for assessing student performance and altering instruction accordingly. Schools need more frequent assessments, and several of the

districts in the sample have developed their own assessments or adopted others that are administered more frequently throughout the school year.

Second, many teachers complained that they receive PSSA results much later than they would like if the results are to be useful for instructional purposes. The exam is administered in the spring each year, but teachers in many schools reported that they are not given results until after the following school year has begun. Teachers (and some principals) throughout the districts in the sample indicated that by the time they have received the results, they have finalized much of their instructional planning for the school year. Teachers (particularly math and language arts/English/reading teachers) noted that the results would be much more useful for making decisions regarding curriculum and instruction if they were given access to them before the start of the new school year.

Third, according to many teachers who were interviewed, a major limitation of the PSSA is the fact that it reports on the performance of different cohorts of students from year to year. Many teachers stressed that their classes often differ markedly from one year to the next in terms of skills, ability levels, and behavior. They recognize the limitations of comparing one group of students with another.

All districts are also setting aside more classroom time to prepare their third, fifth, eighth, and eleventh grade students for the PSSA. This often involves devoting more class time to specific content and skill areas that will be covered on the exam. Several teachers remarked that PDE's publication of assessment anchors in reading and math has made it easier to identify these areas and therefore prepare students for the exam. Teachers in the PSSA grades are also spending more time than in the recent past teaching strategies and skills for taking standardized tests.

Some teachers and principals expressed concern that too much emphasis is placed on the PSSA. These interview respondents worry that more time spent preparing students for the PSSA exam (including time spent on test-taking strategies) means less time teaching other core subjects or skills not tested on the PSSA. In addition, these teachers and principals tend to value the use of a variety of assessments in measuring student learning and progress. They worry that state and federal policymakers and, in turn, district office staff, assign too much weight to PSSA results.

More frequent assessments

In addition to annual assessments such as the PSSA, SWPA districts are using a variety of more frequent assessments. Two of the districts in the sample, Adams and Wilson, are using the DIBELS program to varying extents to track and improve the literacy skills of students in the elementary and intermediate grades. The DIBELS assessment consists of a set of standardized fluency measures. The assessment is designed to measure the pre-reading or reading skill level of the student. In general, these assessments are administered at the beginning, middle, and end of the school year. The assessment measures specific pre-reading and reading literacy skills, and suggests different instructional practices that teachers can try for students who are deficient in certain skills.

Many of the schools that were visited are using a variety of off-the-shelf software programs and online tools, such as The Princeton Review's Homeroom.com, Study Island, CompassLearning Odyssey Math and Reading, or Carnegie Learning's Cognitive Tutor, which contain lessons, tutorials, and practice quizzes or other assessments. These programs typically assess a student's current ability level in a particular content area or targeted skill area (e.g., in reading or particular reading skills) and design tailor-made exercises or tutorials to help the student improve his or her performance. Real-time results are provided for the student and teacher. The item banks for some of these programs can be tied to the state standards in reading, math, or other content areas. Some of these programs also allow the teacher to quickly create a quiz or assessment. In general, teachers believe that these programs are a valuable supplement to more traditional curricula. In particular, many teachers who use these programs in their classrooms (or in a computer lab) feel that they help prepare students for the PSSA.

As indicated above, three of the six districts in the case studies have developed their own assessments that are administered more frequently (Eisenhower, Adams, and Wilson). At Eisenhower, a group of elementary school teachers, working closely with administrators, developed local assessments for reading and math based on the state standards. Separate assessments were developed for each grade level. These exams are administered to all students at the beginning, middle, and end of the school year. In both subjects, the exam at all three points in time reflects the skills that students are expected to have mastered by the end of the year. The results are used to track each student's performance over the course of the year. Results from the assessment administered at the beginning of the year are used to identify specific content areas or skills that teachers must focus on at the classroom level. Hence, certain aspects of the curriculum are emphasized or de-emphasized, or otherwise altered, based on teachers' analyses of the assessment results. To some extent, teachers also adjust the curriculum to differentiate instruction for small groups of students. This process is repeated at mid-year. Teachers assess where their students stand in terms of meeting the end-of-year goals, and adjust the curriculum and instruction accordingly.

At Adams, the high school principal (who previously taught math), with input from a group of math teachers representing each level, revamped the elementary math curriculum to better align it with the state standards. This group also created a local standards-based assessment, which is administered at mid-year and at the end of the school year. Some teachers choose to administer more frequent (e.g., monthly) math assessments so that they can track their students' progress more closely. A similar revamping of the curriculum and development of a local standards-based assessment was recently done for reading. Having successfully made these changes at the elementary school, the district is now in the process of making them at the middle and high schools.

Wilson has developed and implemented its own standards-based assessments in reading/literacy (for grades K-8) and math (for grades K-5), which are administered at the beginning of the school year, mid-year, and at the end of the school year. Similar to Eisenhower, most of the teachers and principals interviewed at Wilson take these

assessments very seriously, and use the results to alter their instruction. Such alterations typically include spending more time on content areas or specific skills on which students scored poorly. This often means creating flexible groupings of students, with each group completing lessons that pertain to skills in which they need improvement. Teachers use these scores, along with other data such as curriculum unit test scores and homework assignments, to determine groupings. Teachers and principals do not use performance data to alter the school's curriculum, because the district controls all aspects of the curriculum (including scope and sequencing). The district plans to eventually develop standards-based assessments for the remaining grades (9-12 in reading/literacy and 6-12 in math).

However, a few teachers in the districts using local assessments expressed some doubts about how well the results of district-made tests can predict performance on the PSSA. It is important to note that this study does not provide information about the validity or reliability of these district-made assessments. The degree to which they actually align with the state standards is an open question.

Of the 26 superintendents who completed the survey, 19 indicated that their districts administer curriculum-based assessments (which may or may not be aligned with the state standards) and use analyses of those scores in their decisionmaking processes. Five reported that analyses of these scores are essential or very important to nearly all of their areas of decisionmaking. Three indicated that they are only somewhat or not at all essential to all areas of decisionmaking, while the remainder felt that analyses of these scores are useful for some aspects of decisionmaking but not others. More respondents reported using these scores for decisions related to staffing than scores from the PSSA or other standardized tests. However, there was no clear pattern of importance across respondents.

In addition, teachers in all case study districts are using other forms of assessment, including classroom projects and portfolios of student work, such as writing samples. (Portfolios are especially common at the elementary level.) The superintendent survey results confirm this finding. Nineteen of 26 respondents reported using alternative forms of assessment in their districts, with portfolios and projects being the most commonly reported. However, many respondents rated them as only somewhat important or not at all important in their decisionmaking. Moreover, as with other forms of assessment there was little reported importance of these assessments in decisionmaking related to staffing.

Some teachers noted that they focus less on their students' classroom grades and other forms of assessment (e.g., curriculum unit tests, portfolios, and projects) than in the past because they are focusing more on their PSSA scores, and to a lesser extent, scores on other standardized tests (ITBS, Terra Nova, etc.) that are administered in non-PSSA grades. These teachers generally believe that alternative assessments such as classroom grades, homework assignments, portfolios, and curriculum-based tests are useful, but believe that they must de-emphasize these assessments in order to focus on the PSSA. However, in those cases in which the curriculum is reportedly aligned with the state standards, teachers do make substantial use of curriculum-based test results.

Longitudinal data

For the most part, the districts and schools that were visited currently lack the capability to track student performance on a longitudinal basis. A notable exception is Wilson, whose Fast Access Information System (FAIS)⁸ maintains a complete history of student data such as grades, results from the PSSA and other standardized assessments, the district's own standards-based assessment results, demographic data, and other information. FAIS is discussed further below. While the study found that teachers and administrators are using the data in this system, there is not much evidence that they are using it for longitudinal analyses.

The Progress Monitoring programs for special education students at Madison, Lincoln, and Adams provide longitudinal assessment data. As mentioned above, these assessments are given in reading fluency and/or math every two weeks. Typically, special education teachers collaborate with regular classroom teachers and special education coordinators at the district level in reviewing the results and modifying instruction accordingly. Special education students' performance is tracked closely throughout the school, as well as from one year to the next.

Several principals and teachers indicated that they would like to have access to more kinds of longitudinal student achievement data. They recognize the limitations of comparing different cohorts of students, as they must do when comparing PSSA results from year to year. In districts that administer alternative standardized tests (e.g., the ITBS or Terra Nova) in grade levels for which there is not yet a PSSA assessment, principals and teachers in some schools have made some attempts to compare scores for individual students over time. Many of them noted, however, that it is difficult to compare results from different assessments. A few superintendents and principals remarked that, for this reason, they look forward to the PSSA being administered at more grade levels. As mentioned above, beginning in 2005-6, PSSA math and reading assessments will be administered annually to students in grades 3-8.

PVAAS

One way to utilize longitudinal data is in value-added analyses. Two districts, Wilson and Madison, are participating in the PVAAS pilot program, but at the time of the site visits they are only in the beginning stages of making systematic use of the PVAAS results.

At Wilson, which had only recently begun to participate in PVAAS at the time of the interviews, PVAAS data use is limited to staff in the district office. District office staff were beginning to investigate ways they could use the data for planning purposes. Some of the principals or teachers who were interviewed in these districts were aware of PVAAS, but most knew little about it.

Madison is further along, as it began participating in the PVAAS program a year before Wilson. At Madison, district office staff are using the data for district-wide instructional and curriculum planning. Direct access to the PVAAS results has been restricted to the

⁸ The name of this data system has been changed in order to protect the identity of the district.

superintendent, other district office staff, and some instructional support teachers. However, an assistant superintendent reviews and assesses the results, and shares summaries with principals and teachers. This assistant superintendent also holds meetings with teachers and principals to discuss possible instructional strategies to pursue with individual students or groups of students whose PVAAS results indicate deficiencies in certain content areas or skills. Teachers are shown results for their individual students, as well as grade level results. They are encouraged to combine the results with PSSA and other assessment data in planning instruction. District office staff said they eventually plan to give teachers direct, password-protected access to the PVAAS results on the district's data system. Teachers would only be given access to the data for their particular students.

Teachers, principals, and district office staff in Madison consider the PVAAS data to be useful for instructional planning, but complained of delays in receiving the data. Districts receive PVAAS results in the fall (usually October or November), after the school year has begun. Madison staff believe that if the data were more timely, they could make better use of PVAAS for instructional planning. District office staff suggested that delays in other districts' submissions of assessment data to SAS inSchool could account for the delays in the availability of results. (Value added analysis relies on statewide data in the model in order to compute each district's results.)

Only four of the 26 superintendents who completed the survey reported that their districts use PVAAS. Of these, three reported specific uses. One reported that the system is not at all important in making decisions, except for identifying groups of students with similar needs and individualizing instruction for specific students, for which the superintendent rated PVAAS as somewhat important. The second superintendent reported that PVAAS is essential for identifying schools and teachers in need of improvement, very important for grouping students and individualizing instruction, and not very important or not at all important for other uses. The third superintendent rated the system as very important for all uses except monitoring schools and terminating staff, where it was considered to be somewhat important.

Non-assessment data

Some teachers, principals, and district office staff said that non-assessment data, such as data on attendance, discipline, health, demographic characteristics, matriculation, and other student characteristics play an important role in decisionmaking. But use of such data on a systematic basis is much less prevalent than use of assessment data in the six districts studied. A few schools, such as the elementary schools in Lincoln and Kennedy, are using discipline, attendance, and related data systematically to target specific interventions or programs to students whose behavior or related problems may be negatively impacting their classroom performance.

Eleven of 26 superintendent survey respondents reported that non-assessment data are somewhat or not at all important to most of their decisions, while six reported that these data are very important in most areas of decisionmaking. The rest were mixed in their assessment of the importance of these data.

Financial resources

The smaller districts in the sample reported significant financial constraints that limit their ability to purchase expensive data systems or software, or to train teachers in DDDM. The larger districts in the sample, such as Wilson, have had less difficulty finding the resources necessary to adopt new data systems and software, and to train teachers. Smaller districts tend to have very small central office staffs and leaner administrative staffs at the school level. As a result, central office and school administrators take on many responsibilities that are likely to be divided among a larger staff in larger districts. Smaller districts also tend to be more dependent on support from IUs and other organizations for their data and technology needs (see p. 36).

Technology resources

School districts in the study vary in the amount of in-house technology that is available for DDDM. Some rely heavily on external support organizations to meet their technology needs.

Data systems

Several schools and districts lack sufficient technology to make the best use of data. This is especially the case in smaller districts, which generally face more resource constraints. In particular, these districts lack comprehensive, integrated data systems that give teachers or administrators easy access to multiple sources of data. In some of the schools visited for the case studies, technical problems with electronic data systems (e.g., systems crashing and losing data) have hampered efforts to implement DDDM.

Three districts in the sample (Adams, Eisenhower, and Madison) participate in the Comprehensive Data Analysis (CDA) program operated by the Allegheny Intermediate Unit (AIU). CDA offers a data warehouse into which districts can export a variety of student-level data and receive analytical reports to help them make decisions regarding curriculum and instruction. However, at the time of the interviews these districts were in the early stages of cleaning and exporting data to the CDA system, and were only beginning to utilize the system's analytical/reporting functions. Administrators at Madison reported that thus far they have found the system's analytical/reporting functions to be difficult to use. They noted that they prefer to analyze student data themselves using spreadsheet programs.

Results from the survey of superintendents in the region indicated that many districts are using CDA (14 of 26 superintendents surveyed), but that many superintendents are also dissatisfied with the system (eight of 12 superintendents who reported their level of satisfaction). In general, most survey respondents reported that their districts use multiple systems, but with little consistency regarding which systems were used across districts. In addition to CDA, the most common systems cited were Central Susquehanna IU software and Microsoft Excel/Word for spreadsheet analysis.⁹ Respondents reported that these

⁹ Several superintendents also listed the PSSA. The authors do not consider this to be a data system but rather a source of assessment data.

data systems meet only some of their needs, with data collection and storage being the most commonly met needs. These systems are reportedly less useful for instruction and evaluation purposes.

Some of the case study districts, such as Adams, operate separate data systems for their special education populations. These systems have electronic records for each special education student, including their IEPs (individualized education plans), evaluation reports, data on their demographic characteristics, legal documents, and related items. Typically, special education and regular classroom teachers who have these students in their classrooms can access these data.

Buchanan recently adopted PowerSchool, a web-based data system licensed by Apple Computer. PowerSchool is a data warehouse with data analysis capabilities. A major goal at Buchanan has been to integrate disparate sources of data into a single data warehouse. The district also wants to give teachers easier electronic access to assessment data and other information on their students.

Of the case study districts, Wilson has the most extensive and sophisticated data system. The district maintains its own repository or warehouse of student data and related data, and makes the data available for teachers (and, to some extent, parents) via several online tools. The most significant of these tools is FAIS. As mentioned above, FAIS is a data warehouse containing data on grades, results from the PSSA and other standardized assessments, the district's own standards-based assessment results, demographic data, and other student information. Principals can access student-level data for all students in their schools, and teachers can access student-level data for all students in their classrooms.

Wilson has revised its reading and math curricula in recent years and has placed the curriculum for every grade and subject in an online system called Teacher Assist.¹⁰ All teachers can access Teacher Assist to view lessons, curriculum scope and sequence, as well as information on the state standards. The main purpose of the system is to standardize the curriculum so that all students are taught the same lessons and skills, which are aligned with the state standards. Furthermore, if a student moves from one school to another within the district, he or she will stay on track with the curriculum. Teacher Assist also contains some of the assessment data (e.g., PSSA) that FAIS contains. These data are extracted from FAIS. Some of the other case study districts would also like to eventually place their curricula on their networks so that teachers can access the information electronically. In the case study schools at Wilson, not all teachers mentioned using Teacher Assist; however those who did reported that they find it somewhat useful.

Wilson is also phasing in an online interface with parents, Dashboard, which is licensed by CommerSel Studios. Parents can access the system via the Internet (with login and password), and can access grades and homework assignments for their child, as well as other information such as schedules of extracurricular events. Parents and teachers use

¹⁰ The name of this system has been changed in order to help protect the identity of the district.

the system to communicate via email. The data in the Dashboard system are extracted from FAIS. Kennedy is also using Dashboard to provide information to parents.

Parents of middle and high school students at Buchanan can access grades, attendance reports, and homework assignments in the PowerSchool system via the Internet in much the same way that parents of students in some Wilson schools can. (Parents whose children attend the elementary schools at Buchanan do not have this online access.)

Availability of computers

Some teachers and principals noted a lack of sufficient technology for using data in their schools (e.g., not enough computers, lack of software for organizing/analyzing data on grades or test scores, lack of high-speed Internet service, etc.). In some schools, not all teachers have a computer at their desk, significantly limiting their ability to access electronic data on their students. Several superintendents who completed the survey cited lack of appropriate technology (including software) as the greatest impediment to implementing DDDM in their district.

At the time of the visit to Buchanan, all students in grades 3-12 had a laptop computer, making it easy for teachers to incorporate online tools into their instruction. These tools were used more frequently at the elementary and middle schools, where teachers were making extensive use of online rapid assessment programs such as Study Island. All of the teachers who were interviewed highly valued having a laptop for every student, though a few noted that equipping every student and teacher with a computer does not guarantee that teachers will regularly use online assessment programs and other DDDM tools. Even so, providing all students with a computer is not feasible for most districts. Buchanan did so with a grant from the state, and at the time of the site visit the grant had just concluded. Subsequently, the district scaled back the laptop program such that the student to computer ratio is now approximately 2:1. High school students are still issued personal laptops, but students in the lower grades must share computers.

Other schools that have adopted frequent online assessment systems have a shortage of computers, and students often have a limited amount of time to use these programs. Their teachers often believe that they could benefit from more exposure to these programs. An example is the elementary school at Eisenhower, where teachers believe that the CompassLearning Odyssey Math and Reading programs have produced significant improvements in students' reading and math skills. But each class of students uses these programs only one day per week, and spends the remainder of its computer lab time on other exercises.

Technical support resources

Poorer districts in the sample reported that they lack sufficient technology support staff. Some of these districts tap teachers who are adept with hardware and software to serve as part-time or voluntary technology support staff for their schools. They assist other teachers with technology issues or troubleshoot software and hardware problems. But these staff cannot spend much time tending to these problems, given their teaching or other responsibilities. Principals and teachers in these schools stated that they would

prefer to have at least one full-time, dedicated technology support person on staff. Some of the schools once had such a support person on staff, but the position has been cut. These schools in poorer districts therefore tend to rely heavily on their IUs for technology support (see below). Even in districts with more resources, such as Wilson, principals and teachers reported experiencing technical difficulties with the district's information system and, to some extent, a lack of technical support (see "Availability and quality of training" on p. 43).

Adams has found a creative way to provide more technology support to teachers. The district has sent middle and high school students who are highly proficient with computer technology to an external training program, where they learned additional skills and how to teach these skills to others. These students now serve as mentors to teachers who need to improve their computer skills.

Technical support from Intermediate Units and other organizations

Poorer districts tend to use the Intermediate Units (IUs) more than districts with more resources. For example, Adams depends on the Westmoreland IU to operate its internal computer network and district website. The district has also relied on the IU to generate its report cards and attendance and enrollment reports, and to assist it with class scheduling. However, the district has recently adopted software (Prosoft) that will enable district staff to perform these functions internally. The new system also has data analysis capabilities, and district staff hope to eventually use it to analyze assessment data. Nonetheless, the district still relies heavily on the IU to operate its network and provide technology support.

As mentioned above, three of the districts in the sample participate in the Allegheny Intermediate Unit's CDA program. Administrators at Madison stated that training in how to use the system provided by AIU has been very helpful, though they believe that the system could be more user friendly.

Of the superintendents who completed the survey, fourteen reported that their IUs do not provide their districts with support in a range of DDDM-related areas from professional development to technology to technical assistance. Of those who reported receiving assistance from their IUs, most reported that the assistance is somewhat helpful or helpful. However, eleven superintendents reported that IU assistance is not at all helpful, particularly in the areas of technology and technical assistance.

Most of the six case study districts, including those who have relatively more resources, rely on at least some support from their local IUs in using data. Madison, for example, has drawn heavily on the support of the AIU's Reading Achievement Center in revamping its reading curriculum for students who score at the Basic or Below Basic levels on the PSSA or who score poorly on the Terra Nova exam, which the district administers in grades for which there is no PSSA exam.

Other sources of data and technology support for districts include the Pittsburgh Technology Council (PTC) and the Math Science Partnership (MSP) project. At Adams,

the PTC first conducted a needs assessment by surveying teachers about their current skills and needs with regard to using technology to improve instruction. PTC used the needs assessment data to identify gaps in teachers' technology skills, and developed customized training sessions to teach them the skills in which they were weakest. Eisenhower has also received technology support from PTC. The MSP provides support for districts to subscribe to CDA, and holds meetings where district leadership teams, comprised of teachers and administrators, analyze data and form action plans.

Finally, as mentioned above, PDE provides several key resources to help schools and districts pursue DDDM. Despite the availability of these resources, few superintendents who responded to the survey reported receiving assistance in data analysis and decision making from the state. Among those who did, most rated that assistance—whether with professional development, technology, or technical assistance—as only somewhat helpful or not at all helpful.

Developing a data-driven decisionmaking culture

The remaining elements that enable DDDM are related to creating a culture in schools where data is routinely used for decisionmaking. These elements include leadership, a well-trained staff with sufficient time to devote to DDDM, and a collaborative environment.

Leadership

As suggested by the literature, the study found that principals play a key role in teachers' implementation of DDDM. In a few schools, teachers who are reporting data to and getting substantial feedback from the principal had favorable views of DDDM. For example, in one elementary school in Wilson School District, each month every teacher prepares one or more Excel spreadsheet summarizing their students' progress on a variety of assessments, quizzes, and assignments. They also provide their plans for addressing students' deficiencies and for customizing instruction for individual students or groups of students. The principal spends a significant amount of time reviewing all of these data (the principal devotes a weekend to this each month), and provides each teacher with detailed feedback on areas of concern, different instructional strategies or lessons to try, possibilities for forming flexible groups, and so on. To a significant extent, this feedback is at the individual student level. If a particular student is having difficulty in a certain skill area, the principal takes a hands-on approach in helping the teacher with remediation strategies. The teachers who were interviewed in this school do not mind the effort they put into reporting data on a regular basis because they value and appreciate the feedback they receive. The principal would like to see teachers take on more data analysis and identification of instructional strategies themselves. Nevertheless, the principal thinks that she will always be involved in the process, seeing her role as that of an instructional leader.

In another school in Wilson, a K-8 elementary school, a similarly intensive DDDM process is followed. Each month, the principal, joined by some teachers and sometimes by the reading and math coaches, meets with each grade level team to discuss assessment results and plan instruction based on student weaknesses suggested by the data. With

strong encouragement from the principal, teachers develop individualized instruction plans for each student who has scored at the Basic or Below Basic levels on the third or fifth grade PSSA. Each plan summarizes the student's most recent assessment scores (e.g., PSSA, Terra Nova, district standards-based assessment) and lists specific actions or strategies the teacher plans to pursue to raise that student's achievement.

At the time of the interviews, Wilson's central office staff reported plans to eventually have every school following a similar monthly student progress review process, and to develop individualized instruction plans for every student, based in part on the experiences of these particular schools.

The study also found that teachers of subjects that are not tested on the PSSA are less likely to use student data to inform decisionmaking. These teachers do utilize some student data, but they are much less likely to use standardized test score data. They are more likely to rely on curriculum tests, homework and quiz grades, and other non-standardized forms of assessment, but even in the case of these assessments they are less likely to use data in a systematic manner. Some of these teachers stated that they do not sense the same level of pressure from principals or the district, compared to the pressure on math, reading, and language arts teachers.

At Wilson, the interviews suggested that whether or not teachers feel compelled to enter data depended on the principal. Some principals press their teachers to enter data into and use FAIS regularly, while others do not.

Interest and willingness to use data for decisionmaking

Almost without exception, the superintendents and principals who were interviewed over the telephone and during the site visits said they are intensely interested in using data to make schoolwide decisions regarding curriculum and instruction, and to evaluate or monitor the success of specific programs or classes. Respondents to the survey agreed, generally characterizing district administrators¹¹ and principals as being excited about using data. The survey also asked superintendents whether they believe that the principals and teachers in their district actually use data for decisionmaking. Superintendents generally responded neutrally to this question. Six reported a neutral stance on whether or not principals use data, while six responded neutrally and three disagreed that their teachers use data. Little difference was reported in the value of school level and student level data to principals, but student level data was rated slightly more important to teachers overall.

In contrast to the administrators the research team talked with, there was less unanimity among teachers concerning the value of data on student performance. Nonetheless, most teachers who were interviewed believe that data are useful and want to use data more often to inform curricular and instructional decisions. The study found that, to some extent, teachers' receptiveness to using data for decisionmaking varied by grade level. In general, elementary school teachers appear to be the most open and interested in DDDM, followed by middle school teachers.

¹¹ In this case superintendents were reporting about themselves.

High school teachers are somewhat less receptive to DDDM than teachers at the other two levels. This observation is based on the general trends in the interviews with teachers, and it is corroborated by the interviews with principals and district office administrators. Additional results from the superintendent survey partially confirm these grade-level differences. Except at the elementary level, teachers were generally characterized as lacking confidence or interest in using data. However elementary teachers were more frequently characterized as excited about using data (although often constrained by lack of resources).

Buchanan illustrates this finding. Among the schools in this district that were visited as part of the case studies, use of data to inform instruction is most prevalent at the elementary school. With strong support from the principal, the school has formed two teams of teachers, one for grades K-3 and the other for grades 4-6. The teams analyze PSSA and other assessment data and identify areas of need and recommendations for instructional changes. The principal and teachers who were interviewed regarded this effort as being highly useful, and believe the teams' work could serve as a model for other schools in the district. The two teams produced a report, which included some suggestions for curriculum changes, that was submitted to the district office, although at the time of the site visit, the teams had received little feedback from the district office on this report.

In addition, teachers at the elementary school that was visited in Buchanan, and to a lesser extent, the middle school, frequently use online rapid assessment tools. Until recently, they used Princeton Review's Homeroom.com. However, due to technical problems with accessing Homeroom.com's server, the district no longer uses that system, replacing it with Study Island, a similar online tool. Study Island generates lessons and assessments in reading and math for students, and quickly reports results. The program's item bank is reportedly aligned with the Pennsylvania state standards. In comparing the two systems, a few teachers noted that Homeroom.com was not as well aligned with the state standards. However, others noted that Homeroom.com had the advantage of allowing teachers to create custom assessments, which cannot be done with Study Island.

While teachers and administrators at the high school in Buchanan are not using DDDM as extensively as those at other levels, the district did start with the high school in implementing a new web-based data system, PowerSchool, a product of Apple Computer. The district proceeded slowly, adding features to the system incrementally. Implementation then began in the middle school, before finally beginning in the elementary school. At the time of the interviews, high school teachers reportedly had the easiest access to electronic data on their students, such as PSSA scores, other assessment data, grades, and demographic information. Middle school teachers had access to somewhat less information, and elementary school teachers had access to even less. Nonetheless, teachers at the elementary school were making more systematic use of student data for instructional and curriculum planning than teachers at middle and high schools. DDDM has become a priority at the middle and high schools—they are simply not as far along in implementing DDDM.

The study found a few examples of high schools in which DDDM is more widespread. At the high school in Madison, for example, teachers are in the early stages of using reading and math assessment data (mainly PSSA data) systematically to plan instruction. These efforts primarily involve identifying students who scored at or below the Basic level on the grade 8 and 11 PSSA exams, as well as those whose scores were just above the Proficient threshold, and targeting specific interventions, such as after-school tutoring classes, to these students. In addition, some teachers at the high school in Madison are using rapid online assessment tools such as Homeroom.com. The teachers at this high school are also further along than most of the case study high schools in collaborating across departments on DDDM. For example, teachers in the math department have begun working with science teachers on common lessons and instructional strategies to improve students' proficiency in certain math skills.

The data do not pinpoint why high school teachers might be less receptive to DDDM, but there are some possible structural and cultural explanations. One possible structural explanation is the specialization of classroom teachers, such that they teach only one or two subjects. Those who teach subjects that are not covered by the PSSA or other assessments may lack relevant data. For example, math or reading PSSA results may be of limited utility to history teachers. Moreover, because of this subject specialization, a typical high school teacher sees many more students each day than teachers at other levels. Hence, high school teachers have less time to focus on the needs of individual students or groups of students.

However, a few superintendents observed that the teaching culture in high schools is less open to DDDM than in elementary or middle schools. A few also noted that elementary school teachers are often more willing to collaborate with each other, which many administrators consider to be a necessary condition for effective DDDM. One high school principal mentioned that a major purpose of using data in his district is to differentiate instruction for groups of students or individual students, but that high school teachers are more inclined to practice whole-group instruction. This principal, as well as some of the superintendents who were interviewed, emphasized the need to promote the usefulness of data at the high school level.

Age is another factor in teachers' receptiveness to DDDM. Across all case study districts, many superintendents, principals, and teachers said they believe that older teachers are somewhat less receptive to using data. In addition, many stated that older teachers are less receptive to using technology (computers, software, web-based tools, etc.). Being willing and comfortable with using technology may be a precursor to using data for decisionmaking. Several stakeholders made this connection, remarking that teachers must first become comfortable with computer technology before they can practice DDDM. In particular, several principals noted that they have had to go through this progression with older teachers, first training and encouraging them in the use of computers and software such as Microsoft Excel or Word, and electronic grading systems or data warehouse systems such as FAIS at Wilson. Once teachers have become accustomed to using these tools, they are ready to receive training and support in DDDM.

In some schools, technical problems with electronic data systems have produced or reinforced teachers' reluctance to enter student achievement data, grades, or attendance data into those systems even after the problems have been resolved. Entering these data requires substantial effort, and some teachers mistrust the data system, fearful that they will waste their time entering data that will become lost.

Teacher collaboration in DDDM

In most of the case study schools, teachers collaborate within, and to some extent, across grade levels in making decisions based on data. In some of the elementary and middle schools, teachers have scheduled time to meet as a grade level group. In high schools, teachers have regular department meetings. Usually, DDDM is not the topic of discussion in these meetings, but teachers reported that they are increasingly devoting time in these meeting to aspects of DDDM. Many teachers recognize the importance of collaborating to assess student data and identify or discuss possible instructional changes that could be made to address students' weaknesses.

Across schools within districts the study found less collaboration or communication among teachers, and several teachers stated that they think more collaboration would be useful. For example, in Adams, portfolios of student work follow each student from kindergarten through fifth grade at the elementary school, and teachers in each grade generally review this information for their incoming class at the beginning of each school year. The portfolios are transferred to the middle school when the students enter sixth grade, but the sixth grade teachers reportedly do not access these files (nor, apparently, do any of the other middle school teachers). Teachers in other districts did not so much complain of a lack of collaboration across schools, but several stated that there is often very little sharing of student data from one school to another. For example, because students move between buildings in these grades, sixth and ninth grade teachers often receive little information, particularly student performance data, from fifth grade and eighth grade teachers. Lincoln and Madison are working to improve collaboration and decisionmaking across schools by convening cross-school departmental or data team meetings.

Group planning time has been built into the schedule at the grades 3-6 elementary school visited in Eisenhower. In contrast, teachers at the middle and high schools in Eisenhower, who do not have this planning time, often complained of insufficient time to collaborate with other teachers in the same content area or grade level. Teachers at these schools indicated that most of their collaboration amounts to brief hallway conversations in between class periods. Across other case study districts, teachers echoed this complaint.

Sufficient time for DDDM

Across all case study districts, teachers and principals identified lack of time as the biggest constraint on their ability to do more with data. In addition, many superintendents who responded to the survey cited lack of time as the greatest impediment to implementing DDDM in their district.

Teachers at all three levels indicated that they would do more with student performance and related data if only they had more time. Teachers have preparation periods built into their schedules, but they spend most of this time preparing lessons, completing paperwork, or fulfilling other duties that are not directly related to reviewing student data. Some teachers, and even principals, stressed that they could do more with student achievement and related data if they had more time. As one middle school principal at Wilson noted, referring to the district standards-based test results and other assessment data, teachers “don’t know what to do with the data”, as a result of lacking both time and adequate data analysis skills. Superintendents who completed the survey also responded that they and other administrators lack sufficient time for data analysis. Specifically, eight of them said that more administrator time for data analysis was essential, while ten indicated that more time was greatly needed.

In addition, many teachers are concerned about the time burden associated with data entry. In all case study districts, teachers must report grades and attendance data. And in some districts, such as Wilson, much of the task of entering test score data (e.g., results of the district standards-based assessments) into district data systems falls to teachers. Some teachers in the sample reported having to re-enter data because it had been lost as a result of technical problems with the data system. Furthermore, in schools in which teachers are responsible for much data entry, teachers often do not receive adequate feedback. They may report data on a particular local assessment or unit test, but receive no feedback from their principal or from the district office on how they should think about the results, how they should focus their teaching, areas of concern, and so on. Hence, some teachers view DDDM as a data entry or reporting task, and not as something that enables them to be better teachers.

In districts where teachers have a high data entry burden, teachers have sometimes exercised discretion over whether or not they actually enter data. Several teachers in Wilson made statements such as, “I used to enter assessment data into FAIS, but I have not done so this year because I lack the time”, or “We’re told to enter data into FAIS, but I don’t always do it because it is too time consuming.” This highlights not only the problem of insufficient time, but also the reality that no one may be enforcing requirements to enter data.

The union official who was interviewed at Wilson echoed the concerns of teachers over data entry and felt that the data entry demands are too great. In particular, the official felt that teachers struggle to find the time to meet these requirements (e.g., entering data into FAIS from a variety of assessments, in addition to the typical reporting of grades and attendance), and stated that teachers get too little feedback from principals or the district office relative to the amount of data they report.

The union official stated that excessive data entry burdens are particularly acute for schools flagged for improvement by PDE. As mentioned above, the data collection and reporting requirements for teachers and principals in improvement schools are greater than in non-improvement schools, as these schools must prepare detailed improvement plans and the district closely monitors their progress. The official also stated that

elementary and middle schools faced higher data reporting demands than high schools, largely because they must administer tests more often.

Availability and quality of training

Many teachers and principals who were interviewed cited the need for more and better professional development on data-driven decisionmaking. While teachers in the sample reported that they receive a great deal of professional development, most of it is not focused on how to use and interpret data. Schools and districts are increasingly finding and offering opportunities for training on DDDM, but these efforts have thus far been insufficient to meet teachers' training needs.

In all case study districts, teachers have received more training in basic computer skills than in how to interpret data and use it for instructional planning. District staff have made training on how to use computers and software programs a high priority, but are only in the early stages of arranging training on how to use data.

Wilson provides much of its training for teachers through the use of math and reading coaches, including some training on how to use student achievement data to inform instruction. The extent to which teachers find the training from these coaches to be useful varied. A few teachers stated that they believe some coaches are much better trainers than others, or are much better at communicating the district office's expectations than others. Lincoln is another district that makes extensive use of math and reading/literacy coaches at all three levels. Heavy use of coaches is also made at Kennedy. Other districts make less frequent use of coaches.

In addition, Wilson has principals on special assignment who visit schools to train teachers on how to use data. The principals train groups of teachers, and in some cases provide one-on-one training. Teachers and principals in a few schools noted that they highly value the training they have received from these principals.

Nonetheless, many teachers and principals at Wilson stated that they could use more support and professional development from the district on using data. Many felt that the training they have received on data systems such as FAIS has been insufficient. A common complaint among teachers is that the district office tells them what to do but does not give them enough guidance on how to do it. Examples teachers cited include being directed to enter results from the district standards-based assessments into FAIS, but being unsure of how to do so. Several teachers also stated that the training they have received on FAIS has focused more on how to access the system than on how to use it for instructional decisionmaking. District office staff conceded that teachers have not been trained adequately on FAIS, and mentioned plans to make more FAIS training available online. In fact, the district has placed many professional development materials and exercises on its intranet.

To provide teachers with the training and tools they need to practice DDDM, some districts are implementing a "train-the-trainers" approach, whereby a few teachers receive training and, in turn, pass their knowledge on to other teachers in their school. In Adams,

the data/technology director has trained a few groups of teachers in the elementary and middle schools the DIBELS literacy system and other student assessment tools, and those teachers have gone on to train others. In Adams and Buchanan, the district has sent small groups of teachers to external training seminars on data use (such as those offered by IUs and universities), and those teachers have returned and trained others. A train-the-trainers approach is a relatively low-cost way to disseminate knowledge, though it carries the risk of compromising fidelity to whatever model or approach is being taught. Wilson also utilizes a train-the-trainers approach to train teachers on how to use tools such as FAIS.

To varying extents, all of the case study districts use data to help identify specific professional development needs. This is generally done at the district level. Some districts, such as Lincoln, regularly survey teachers to identify various needs, including needs for additional training on data use and technology. In some districts, data-driven decisionmaking concerning professional development occurs at the school level. One such district is Wilson, where principals exercise some discretion over the kinds of professional development to provide. In some of the schools that were visited in this district, the principals identify professional development needs based on an assessment of student achievement data and arrange for trainers (from either within or outside the district) to visit the school. In one school, the data indicated that most students lacked proficiency in reading comprehension, and the principal devoted several regularly scheduled staff development sessions to instructional strategies for teaching reading.

Half (13) of the superintendents surveyed reported that more professional development for teachers in DDDM is essential. Another six said it is greatly needed. Ten reported that more professional development for principals is essential, while 12 indicated that it is greatly needed. Most respondents to the superintendent survey agreed or strongly agreed that their district's teachers and principals need support in using data for decisionmaking, although in several cases, these respondents also reported that their teachers or principals had the skills necessary to use data effectively.

The survey also asked about whether the district provides various kinds of support to schools, and about the usefulness of that support. All 26 respondents reported providing some professional development in DDDM to principals and teachers, as well as computer hardware, and technical assistance with technology. Twenty-two indicated that their district provides software and other technology support, and 24 reported that they offer technical assistance with data collection and analysis.

Summary

Across all case study districts, superintendents and principals expressed a strong interest in DDDM. Responses from teachers were more mixed, but most indicated that they value data and would like to use it more frequently for curriculum and instructional planning. Elementary and middle school teachers are somewhat more receptive to DDDM than high school teachers.

PSSA results are widely considered the most important source of student data, largely because the state relies on these results to evaluate schools and districts. Teachers and

administrators find the PSSA results to be useful but report three significant limitations: (1) the PSSA is administered too infrequently to be adequate for assessing student performance and adjusting instruction accordingly; (2) teachers receive PSSA results rather late in the school year, after they have done much instructional planning; and (3) the PSSA assesses the achievement of different cohorts of students from year to year.

Given the limitations of the PSSA, most of the case study districts are administering more frequent assessments and using the results to adjust instruction or revise the curriculum. In general, these are “low-stakes” assessments that enable teachers to track student progress more closely and vary instruction as needed. Schools are making increasing use of online rapid assessment tools. In some schools, however, a lack of computers makes use of these tools infeasible. Teachers most commonly use the results of frequent assessments to differentiate instruction for small groups. Schools and districts are making some use of non-assessment data (e.g., attendance, discipline, or demographic statistics), but use of these data is much less common.

Teachers collaborate in making decisions based on data. Most collaboration occurs within grade levels or, at the high school level, departments. In some schools data teams span grade levels. However, teachers frequently reported that they would collaborate more if they had more time. Some schools have built time into teachers’ schedules specifically for reviewing student data and planning instruction, but this is rare. Collaboration in DDDM across schools within a district is much less common, and some teachers and principals noted that such collaboration would be useful.

Several schools and districts lack sufficient technology to make the best use of data. This is especially the case in smaller districts, which generally face more resource constraints. In particular, districts lack comprehensive, integrated data systems that give teachers or administrators easy access to multiple sources of data. In some of the schools that were visited, technical problems with electronic data systems (e.g., systems crashing and losing data) have hampered efforts to implement DDDM.

Across all case study districts, teachers and principals identified lack of time as the biggest constraint on their ability to do more with data. Teachers and principals have many responsibilities during the course of a day and have difficulty finding time to regularly review and reflect on student data.

Schools and districts are increasingly finding and offering opportunities for training on DDDM, but these efforts have thus far been insufficient to meet teachers’ training needs. Many teachers expressed a desire to learn more about how to analyze and interpret data.

6. Conclusions and Recommendations

This final chapter summarizes findings from this study and presents several recommendations for action based on the literature review and analysis of the data collected. Most of the recommendations are directed to schools and districts, but some are intended for policymakers, and still others are directed to outside funding agencies.

Conclusions

Several broad conclusions can be drawn from these findings. First, the case study districts have a strong interest in DDDM, and district leadership has made DDDM a high priority. Nevertheless, the schools and districts in the study are generally in the early stages of systematically using data to drive decisionmaking.

Second, most teachers and principals also value data and are actively seeking ways to use data to improve instruction. However, many of them lack sufficient data analysis skills and a process for systematically using data. In addition, because most of these districts do not have comprehensive, integrated data systems, teachers and principals lack easy access to all of the existing data.

Third, schools and districts are using data to evaluate and adjust curriculum and programs, but generally not for evaluating teachers. They are taking significant steps to align their curricula and instruction with the state standards and improve their performance on the PSSA. DDDM plays a large role in these activities. Districts have made less progress in offering a sufficient amount of professional development or training in DDDM, such as how to interpret data and use it for instructional or curriculum planning, or how to use the available data systems effectively.

Fourth, the case study districts recognize the limitations of annual assessments and are making greater use of more frequent, interim and formative assessments to inform instructional decisions. Nevertheless, the case study districts are still finding their way in determining the best strategies for regularly administering these assessments and using the results.

Finally, lack of time presents perhaps the biggest challenge to schools and districts in Southwestern Pennsylvania as they pursue DDDM. Teachers and principals struggle to find the time to study and think about the data that are available to them. They lack adequate time to collaborate in analyzing and interpreting data, and to develop interventions to address students' learning needs.

The findings of this study, along with the review of literature on DDDM, lead to the following recommendations for schools, districts, policymakers, and funding agencies to help enhance the state of DDDM in SWPA schools. They are organized in parallel to Chapter 5, addressing policy, data sources, technology, and culture.

Recommendations regarding state and district policy

The state, possibly with the help of external funding agencies, should expand its efforts to build the capacity of the intermediate units to assist districts with DDDM. Research indicates that external support organizations such as IUs can help central office and school staff and make better use of data (Honig and Coburn, 2005). Intermediate units, as well as the Pennsylvania Training and Technical Assistance Network (PaTTAN), can assist districts with selecting data systems or warehouses, and can provide training and support in using them. For small districts with limited analytic capacity, IUs might also be the most appropriate locus of responsibility for data analysis. It is unreasonable to expect that every district will have substantial analytic capacity. Some of the relatively small case study districts face significant resource constraints and could benefit from analytical support from their IUs. The case studies suggest that while districts in Southwestern Pennsylvania get some assistance in using technology and analyzing data from their IUs, this level of assistance is generally insufficient.

The state should take advantage of economies of scale by building the capacity of the IUs to train district personnel in DDDM and analyze data for smaller districts. PDE may want to consider devolving its Governor's Institute training model to the intermediate unit level, so that more districts can take advantage of training. Funding agencies can also play a role in building IU capacity to assist schools and districts with DDDM. Rather than directly funding individual schools or districts, funding agencies are likely to have more leverage if their funding is targeted to intermediate units or other external support organizations, which can in turn assist districts.

To its credit, the PDE has begun to take more steps in this direction as evidenced by its recent contract with CDDRE (see p. 25). This is a very positive development, and expanding CDDRE's work to more districts while continuing its work with the intermediate units and PaTTAN should be a major priority for the PDE.

The state should create a statewide student achievement data system, with longitudinal student-level data. As noted above, the state officials who were interviewed said that such a statewide system is part of their vision for DDDM in Pennsylvania, and the PDE has recently received a \$4 million grant for this purpose. Developing the system requires the state to develop unique identifiers for each student in the state, which would enable the state to track individual students from year to year. If done appropriately, with random numbers used to identify each student, the privacy of each student can be protected. It is also necessary for the system to be compatible with SIF (Schools Interoperability Framework) standards, to ensure that it will be able to readily exchange data with other education data systems at the state, IUs, districts, and other locations.

School and district office staff should send clear and consistent signals to teachers concerning expectations for DDDM. Teachers in two of the case study districts, Wilson and Buchanan, reported that their efforts to use data were hampered by frequently changing or inconsistent mandates from the district office. For example, teachers in Buchanan have received considerable professional development in using online rapid assessment programs, only to have the district replace those programs with others. At

Wilson, teachers have reportedly received conflicting directives about developing individualized instruction plans for each student.

Although maintaining a stable technology and policy environment is not always possible, especially given the rapid pace with which technology changes and new ideas emerge, district office staff should at least be aware of this problem. They should consider the potential negative consequences that may result from replacing technologies or altering the processes by which teachers use data, and should carefully evaluate the systems and processes before implementing them at a large scale.

Schools and districts in the early stages of DDDM should focus first on setting goals and objectives for using data and on taking an inventory of data they already have. District office staff need to determine what questions they want to answer with the data. Several of these questions can probably be answered with data they already have, and a surprising amount of these data may already be in electronic form. After taking an inventory of all existing data sources, district staff should identify steps needed to integrate these data to the extent possible. This may involve purchasing a data system or turning to an external organization, such as their IU, to provide this function. They should then identify additional kinds of data they need to collect to help them answer the questions they have specified. These questions should include the following: How are we performing overall as a district? How is each school performing, both relative to state standards and with respect to the educational value added to each student? Are we serving all students well? What are our strengths and weaknesses? Which students are most in need of improvement?

District curriculum planners must ensure that instruction, the curriculum, assessments, and the state standards and assessment anchors are well aligned. Several of the districts that were studied have either just completed or were in the midst of this time-consuming exercise, generally through a formal curriculum mapping process. Achieving alignment across all of these levels can be quite difficult and is an ongoing effort. Yet many failures to use data effectively to drive decisionmaking can be traced to misalignment across these levels. For example, if assessments (including the PSSA) are not aligned with the curriculum, students may be tested in content areas that have not yet been covered in class, or teachers may feel they must adjust their teaching to the test. The PDE offers some resources to assist districts with this task, including tools provided by the Grow Network that link instructional strategies, PSSA results, and the state standards. Intermediate units should also be able to assist districts in this area. External funding agencies can play a role here, by ensuring that IU have the requisite resources, skills and knowledge to assist districts.

Districts should ensure that schools have the tools they need for effective DDDM. District office staff should ensure that teachers and principals have the tools and resources they need. Examples include formative assessment software, adequate professional development on analyzing and using data, coaches or other support staff to assist with DDDM and other instructional activities, and sufficient time to collaborate and analyze data.

Recommendations regarding data sources

Schools, districts, and the state should make better use of PVAAS. PVAAS offers significant advantages for DDDM over the use of cross-sectional student achievement data. Under the current accountability system in Pennsylvania (which is determined largely by the federal NCLB law), schools are encouraged to compare the performance of different cohorts of students over time (e.g., comparing PSSA scores for last year's eighth graders with those eighth graders who took the PSSA the year before). Many of the teachers who were interviewed pointed out that, from one year to the next, their students' ability levels, skills, and content knowledge often differ markedly. Year-to-year changes in mean PSSA scores or in the percentage of students scoring Proficient or above at each grade level may have as much to do with differences in the student populations as they do with the curriculum or teachers' instructional practices. Across all schools and districts, the teachers who were interviewed recognized the limitations of using cross-sectional PSSA score data, and many reacted positively to the concept of value added analyses.

By enabling schools to track the same students over time, PVAAS can give teachers, principals, and central office staff more valuable data on which to base decisions. This study indicates that many teachers and principals will perceive PVAAS as an improvement over using PSSA data alone. The PDE should continue to develop PVAAS reports and trainings as it brings all districts in the state into the program. Once all districts are participating in PVAAS and the PSSA is administered in all grade levels from 3-8, the DDDM efforts of districts in Southwestern Pennsylvania and throughout the state should benefit significantly. Those districts already participating in the PVAAS pilot program (as are two of the districts studied here) should make the data accessible to all principals and teachers, and should provide training to ensure that staff know how to interpret the data.

Schools and districts should combine assessment data with demographic information and data on student behavior and school processes. Discussions of DDDM often focus on assessment data, but other data are essential for interpreting that data. Important demographic data include (but are not limited to) race/ethnicity, gender, special education status, and free and reduced lunch status. Important behavioral indicators include absences, suspensions, and dropout rates. Data on school processes include (but are not limited to) class size, programs, instructional strategies, classroom practices, course descriptions, and the curriculum (Bernhardt, 2003).

Sound DDDM involves disaggregating assessment results by race, gender, and socioeconomic status in order to identify racial or gender achievement gaps, and gaps between higher and lower income students. This is particularly important due to the emphasis placed on closing these gaps by NCLB. Similarly, merging assessment results with school process data can yield useful insights and help to pinpoint where problems lie. For example, Love (2004) describes one district that cross-tabulated assessment data with data on the courses students had taken, and found that students who scored poorly in mathematics were generally the same students who had been taking certain remedial math classes.

District staff should focus more on the quality of the data than on the quantity. This means they should take an inventory of all assessments given in all grades throughout the district to identify those that may not serve a clear purpose. District office staff should ask of each assessment: Is it aligned with the state standards and the curriculum? Does it provide teachers and principals with useful information about their students? Some districts in this study that have gone through this exercise have identified assessments that yielded minimal useful information relative to their cost and the time they took away from teaching. Reducing the number of assessments may be a good idea anyway, as multiple assessments can become overwhelming for students (Cromey, 2000).

In adopting interim assessments, schools and districts should recognize that they are designed to be used for diagnostic purposes, not high-stakes purposes. The main objective of frequent assessments should be to closely track the progress of individual students or groups of students, diagnose learning problems, and think about options for remediation. Thus, their main use is at the classroom level, although principals may take an interest in periodically reviewing results or summaries of results. The value of these assessments could be undermined if they are used to evaluate, reward, or punish schools or teachers.

Recommendations regarding technology resources

Districts should adopt integrated student-level electronic data systems. Such systems include not only standardized assessment results, but also administrative data and student background information. Districts might follow Bernhardt's advice on the six key features that a data system or warehouse should have (Bernhardt, 2003). Specifically, these features are:

- Accessibility at different levels. In addition to principals and district office staff, all teachers should have access to the system at their desks.
- Automatic graph builders. Depicting data visually in charts or graphs facilitates data interpretation.
- Disaggregation on the fly. Teachers, principals, and district office staff need to be able to easily disaggregate data by classroom, achievement level, race, gender, and so on.
- Intuitive point-and-click or drop-and-drag technology. Systems with these features are user-friendly and preclude the need for substantial amounts of training.
- The ability to follow individual student achievement. Staff should be able to track a student's achievement over time, and to examine trajectories of all students in classrooms and other groups.
- Fast and easy creation of standard reports. As the site visits and superintendent survey results reveal, schools and districts must create multiple reports—often containing much of the same information—for the state and other stakeholders. Good data systems can quickly and easily generate these reports (Bernhardt, 2003).

A good model is the homegrown data system at Wilson. This system contains grades, results from the PSSA and other standardized assessments administered by the district, results from the district's own standards-based assessments, demographic data, attendance and behavior records, course enrollment, and a variety of other kinds of information. In essence, everything the district knows about each student is linked together. The data are accessible to district office staff, principals, and all teachers.

Although many districts lack the resources to develop such a system internally, they could investigate the many commercial systems that are available. Another option is to use one of the centralized data systems or warehouses operated by IUs, such as the Allegheny Intermediate Unit's CDA. However, the case study districts and the superintendents who completed the survey generally gave the CDA lukewarm marks, except in the area of data collection and storage. Whatever option a district chooses, it should make sure that the system is SIF compatible, so that it can interact with other data systems. Having a data system that is integrated and SIF compatible also reduces the data entry burden for teachers and other staff.

Districts should invest in technology that allows teachers to give more frequent, formative assessments. Teachers need access to online diagnostic assessment programs, such as Homeroom.com or Study Island, so that they can assess and track their students' progress on a monthly or even more frequent basis. Systems are also available from Harcourt Assessment, Educational Testing Service, Pearson, Edusoft, CTB/McGraw-Hill, and others. Some of these systems give teachers the choice of creating their own assessments or having the program pull questions from its item bank to generate its own assessments. Other systems only give teachers the latter option. Ideally, the item banks and assessments generated should be aligned with the state standards. The programs minimize the data-entry burden (i.e., data are entered by students when they complete the assessment online or answer sheets are automatically scanned into the computer) and ensure rapid turnaround of results (i.e., the program calculates the results quickly for both students and teacher). These programs can also be linked with the school's or district's data system, allowing electronic transmission of results to a data repository or to the principal.

Use of formative assessments to drive and adjust instruction should become an institutionalized practice within classrooms. The software must be able to create user-friendly reports for teachers. As mentioned above, teachers and principals need data systems—as well as online assessment systems—that can quickly and easily generate reports, including graphs. Teachers in the case studies who had access to these technologies generally found formative assessments to be valuable, and there is some empirical evidence that they are effective in raising student achievement (Black and Wiliam, 1998).

Indeed, greater use of formative assessments is a major goal of the PDE. According to PDE's Office of Educational Technology, a key step towards improving student achievement is for teachers to have access to real-time data in formats that suit their specific needs. As mentioned above, CDDRE is working with several districts in the state

to implement DDDM initiatives. A major part of these initiatives is the adoption of a formative assessment program called 4Sight Benchmarks, developed by the Success for All Foundation. In selecting an online formative assessment program, schools and districts should consider 4Sight Benchmarks, and they may want to contact officials in other districts who are using it.

Formative assessments should supplement other kinds of assessments that teachers administer. These other assessments include teacher-made tests, curriculum unit tests, and even reviews of portfolios or other student work. Developing an accurate picture of how a particular student or group of students is performing and of what their learning needs might be requires combining multiple pieces of assessment data. Furthermore, different assessments are often better at meeting different aims. For example, while several teachers said that PSSA results play a role in guiding their instructional decisions, those who administer more frequent, formative assessments generally report that the results of these assessments are more useful for diagnosing and addressing the learning deficiencies of individual students. However, in exploring the adoption of more frequent assessments, schools and districts should be careful to balance the need for a variety of assessments with the necessity to avoid overwhelming teachers and students with too many assessments.

Recommendations regarding development of a data-driven decisionmaking culture

Schools and districts should either develop or adopt a process for DDDM. Simply training teachers or principals in how to analyze data is insufficient. A majority of the superintendents who responded to the survey described their district's overall status with regard to DDDM as "willing and able to analyze data, but with limited capacity to plan from and utilize it". Teachers and principals need to be taught a process for using data, especially for formative or routine assessment purposes. Examples would be PDE's *Getting Results!* Framework, the Plan-Do-Study-Act model, or a similar model of continuous quality improvement (Cromey, 2000). Without such a process to follow, teachers are likely to be unsure of how they can systematically and consistently apply their new data analysis skills.

The National Science Foundation's Using Data Project offers another potential model process for using data (Love, 2004). Districts funded under this project send "data facilitators" from each school to workshops where they are taught data analysis methods as well as how to lead a data team in a collaborative inquiry process at their school. The project lays out a systematic approach for data teams to follow. For example, data teams are to begin by making predictions of what the data will tell them (e.g., eleventh grade students' PSSA math scores will be lowest on geometry items). Next, they are to analyze the data to identify patterns and student weaknesses (e.g., the data indicate that a large proportion of eleventh graders score poorly on geometry items). Finally, the team is to focus on interpreting the data—determining potential explanations for the results of the analysis (e.g., the geometry section of the math curriculum is weak, or teachers lack effective strategies for teaching geometric concepts). The entire process is led by the data facilitator (Love, 2004).

School leaders or data teams should identify a specific list of questions they want to answer with data. This list of questions should be aligned with the overall goals and objectives for DDDM identified at the district level (see above). These questions should frame all data collection and analysis activities. Research suggests that having a clear, defined set of questions helps to get everyone “on the same page”. It also makes DDDM more meaningful to teachers and reduces the likelihood that they will collect or analyze data that yield little information on the areas of student achievement that need the most attention. Such questions also encourage staff to consider the perspectives of others in the school or system (e.g., guidance counselors, the principal, teachers in other grade levels), to “step back and consider more objectively how school policies, teacher beliefs, conditions for learning, or teaching practices might be affecting students’ learning and achievement” (Lachat and Smith, 2005, p. 343). Examples of such questions might be: In which content areas is students’ performance weakest? Which instructional practices appear to be the most (or least) effective?

Schools and districts should ensure that teachers receive useful feedback reports on interim and other assessment data they provide to the data system. In some of the case study districts, teachers complained of entering classroom assessment and other data into the district’s data system but rarely receiving any useful information back. Because teachers should be the ultimate end-users of much data that is collected (albeit not the only end-users), they must receive timely feedback reports that provide them with information that is useful for instructional planning and decisionmaking. District staff should survey teachers or meet with focus groups of teachers to learn about the kinds of data they value for making decisions.

Districts should invest heavily in professional development in DDDM for teachers and principals. In the case study schools there is no dearth of professional development, and much of it focuses on using technology. Yet the professional development does not typically include how to use data to inform instructional and curriculum planning. Professional development planners in district offices (as well as union offices and intermediate units) should establish a plan for systematically training teachers and principals in DDDM, and make sure that the training is well aligned with the curriculum and state standards. The research literature indicates that many districts take a scattershot approach to professional development, offering training in a wide variety of topics with little attention to how the training sessions relate to each other, the curriculum, or other district goals.

Districts should make greater use of curriculum specialists such as math and reading coaches to instruct teachers on how to use student achievement data to guide instruction. Wilson, Lincoln, and Kennedy use coaches in this way, and there is some evidence that such an approach is effective (Armstrong and Anthes, 2001). Wilson also uses principals on special assignment to visit schools and provide training in DDDM and other areas. Although these coaches and principals often perform other duties, such as modeling lessons or instructional approaches, the study found that in these three sites they also frequently connect the instructional strategies they teach to student data. Training staff to become coaches is a task that IUs could undertake, and that funding agencies could

possibly help to fund. In addition, districts can use Pennsylvania Accountability Grant funding to pay for coaches, although they can use this funding for a variety of other programs or activities as well.

Schools and districts should seek creative ways to give teachers time to examine data and collaborate. Lack of time to review and reflect on student data was the most common barrier to DDDM cited by the teachers and principals in the case study districts. District administrators and principals may have to revisit certain priorities to ensure that teachers have enough time built into their schedules to examine data and regularly convene meetings of data teams, departments, or grade level teachers for the purpose of DDDM. Simply mandating that teachers review data from periodic or formative assessments or that they form data teams is insufficient. Given the time constraints mentioned by teachers across all districts and levels in the study, administrators must free up time for teachers to review data and plan. Teachers face many competing demands, and district and building leaders need to send a clear message that DDDM is a high priority. District and building leaders should also consider whether teachers face conflicting demands. For example, if the curriculum is standardized across all schools, as is the case at Wilson, central office staff should ensure that teachers and principals have the flexibility they need to make adjustments or supplement the curriculum with other materials.

District and school leaders should consider teachers' input in the selection of assessments, technology, models of continuous quality improvement or other processes for routinely analyzing data, and other key decisions related to DDDM. Teachers are more likely to buy into the notion of DDDM if they have a voice in the development of DDDM initiatives. This can be accomplished, for example, through teacher surveys or focus groups; or by establishing data teams tasked to analyze student data and draft recommendations for action, and to regularly seek input from other teachers in the building. Obviously teachers have no choice with regard to certain assessments, such as the PSSA. But administrators should seek their opinions on interim or formative assessments, and on the selection of software products such as online assessment tools. Administrators could also seek teachers' opinions about gaps in the curriculum or other aspects of whether the curriculum is aligned with the state standards and assessment anchors.

School and district staff should encourage teachers and parents to use the web-based and paper resources provided by the Grow Network. The Grow Network offers a variety of tools for viewing and analyzing PSSA scores in a user-friendly format, as well as resources that can help teachers better align their lessons with the state standards. The Grow Network also provides online resources for parents, such as suggested reading lists and reading and math activities that parents can do with their children. In addition, the website provides advice for parents on discussing their children's achievement with teachers, and contains information about the state standards and public libraries and other community resources (Olson, 2004; PDE, 2005).

Schools and districts should investigate ways to share more data with parents. One case study district, Buchanan, has used grant funding to give parents access to information on

their children's activities and achievement via the Internet. From their home computers (or from computers in the local public library or other community sites), parents of middle and high school students can access a password-protected district website to view their children's grades, attendance reports, and homework assignments. Parents can also communicate with teachers via email. Wilson is also phasing in an online interface that gives parents access to student information and the capability to send email to teachers.

By providing parents with more information about how their children are faring in school and enabling them to email teachers, schools may be able to foster more parent involvement and improve teacher-parent communication. Smaller and poorer districts may lack the financial resources to give parents online access to student data. Nevertheless, these districts can send home periodic reports that go beyond the standard report card.

References

- Armstrong, J., K. Anthes, "How Data Can Help: Putting Information to Work to Raise Student Achievement," *American School Board Journal*, November 2001, pp. 1-4.
- Bernhardt, V. L., "Using Data to Improve Student Achievement," *Educational Leadership*, Vol. 60, No. 5, 2003.
- Black, P., and D. Wiliam, "Assessment and Classroom Learning," *Assessment in Education: Principles, Policy, and Practice*, Vol. 5, Issue 1, 1998, pp. 7-75.
- Chen, E., M. Heritage, and J. Lee, "Identifying and Monitoring Students' Learning Needs with Technology," *Journal of Education for Students Placed at Risk*, Vol. 10, No. 3, 2005, pp. 309-332.
- Choppin, J., "Data Use in Practice: Examples from the School Level," paper presented at the Annual Conference of the American Educational Research Association, New Orleans, La., April 2002.
- Council of the Great City Schools (CGCS), *Beating the Odds II: A City-by-City Analysis of Student Performance and Achievement Gaps on State Assessments – Spring 2001 Results*, Washington, D.C., 2002.
- Cromey, A., "Using Student Assessment Data: What Can we Learn From Schools?" North Central Regional Educational Laboratory, Policy Issues Brief No. 6, November 2000.
- Deming, W. E., *Out of the Crisis*, Cambridge, Mass.: MIT Center for Advanced Engineering Study, 1986.
- Detert, J. R., M. E. B. Kopel, J. J. Mauriel, and R. W. Jenni, "Quality Management in U.S. High Schools: Evidence from the Field," *Journal of School Leadership*, Vol. 10, 2000, pp. 158-187.
- Feldman, J., and R. Tung, "Whole School Reform: How Schools Use the Data-Based Inquiry and Decision Making Process," paper presented at the 82nd Annual Meeting of the American Educational Research Association, Seattle, Wash., April 2001.
- Herman, J., and B. Gribbons, *Lessons Learned in Using Data to Support School Inquiry and Continuous Improvement: Final Report to the Stuart Foundation*, Los Angeles, CA: National Center for Research on Evaluation, Standards, and Student Testing, 2001.
- Honig, M. I., and C. E. Coburn, "When Districts Use Evidence to Improve Instruction: What Do We Know and Where Do We Go From Here?" *Voices in Urban Education*, Number 6, Winter 2005, available online at <http://www.annenberginstitute.org/VUE/archives.html>.

- Ingram, D., K. S. Louis, and R.G. Schroeder, "Accountability Policies and Teacher Decision Making: Barriers to the Use of Data to Improve Practice," *Teachers College Record*, Vol. 106, No. 6, 2004, pp. 1258-1287.
- Johnson, J. H. "Data-Driven School Improvement," *Journal of School Improvement*, Vol. 1, Issue 1, Spring 2000.
- Juran, J. M., *Juran on Planning for Quality*, New York: Free Press, 1988.
- Keeney, L., *Using Data for School Improvement: Report on the Second Practitioners' Conference for Annenberg Challenge Sites, Houston*, Providence, RI: Annenberg Institute for School Reform, 1998.
- Kerr, K. A., J. A. Marsh, G. S. Ikemoto, H. Darilek, H. Barney, "Districtwide Strategies to Promote Data Use for Instructional Improvement," Santa Monica, Calif.: RAND Corporation, WR-254-WFHF, April 2005.
- Lachat, M. A., *Data-Driven High School Reform: The Breaking Ranks Model*, Providence, RI: LAB at Brown University, 2001.
- Lachat, M. A., and S. Smith, "Practices That Support Data Use in Urban High Schools," *Journal of Education for Students Placed at Risk*, Vol. 10 No. 3, 2005, pp. 333-349.
- Love, N., "Taking Data to New Depths," *JSD*, Vol. 25, No. 4, Fall 2004, available online at <http://www.nsd.org/library/publications/jsd/love254.cfm>.
- Mason, S., *Turning Data Into Knowledge: Lessons from Six Milwaukee Public Schools*, Madison, WI: Wisconsin Center for Education Research, 2002.
- Massell, D., "The Theory and Practice of Using Data to Build Capacity: State and Local Strategies and Their Effects," in S. H. Fuhrman, ed., *From the Capitol to the Classroom: Standards-based Reform in the States*, Chicago: University of Chicago Press, 2001.
- McCaffrey, D. F., J. R. Lockwood, D. M. Koretz, and L. S. Hamilton, *Evaluating Value-added Models for Teacher Accountability*, Santa Monica, Calif.: RAND Corporation, MG-158-EDU, 2003.
- Mooney, M., L. A. Phelps, and T. M. Anctil, *Using Postschool Outcome Data to Improve Practices and Policies in Restructured Inclusive High Schools*, Research Institute on Secondary Education Reform for Youth with Disabilities, Research Brief No. 6, July 2002.
- Olson, L., "User-Friendly Reports on Student Test Scores Help Guide Instruction," *Education Week*, Vol. 23, No. 38, 2004.
- Pennsylvania Department of Education, Grow Parent Website, available online at <http://www.growparents.com/paelementary/>.

- Sanders, W., and S. Horn, "Research Findings from the Tennessee Value-added Assessment System (TVAAS) Database: Implications for Educational Evaluation and Research." *Journal of Personnel Evaluation in Education*, Vol. 12 No. 3, 1998, pp. 247-256.
- Schmoker, M., *Results: The Key to Continuous School Improvement*, Alexandria, VA: Association for Supervision and Curriculum Development, 1996.
- Schmoker, M., "First Things First: Demystifying Data Analysis," *Educational Leadership*, Vol. 60, No. 5, 2003.
- Schmoker, M., and R.B. Wilson, "Results: The Key to Renewal," *Educational Leadership*, Vol. 51, No. 1, 1995, pp. 64-65.
- Senge, P., *The Fifth Discipline: The Art and Practice of the Learning Organization*, New York: Doubleday, 1990.
- Snipes, J., F. Doolittle, and C. Herlihy, *Foundations for Success: Case Studies of How Urban Schools Improve Student Achievement*, New York: MDRC, 2002.
- Supovitz, J. A., and V. Klein, *Mapping a Course for Improved Student Learning: How Innovative Schools Systematically Use Student Performance Data to Guide Improvement*, Philadelphia, Penn: Consortium for Policy Research in Education, University of Pennsylvania, 2003.
- Thorn, C. A., "Knowledge Management for Educational Information Systems: What is the State of the Field?" *Education Policy Analysis Archives*, Vol. 9, No. 47, 2001, available online at <http://epaa.asu.edu/epaa/v9n47>.
- Viadero, D., "Achievement Gap Study Emphasizes Better Use of Data," *Education Week*, Vol. 23, No. 19, 2004.
- Young, V. M., "Data-Driven Instruction: A View from the Bottom Up," paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada, 2005.
- Wayman, J. C., S. Midgley, and S. Stringfield, "Collaborative Teams to Support Data-Based Decision Making and Instructional Improvement," paper presented at the 2005 Annual Meeting of the American Educational Research Association, Montreal, Canada.