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### Leading Data Use in Schools: Organizational Conditions and Practices at the School and District Levels

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## **Leading Data Use in Schools: Organizational Conditions and Practices at the School and District Levels**

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*This study examined data use and conditions influencing data use by typical principals and teachers, as well as the relationship between data use and student performance. The analysis drew upon a multi-method investigation of leadership at the school, district, and state levels. The findings emphasize the leadership of principals in establishing data use purposes and expectations, opportunities, training, access to expertise, and follow-up actions. Principal and teacher use of data is strongly shaped by district leaders in the context of state accountability systems. Statistical evidence linking patterns of data use to achievement test results was weak, and limited to elementary schools.*

Teachers and administrators are being strongly urged to use more systematically collected sources of evidence to justify their claims and inform their decision making (Ladd, 1996). Such admonishment arises from two sources. One source is the accountability context in which schools find themselves. The public has become increasingly concerned, over the past 20 years, about the ability of schools to prepare their students for a challenging and uncertain future. In this context, the value of public schooling is no longer to be assumed, it is to be demonstrated. These concerns are manifested in government policies that demand technically acceptable and publicly accessible evidence of value for dollars spent on public education. Educator expectations that the communities they serve should simply “trust me” because of their credentials and presumed expertise no longer suffice.

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A second and related source of the admonishment to be more evidence-driven is the widely accepted expectation of continuous school improvement. Accountability-oriented educational policies, such as No Child Left Behind, demand “adequate yearly progress.” As well, popular organizational theorists have created idealized visions of organizations that continue to get better forever. These are “learning organizations” (Senge, 1990), organizations that develop from “good to great” (Collins, 2001), organizations capable of “sustaining” their productivity indefinitely through ongoing adaptations to their ever-changing environments (Wheatley, 2005). A central feature of these idealized organizational types is access to, and use of, exceptionally comprehensive, sensitive, formative feedback about their progress and conditions affecting that progress. When schools aspire to continuous progress there is an expectation that they, too, will make use of such data to better pinpoint problems, assess their current status, and learn their way forward (e.g., Goldring & Berends, 2009; Hawley & Sykes, 2007; Zmuda, Kuklis, & Kline, 2004).

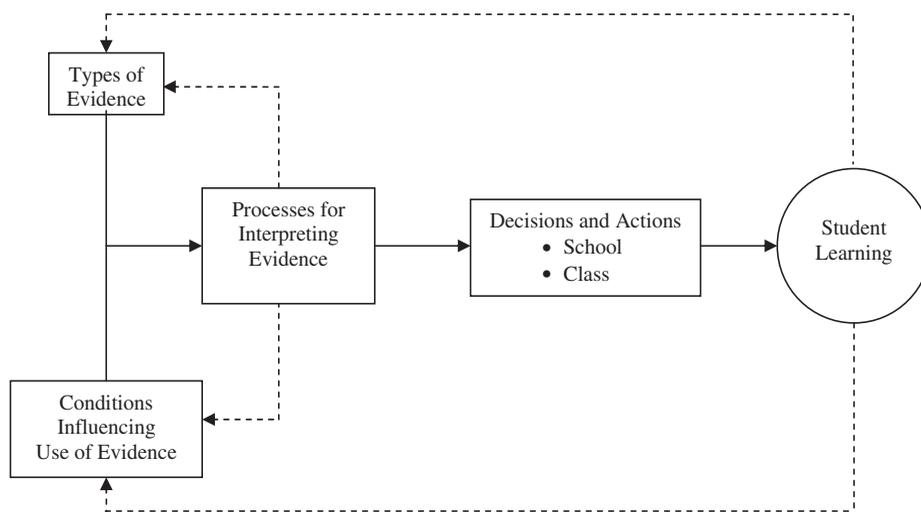
Here we present findings from an analysis of data use for school improvement and student learning by principals and teachers. The study addressed three broad questions:

- What organizational conditions influence principals’ engagement in using data and supporting data use by teachers?
- What types of data and patterns of data use are found in typical schools (and in schools where evidence-driven decision making has become a priority)?
- What relationship does data use in schools have to student performance?

Our analysis builds upon findings and a framework from prior research by Ikemoto and Marsh (2007) concerning patterns of data-based decision making in schools, and related conditions.

## FRAMEWORK AND RELATED RESEARCH

Data collection and analysis for the study were framed by five variables about which there is considerable prior evidence. In this framework (Figure 1), student learning is the dependent variable, influenced most directly by the *decisions and actions of school principals and their staffs*. *Types of evidence available to the school* and existing *conditions influencing how evidence are interpreted and used* are variables shaping the *processes for interpreting evidence* used by principals and their colleagues in their *decisions and actions*. The framework acknowledges the reciprocity of relationships among these variables. For example, the outcome of data interpretation processes might not be actions or decisions aimed directly at student learning; instead, it



**FIGURE 1** Framework for understanding evidence-informed processes.

might be a search for additional types of evidence considered crucial to decisions, or push-back on some external influences on data use considered unhelpful by principals and teachers. Our analysis is drawn from a broader study of linkages between leadership and student learning at the school, district, and state levels (see Methods, below, for details). The analysis focuses on findings associated with types of evidence, organizational conditions influencing data use, and patterns of data utilization, because the study was not explicitly designed to investigate specific action plans arising from principal and teacher data use. While the linkages between student achievement and these three factors are indirect and mediated by decisions and actions arising from data use, we did explore the relationship between our findings on data use and the measures of student achievement obtained for the broader study.

The term “evidence” in this framework is indicative of our sense that information from achievement and other types of systematically collected and codified data are a particular category of information, but do not represent all the information that principals and teachers might draw upon in making decisions about school improvement and student learning (discussed in greater detail further on). We approached our analysis with an open mind about the kinds of evidence principals and teachers might refer to in talking about the information they take into account for these purposes; however, as will be evident in our discussion, talk about evidence use for decision making in schools tends to be couched largely in terms of formally collected data on student learning and student characteristics. Hence, we opt for the term data use.

## TYPES OF DATA: BREADTH &amp; NATURE

## Nature of Data

The admonition to be “more evidence-based” should not be taken literally. It is certainly not the case that teachers and administrators have been making “evidence-free” decisions for the past hundred years. But the evidence typically available to teachers and school leaders about many important features of their work has often come from the impressions they form as they go about their normal work in schools and classrooms. Just walking through the halls of their schools, principals hear the voices of happy children and see the anxiety on the faces of some of their teachers. Children come to principals’ offices to read them their stories. Picking up their kids after school, some parents chat with the principal about what their children had to say about the school trip yesterday. These opinions are further shaped by the inevitable sharing of views in regular staff meetings and the many informal conversations with and among teachers and support staff. All of this is what Little refers to as ordinary workplace practice; these typically narrative accounts of experience “constitute a pervasive feature of workplace discourse and a resource for workplace learning” (2007, p. 220). Historically, however, the academic community has distrusted information absorbed or generated informally by teachers and administrators through their ordinary workplace practices (Little, 2007).

Report card grades represent another conventional source of data produced by teachers and available to principals. One key feature of these data is that they tend to be considered on an individual basis, not an aggregated basis for all students or subgroups. The aggregation and disaggregation of student performance data in order to identify and monitor student learning needs and progress, and to plan for improvement, is a recent phenomenon in the work of school personnel.

To be more precise, then, the admonition for administrators and teachers to be more “evidence-based” is not simply an admonition to make greater use of evidence; as Wilson points out, “assessment information drawn from standardized tests represents no more than a drop in the bucket of all assessment information that is gathered in a typical classroom” (2004, p. 2). Rather, it is an admonition to make greater use of a different type of evidence than administrators and teachers have typically used. This would be formally and systematically collected evidence for which there are, preferably, estimates of reliability and validity of the kind developed and championed by the academic test and measurement community, and objective criteria and standards for evaluating performance progress and outcomes. Whether or not shifting the weight of emphasis from unobtrusive to obtrusive evidence (“data,” in contemporary terms) for decision making will improve schools, as many now argue (e.g., Heritage & Yeagley, 2005), is an empirical question.

## Breadth of Data

The framework for our larger project points to the mostly indirect influence of principals' actions on students and on student learning (e.g., Hallinger & Heck, 1996). Such actions are mediated, for example, by school conditions such as academic press (Goddard, Sweetland, & Hoy, 2000) with significant consequences for teaching and learning, as well as by powerful features of teachers' classroom practices such as the uses of instructional time (e.g., Resnick, Besterfield-Sacre, Mehalik, Sherer, & Halverson, 2007). Data-informed decision making by principals, guided by this understanding of principals' work, could include having and using a broad array of systematic evidence, for example, key features of their school's external context; the status of school and classroom conditions mediating leaders' own leadership practices, as well as the status of their students' learning.

The systematically collected type of data available to schools is often limited in its breadth to the current status of student achievement. In some schools this consists almost entirely of externally mandated test data gathered toward the end of the school year, while in others, formative assessments of students' academic progress are gathered during the year, in addition to the end-of-year summative assessments. While information about achievement is obviously critical for schools, it has little to say about the causes of such achievement or about the strategies that might be useful in moving such achievement forward. Finally, the majority of large-scale national or state testing programs provide achievement data focused only on a narrow band of objectives in the formal curriculum (Knapp, Copland, & Swinnerton, 2007; Leithwood & Levin, 2005), thereby limiting school accountability to only a subset of public aspirations for education (Anderson & Rodway-Macri, 2009).

## CONDITIONS INFLUENCING DATA USE IN SCHOOLS

Ikemoto and Marsh (2007) examined interview and documentary data from two school-improvement related studies in ten districts across four states to gain insight into variations in data-driven decision making practices and conditions across districts and schools. They identified a set of school and district conditions likely to support data use in schools. Developing these conditions requires leadership most obviously from principals (Firestone & Gonzalez, 2007; Wayman, Midgley, & Stringfield, 2006), although others might certainly contribute. Six of the seven conditions identified by Ikemoto and Marsh include:

- Accessibility and timeliness of data;
- Perceived validity of data;

- Staff capacity and support for considering data;
- Time available to interpret and act on the evidence;
- Partnerships with external organizations in analyzing and interpreting data;
- Tools for both data collection and interpretation (procedures and instruments).

Similar sets of conditions fostering data use in schools have been suggested by Wilson (2004), Heritage and Yeagley (2005), Yeh (2006), Datnow, Park, and Wohlstetter (2007), and Coburn, Touré, and Yamashita (2009). Datnow and her colleagues, for example, investigated data-driven decision making practices in eight elementary schools from two midsize urban school districts and two charter school management organizations that were identified as leaders in data use for school improvement. In addition to the conditions identified above (i.e., staff development and expert support, structured time for teacher collaboration, and tools), they highlighted central office strategies to build school capacity for data use that included creating opportunities for networking and sharing between schools about data and its utilization, and offering rewards and incentives to schools and staff linked to data use.

Organizational culture and leadership reflecting norms and values supporting careful use of systematically collected data, creating what Katz and his colleagues (2002) refer to as an “evaluation habit of mind” within schools, is a seventh condition fostering data use identified by Ikemoto and Marsh (2007). Justification for including this condition in our analytic framework is supported by evidence reported by Louis, Febey, and Schroeder (2005). “Active efforts,” they reported, “by district-level administrators to mediate sensemaking affected teachers’ attitudes toward accountability policies and standards-driven reform” (p. 177). Firestone and Gonzalez (2007) also demonstrate different ways in which data are interpreted and used in schools and districts when the dominant norms in the district culture are “accountability oriented” rather than “organizational learning” oriented. Datnow, Park, and Wohlstetter (2007) emphasized the importance of building a foundation for data-driven decision making at the school system level by establishing specific measurable goals at the system, school, and classroom levels; the development of a systemwide curriculum aligned with those goals; and instituting data-linked strategies for monitoring progress toward the accomplishment of those goals (see also Togneri & Anderson, 2003). They argued that these foundational conditions were key to establishing a culture of data use and continuous improvement at both the school system and school levels manifested in shared professional expectations and norms regarding data use, and mutual accountability for data use and support in school and central office relations. We consider state and district accountability policies as an element of this condition, in addition to professional norms and beliefs associated with data use at district and school levels.

## PROCESSES AND PATTERNS OF DATA USE

Ikemoto and Marsh (2007) examined and compared 36 examples of data-driven decision making across their district and school level data set. From their analysis they derived four models of data-use varying in terms of the relative complexity of the types of data used and the relative complexity of data analysis and decision making. They labeled these models basic (simple data, simple analysis and decision making), analysis-focused (simple data, complex analysis and decision making), data-focused (complex types of data, simple analysis and decision making), and inquiry-focused (complex types of data, complex analysis and decision making). In principle, different decisions might exemplify varying data use models within the same setting. Ikemoto and Marsh observed that the basic model, however, was the predominant pattern of data use in their sample (which was not limited to schools known as exemplary users of data for decision making). These data use models vary along five dimensions, some of which interface with type and breadth of data as previously discussed:

- *Number of data sources.* Variation on this dimension is from a single source (such as an annual standardized reading assessment) to multiple sources (for example, including other standardized tests or teacher-created assessments). Justifications for considering this dimension can be found in basic and longstanding arguments about the limitations and biases inevitably associated with any single type or source of data (Brewer & Hunter, 1989; Yin, 1984). Knapp and his colleagues (2007) have described several mistakes schools can make if they rely on only one data source.
- *Nature and extent of data analysis.* While Ikemoto and Marsh (2007) acknowledge that in some circumstances simple forms of data analysis might be quite appropriate, less obvious but critical underlying explanations for results will sometimes require more complex analysis. Disaggregating data by student groups, for example, is a minimum requirement for pinpointing the potential sources of underperformance among students in many school contexts. The use of external standards or criteria as tools to aid in the interpretation of data adds a further dimension of complexity in creating meaning out of student performance data.
- *Who is involved in data interpretation and use.* At the least productive end of this dimension, one person (often the school administrator or a designated teacher leader) does most of the analysis and interpretation and then reports the results of that work to teachers. The most productive end of this dimension entails the engagement of multiple staff in data analysis and in decision making, akin to what Wayman and colleagues (2006) call collaborative data teams, whose work together exemplifies the popular images of professional learning communities (Dufour, Eaker, & Dufour, 2005). Collaborative structures in which educators jointly work to

make sense of data in schools have been recommended by many others, as well (e.g., Earl & Katz, 2002; Heritage & Yeagley, 2005; Knapp et al., 2007; Datnow, Park & Wohlstetter, 2007).

- *Engagement of special expertise.* This dimension considers the nature and extent of engagement by people with expert knowledge. Ikemoto and Marsh (2007) refer specifically to sources of expertise external to the school, for example, district staff with technical measurement expertise or university faculty with specialties relevant to the content of particular assessments. For our purposes we expand this construct to encompass the engagement of special expertise in the collection and interpretation of data from sources within as well as outside the school. At the least productive end of this continuum is complete lack of engagement of such people in a school's analysis and interpretation processes, while at the most productive end experts are called upon to assist for well-defined reasons. Wayman et al. (2006) describe how some schools in their study engaged people with expertise in the data analysis programs that were used to summarize the school's student achievement data. Datnow, Park, and Wohlstetter (2007) highlight the presence of experts in the analysis and interpretation of data at both the district and school levels in their sample of high data-use settings, and note that this role is best served by educators with deep knowledge of curriculum and instruction, not simply by measurement and evaluation specialists. Again, the issue may be less whether special expertise for interpreting data originates from outside or inside the school, than whether and how that expertise is brought to bear in the utilization of student learning data.
- *Number of data points.* This dimension distinguishes principal and teacher decisions informed by data collected at only one point in time from those grounded in data collected and assembled from several points, especially data on student growth against expected learning standards throughout the year, and from year to year. Longitudinal evidence can reveal trends in student performance and characteristics in schools that have greater significance for school improvement purposes than data that provide a snapshot at only one point in time.
- *Data utilization contexts.* Added to these dimensions along which principals and schools vary in their data use, we also inquired about the range of purposes and contexts of data use in schools, a broader indicator of the prevalence of data use in schools not distinctly evident in the other five dimensions. Within this dimension we incorporate variability in the types and number of organizational contexts in which data are used (e.g., school improvement planning meetings, grade-team meetings, data retreats). We found these dimensions of data use, more so than the models per se, useful in comparing data use across our sample of site visit districts and schools.

## DATA USE AND STUDENT LEARNING

Evidence about the influence on student learning of data use by district leaders, principals, or teachers has to be cobbled together from different strands of research. The most compelling line of research concerns teachers' use of formative or "just-in-time evidence" (Erickson, 2007) about their students' learning to shape their own instruction. A review of more than 250 studies by Black and Wiliam (2004) is frequently cited as the primary source of the claim that formative assessment, in Popham's words, "can fundamentally transform the way a teacher teaches" (2008, p. vii). Given that conclusion, the contemporary emphasis on use of evidence of student performance emanating from large-scale accountability tests as the sine qua non of data utilization in schools seems somewhat misdirected, at least for the purpose of instructional decision making aimed at improving the performance of individual students.

Evidence about the impact on student achievement of large-scale testing programs developed as part of state and district performance-based accountability policies is mixed at best. Based on his review, for example, Mehrens (1998) concluded that there was much more rhetoric than evidence about the positive consequences of this type of assessment. Koretz (2005) asserts that evidence about the effects of assessment-based accountability is both sparse and discouraging. Indeed, a vigorous critique of the effects of large-scale student assessment has developed as such data have become increasingly high stakes for students, teachers, and administrators (e.g., McNeil, 2000; Mintrop, 2004). On the other hand, Carnoy and Loeb's (2002) comparison of high- and low-accountability states found significantly greater 8<sup>th</sup> grade math achievement for students in high-accountability states with no difference in retention or high school completion rates.

There is evidence from research on effective and improving school districts that data-informed decision making, with an emphasis on data about student progress and outcomes, is characteristic of district-level leadership in these settings (e.g., Cawelti & Protheroe, 2001; Murphy & Hallinger, 1988; Togneri & Anderson, 2003; Datnow, Park, & Wohlstetter, 2007). Coburn et al.'s (2009) case study of evidence use related to instructional decision making in one school district, however, reveals that the use of assessment data and other forms of evidence (e.g., research) can be more symbolic than instrumental as different policy actors attempt to influence decisions to reflect their preferences. This finding challenges the common view that evidence use for school improvement is objective, and that the mere fact of evidence use will consistently lead to improved learning. The fact that data use is correlated to district leader concerns and evidence about student performance does not necessarily mean that it contributes positively or negatively to that performance. Whether and how district-level uses of data shapes the use of data by principals and teachers in schools is less clear from existing studies of district central offices.

Datnow, Park, and Wohlstetter's (2007) study of districts nominated as leaders in data use, however, confirms the positive relationship between student achievement and the engagement of central office leaders in data-driven decision making, and highlights their key role in establishing a culture and support system for performance-driven inquiry and decision making at the school and local system levels.

While increasing reports of data use by educators at the school and district levels can be found in the literature, at present these often consist of case studies of one or a few sites purposively chosen to exemplify positive stories of data use (e.g., Boudett & Steele, 2007; Mandinach & Honey, 2008; Datnow, Park, & Wohlstetter, 2007). Such studies provide insights not only into the uses of data, but into the organizational conditions (e.g., leadership, resources, professional trust between teachers and between teachers and administrators) conducive to data use, and how data use by local practitioners can evolve and become more comprehensive and institutionalized into ongoing work routines over time. Often, however, the recency of data use innovations in practice make it difficult to discern their impact on student learning. These kinds of case studies, like case studies of effective schools, do not necessarily represent the norm in most districts and schools. The findings presented from our research offer a less-selective perspective on the prevalence, nature, and conditions supporting data use in typical schools across multiple state and district jurisdictions.

## METHOD

### Design

This mixed-methods study was part of a larger five-year project about how leadership influences student learning (Louis et al., 2010). The larger study collected teacher and principal survey data in the second and fifth year from a stratified random sample of approximately 180 schools nested in 43 districts and nine states. Three cycles of site visits were conducted in years two, three and five in 18 districts (one large, one small from each state). These visits included interviews with district personnel, and interviews and classroom observations with teachers and principals in 36 schools (one elementary and one middle or high school per district). A three-year profile of student achievement data in language arts and mathematics from state accountability tests was created for each of the districts and schools.

Evidence for this analysis comes from the first round of teacher ( $N = 4491$ ) and principal ( $N = 280$  including assistant principals) survey data, interviews with principals ( $N = 27$ ) collected during the second round of site visits, and case studies based on interviews with district leaders, school administrators, and selected teachers from six site-visit elementary schools identified from the survey responses as high users of data for decision-making.

**TABLE 1** Extent of Principal Data Use.

Items (scale reliability)	<i>N</i>	Mean	Standard deviation
Principal survey (scale = 0.866)			
I rely frequently on research evidence in my decision making.	237	4.86	0.962
I rely frequently on systematically collected evaluation data about my school in my decision making.	236	4.97	0.958
I use data about student achievement to help make most decisions in my school.	237	5.14	0.914
I encourage my teachers to make use of data in their decision making.	237	5.32	0.802
Teacher survey (scale = 0.941)			
School's principal(s) encourages you to use data in your work.	4039	4.34	1.427
School's principal(s) encourages data use in planning for individual student needs.	4038	4.40	1.410

## Surveys

Four questions on the principal survey and two on the teacher survey inquired about principals' use of evidence and encouragement for such use on the part of their teachers. Means, standard deviations, and internal scale reliabilities were calculated for responses to these questions and Pearson product correlations were estimated (Table 1). Five principal survey questions asked about their districts' capacity for assessing and using data for several different purposes (Table 2).

## Principal Interviews

Interviews with principals were guided by relatively open-ended questions about many aspects of their work, including the use of evidence in decision making. The open-ended nature of these questions presents both advantages and disadvantages to the interpretation of results. On the positive side, these questions did not overtly encourage respondents to claim more evidence use in their decision making than was actually the case. On the other hand, since the study was focused primarily on leadership sources and practices, questions that provided an opportunity for principals to talk about uses of student data and other evidence in decision-making contexts (e.g., leadership and school improvement planning) were not necessarily probed for details about actions arising from decisions associated with data use. Thus, the interview data reveal salient patterns of data use across the sampled schools and districts as reported by principals across the schools and districts sampled, but the findings are more suggestive than conclusive about what principals and teachers are and are not doing in regards to using and supporting the use of data.

**TABLE 2** Relationship Between Principal and District Data Use.

	Principal responses to items about the school		Teacher responses to items about the principal	
	I rely frequently on research evidence in my decision making.	I rely frequently on systematically collected evaluation data about my school in my decision making	The principal encourages me to use data in my work	The principal encourages me to use data in planning for individual student needs
Principal responses to items about the district				
Our district has the capacity for reliable assessment of student and school performance.	0.331**	0.271**	0.111	0.162
Our district incorporates student and school performance data into district-level decision making.	0.402**	0.384**	0.106	0.118
Our district assists schools with the use of student and school performance data for school improvement planning.	0.344**	0.416**	0.046	0.058
The district uses student achievement data to determine teacher professional development needs and resources.	0.426**	0.397**	0.102	0.129

\*\*Significant at the 0.05 level (2-tailed).

## Student Achievement

Data about annual levels of achievement in literacy and mathematics were acquired through each school's website. These were data generated from state testing programs. We explored our question about the relationship between variations in data use and student achievement using two achievement measures: changes in achievement over three years, and average annual achievement measures. Following Linn's (2003) advice for generating stable achievement measures, each school's score included a combined math and language score for all grades tested, though math and language scores were also examined separately.

## Case Studies of Exemplary Data Use

The survey data enabled us to identify school sites (five elementary, one middle school) where principal and teacher utilization of data associated with student performance was significantly greater relative to other schools in the sample (one SD or more on a combined measure of principal and teacher data use items). Using the full sets of interviews with principals and teachers in these schools, we examined further details about data use, while checking the consistency of principal and teacher accounts of data use (e.g., in grade-team meetings, at school data retreats, for planning tutoring). We were also able to compare interview comments from central office personnel concerning data use and support for data use at the district level with the school-based stories of data use. We developed case studies of data utilization for each of the six highest-use schools. Here we report cross-case findings from these cases.

## RESULTS

We present our findings in five subsections, reflecting our initial conceptual framework blended with Ikemoto and Marsh's conditions and processes of data use in schools (Ikemoto & Marsh, 2007). We begin with survey data from principals that provide an overall measure of their own data use for decision making, as well as teacher survey data concerning principal encouragement for data use by teachers. Then we present findings about organizational conditions affecting use, drawing upon the principal interviews and our case studies of data use in six elementary and middle schools. Because of the prominence in our findings of district level influence on data use by principals and teachers, we discuss this "condition" separately, incorporating both survey and interview data. Next we turn to the reported processes and patterns of data use in schools. We conclude with findings from our efforts to investigate the relationship between data utilization and student performance.

## INCIDENCE OF PRINCIPAL ENGAGEMENT IN DATA USE

Table 1 summarizes mean responses and standard deviations for each of the principal and teacher survey items related to the incidence of principals' data use in the sampled schools, as well as for the items treated as two separate scales (both quite reliable). One scale reflects the principals' self-reports, the other measures teachers' perceptions of the extent to which principals encourage teachers to use data in their schools.<sup>1</sup> The surveys asked respondents to indicate on a 6-point scale (Strongly Disagree to Strongly Agree), the extent of their agreement with the statements listed in Table 1.

All response means were above the midpoint of the scale (3.5). Even for the lowest rated item ( $M = 4.86$ ), principals moderately agreed that they made frequent use of research evidence. They were in strongest agreement (and with the lowest variability across respondents) that they encouraged teachers to make use of data in their decision making. Teachers, by comparison, less strongly agreed that principals provided this encouragement, either for work decisions in general or in planning for meeting student needs more particularly. As the standard deviations reported in Table 1 indicate, there is more variability in teachers', as compared with principals', responses, which suggests either that teacher awareness of the extent of principals' use of data is inconsistent or, more likely, that principal self-reports overestimate the frequency and extent of their engagement in data use for different decisions.

These results indicate that principals and teachers in our sample of typical schools believe that principals use data and provide a moderate amount of encouragement for their use by staff. We turn to the interview and case-study data for further insight into the extent and nature of variability in data use amongst principals and their staffs.

## INFLUENCES ON DATA USE IN SCHOOLS

Evidence about influences on data use in schools was provided in the principal surveys, principals' interviews across all sites, and our school and district case-study interviews in high data-use sites. Interview results offer a perspective on the extent to which principals were aware of and attended to conditions that foster data use in schools, and what they believed districts were doing to foster such use. Survey data allowed us to assess the extent to which district data-use practices influenced principals' reports of their own engagement in data use in their schools.

### Principals' Attention to Conditions Affecting Data Use

Table 3 summarizes principal interview results about attention to data use conditions. The left column lists conditions identified by Ikemoto and Marsh

**TABLE 3** Principals' Attention to Conditions Affecting Data Use.

Conditions affecting data use	Mentioned ( <i>N</i> = 27)	Mentioned/ actions described
1. Accessibility and timeliness of data	16	–
2. Perceived quality of data	8	–
3. Staff capacity and support for considering data	15	5
4. Time available to interpret and act on the evidence	6	4
5. Partnerships with external organizations in analyzing and interpreting data	–	–
6. Tools for both data collection and interpretation	4	2
7. Organizational culture supports data use	14	3
8. District and state policy support data use	17	6
Total mentions	80	60

(2007). We separated out references to district and state policy support for data use from more general statements of support related to school and district organizational culture. The number of principals who mentioned each condition is indicated in column two. Column three reports the number of principals who not only mentioned each condition but who also described actions that they had taken concerning that condition.

These results suggest that a majority of the 27 principals in our sample of typical schools communicates an awareness of key conditions identified by Ikemoto and Marsh as influencing the use of data by school personnel, particularly in regards to accessibility and timeliness of data, school staff capacity for data use, and external (district, state) support for data use. Data quality, time to interpret and act upon data, and the availability of tools to facilitate data collection and interpretation were mentioned, albeit by a minority, of the principals interviewed. Awareness, however, does not necessarily translate into action. The number of principals who spontaneously talked about actions that they themselves were taking to influence one or more of the conditions listed is proportionately much smaller, and unevenly distributed across the conditions. This pattern leads us to surmise that some principals felt more empowered or capable to act upon organizational and technical conditions that affect the potential for productive data use for decision making by school staff. Others (the majority) appear to be externalizing these conditions, suggesting an orientation toward data use as an externally imposed expectation or requirement to which they must comply, but over which they have little control.

Some of the conditions identified by Ikemoto and Marsh (2007) may, in fact, be more susceptible to principal influence than others. Principals, for example, may have little control over the accessibility and timeliness of student performance data provided by the state or through the district, or the perceived quality of those data. While the provision of time to engage with data might seem more likely to be a focus for principal intervention, time during the regular work day in schools is often constrained by contractual

arrangements and district policy, and thus, may be less generally available to individual principal influence.

None of the principals in these interviews (Round 2 site visits) spoke about from external sources outside the district in analyzing and interpreting data. As reported later (drawing as well from the in-depth case studies), expertise to assist with data use is more typically provided by or through the district, or is developed within the school as a focus of district efforts to build school capacity for data use.

### District Influence on Data Use in Schools

The principal survey included four items related to use of student data and support for data use at the district office level. Principals rated the strength of their agreement with statements describing district office capacity, support, and uses of student performance data for instructionally related decision making. Table 2 summarizes the relationships (correlations) between principal and teacher survey items that addressed district and principals' capacities and efforts to use and support the use of systematically collected data.

The pattern of results evident in this table is clear. All relationships between principals' reports of their own and their districts' data use are significantly though modestly correlated. While one cannot infer causality from this analysis, it does indicate at least moderate interaction between data use at the school and at the district levels. From the interview data reviewed below, however, it is evident that district office leaders, acting in response to state/federal accountability requirements and pressures, are key players in the use of and support for the use of data for instructionally related decision making at both the district and school levels, and that principal use and support for teacher use of data is strongly shaped by district action.

Central office administrators acknowledged that government accountability systems have created a situation in which district and school personnel cannot ignore the evidence of students who are struggling or failing to meet mandated standards and targets for academic performance, as reflected in standardized test results and other indicators of student success (e.g., attendance, graduation rates). Most district leaders that we interviewed described this as a positive turn of events, though they were not all equally well supported by their state education agencies in local efforts to make use of data. Commonly mentioned issues associated with state expectations and support for data use included:

- Whether state assessment data are made available in a timely manner that would enable local educators to make meaningful use of data;
- Whether state data reports enable local educators to identify which specific curriculum expectations are not being met by individual and subgroups of students;

- Whether the state makes available diagnostic and formative assessment tools aligned with state curriculum standards to help school personnel track student progress;
- Whether the state education agency and/or regional education service units have sufficient expertise to respond to local needs for assistance with effective data use;
- The compatibility of state-mandated assessments and those that the district develops or adopts to compensate for perceived gaps in the state system.

Differences among districts in their approaches and support for data informed instructional decision making, thus, are partly a reflection of differences in state accountability systems and support, and partly due to how district leaders choose to use the data resources provided by their state and to compensate for perceived deficiencies.

District leaders play a key role in guiding how data for decision making about school improvement and student learning are used by principals and teachers within their districts. They do this through (a) expectations they set and monitor for data use in school improvement activities, (b) modeling data use in district decision making, (c) the supplementary tools and resources they mobilize to facilitate data use (e.g., data reports for schools, curriculum embedded teacher assessment instruments, time and data use teams), and (d) the expertise that they develop locally or access externally to meaningfully incorporate data use into principal and teacher decisions about improving student learning and school results. Few principals among those we interviewed were deeply and skillfully engaged in data use on their own, and isolated school leader engagement seemed unsustainable in the face of staff turnover.

One obvious way that district leaders foster data use by principals and teachers is by explicitly insisting on it in various ways. According to the principal interviews, districts do this by requiring principals to link school improvement goals and progress reports to student performance data; insisting that teachers justify their claims about good practice with some type of data beyond informal observation and professional opinion; requiring decisions about the expenditure of money to be justified with evidence; and expecting that the focus of professional development will be based on areas of needed improvement apparent in the data. In schools and districts where data use appeared to be more deeply embedded into routine practice, central office administrators commonly talked about engaging principals individually in data-informed discussions about the school goals and progress during the school year.

District leaders also foster data use by modeling the use of data relevant to student and school performance in decision making at the district level about system improvement goals and initiatives, and in decisions about how they define and respond to particular school needs for assistance. In

one site-visit school district, for example, central administrators set improvement in high school graduation rates as a system priority, jointly studied the academic records of students who failed to graduate on time, shared their findings with principals, and set an expectation that principals and their staffs would take action to address the factors contributing to failure. In another district the superintendent mobilized a district-led investigation of why the proportion of children reading at grade level declined from grade 3 to 5.

In some districts, central office administrators promote and support data use in schools by providing school personnel with a variety of tools to facilitate data collection and interpretation. At a minimum, this includes data reports that assemble, present, and perhaps simplify the variety of data on student performance and student characteristics required by the state and district for accountability purposes. In addition, some districts have the internal professional capacity to develop local assessment tools (e.g., subject-specific benchmark tests for continuous assessment, scoring rubrics aligned with state/district curriculum standards) to enable formative assessment of student progress. In the most elaborated systems, district staff have created procedures and forms to help principals and teachers link assessment data to specific curriculum standards and to information about promising instructional strategies and programs that could address identified gaps in student performance. The nature and range of school-level data use tools created, accessed, and supported by district office leaders, however, is quite variable from district to district.

In the category of “tools and resources” we include references to organizational structures and routines created by district leaders to promote and facilitate data use for improvement in student learning in schools. This included opportunities to foster the sharing of information across schools. District administrators and principals, for example, frequently referred to times set aside in monthly principal meetings for collective data sharing and interpretation by principals in consultation with district supervisors and professional staff. While not as widely in evidence, a few principals mentioned recent or emerging district initiatives to establish student learning-focused professional learning community structures (teacher teams) and time in schools, in which the use of student performance data was an expected component.

A fourth way that districts foster data use in schools is by developing the professional capacity of school personnel to interpret and incorporate data into decision making for school improvement and student learning. Interviewees referred to several aspects of their districts’ capacity-building assistance, in particular, providing access to district or external experts (e.g., regional education service center staff, university faculty) to help with organizing and interpreting data from state tests and/or to deliver professional development for teachers and principals regarding data interpretation and use. District size was clearly a factor. Whereas large districts were likely to

employ assessment and evaluation specialists (individuals or teams), small districts were more likely to rely on district administrators or curriculum directors who have sought to develop their own expertise in assessment matters. Small districts, as well, were more likely to draw upon the expert advice and assistance of curriculum and assessment specialists from state-supported education service centers.

District leaders recognized the need to develop the capacity of school personnel on their own to use student assessment and other performance data to inform collective decisions about school improvement goals and plans, and about programming for assessed student needs. We observed what may be a progression in district approaches to developing that capacity in schools. In some settings, district leaders reported a shift over time from an emphasis on developing principals' expertise in data use, to training selected teachers in each school as resident experts, and more recently to encouraging and supporting data use by classroom teachers working in teams.

Our findings about district-level leadership and support for data use in schools are consistent with evidence from other research on the district role in school improvement (e.g., Togneri & Anderson, 2003) and from research that specifically focused on district leadership and support for data-driven decision making (e.g., Datnow, Park, & Wohlstetter, 2007). In their study of four school systems known as leaders in data use for decision making, Datnow, Park, and Wohlstetter also emphasized the key role of district leaders in selecting and organizing the right kinds of data to best inform the work of principals and teachers

In combination, the interview and survey data results about district and other organizational influences on data use in schools suggest, in sum, that:

- Principals demonstrated awareness of conditions in their schools that fostered or inhibited data use. But a majority of principals appeared to have externalized those conditions. Few indicated taking action to improve most of the conditions.
- Some conditions influencing data use by principals and teachers may be more accessible to principal influence (e.g., teacher capacity for data use, time for data use) than others (e.g., timeliness of data, quality of data). A minority of principals take action to shape those school-level conditions most open to their influence.
- Principal use and support for teacher use of data related to student performance is strongly shaped by the actions of district office leaders in the context of varying state accountability requirements and support.
- District leader actions influencing data use by principals and teachers include modeling data-informed decision making, setting and monitoring expectations for data use, providing tools to assist with data collection and interpretation, and providing or developing expertise to support data use and the school level.

## VARIATION IN THE TYPES AND PATTERNS OF DATA USE

Principal interview data were used to explore the nature of principal and teachers' data use guided by Ikemoto and Marsh's (2007) five dimensions of data-informed decision making. The first dimension, "number of sources of data," overlaps with the construct "types of data" that included both the nature and breadth of data in our initial conceptual framework. To avoid redundancy we incorporated types of data into the findings and discussion reported for sources of data. We address the overall patterns of data use in all the site-visit schools sampled, and highlight salient variations in use that were uncovered in our case studies of schools (five elementary, one middle) identified as more heavily engaged in data-informed decision making.

## Number of Sources of Data

A significant proportion of the 27 principal interviewees reported using several different sources of data—state-mandated assessments in almost all cases (26 principals), along with district-sponsored (18), and teacher or school developed (16) assessments of student learning. Many districts require schools to administer nationally normed tests of student performance as an added measure of quality, in addition to the criterion-referenced state tests that are the lynchpin of their state accountability systems. A few principals talked about the development and systematic use by teachers of diagnostic and formative assessments of student learning aligned with state/district curriculum expectations. Some referred to data on student performance from comparable districts identified by the state or by district leaders.

Principals often mentioned the availability of data pertaining to student characteristics, such as ethnic and linguistic background and socioeconomic status. They also spoke of data about other bureaucratically designated indicators of student characteristics, such as mobility rates, attendance, Title I eligibility, special education needs, and English language proficiency. At a minimum, these kinds of individual and group data about student characteristics were being invoked and used in compliance with policy requirements for reporting student test results and for allocating students and district resources to categorically prescribed programs (e.g., Title I, bilingual programs). Less frequently, school and district personnel reported using these kinds of background information to help interpret student and school performance data.

Principals and teachers in some districts described the district-sponsored and mandated adoption of computerized data management systems that allow for storage and retrieval of a wide variety of individual student data: standardized test results, diagnostic and formative assessment results, classroom assessments and report cards, student placements (e.g., in special programs, tutoring), attendance, and student background data. While these

do not represent a different type of data than that already being collected, these so called “data warehouses” permit student data previously kept in separate files and locations to be more accessible to principals, teachers and other users. Given the recency of adoption of these data-management systems, school personnel talked more about the added workload of entering the data into the systems than about actual use of the systems to inform instructional decision making.

We note that our school interview respondents rarely spoke about the collection and use of other kinds of information that might inform their understanding of challenges for student performance (individual or group), and decisions about how to respond. For example, the vast majority of principals across the site-visit schools made no mention of data on teacher performance and needs for professional support gathered formally through teacher appraisal processes, or informally through classroom walk-throughs. While our findings indicate that informal classroom walk-throughs are an increasingly common administrator practice in schools, it seems that principals did not routinely think of the information they were assimilating through informal classroom observation and conversations with teachers as “data,” even though they were certainly accumulating evidence that informed their considerations and decisions about school-improvement needs and actions. Similarly, principals made little or no mention of attempts to systematically gather and use information about parental support for student learning that might contribute to collective understanding and plans for addressing student learning gaps and goals. These observations are not intended as a criticism of the evidence that principals and teachers are routinely using to inform instructional decision making and goals for improvement, rather as an observation on the limited range of data that school personnel across typical schools are using in the enactment of data-informed decisions.

Information from published research constitutes another potential source of data to inform decision making in schools. Data from external research sources was not commonly invoked in principal and teachers reports of the kinds of evidence in use in schools, though it was reported by principals in some of the site-visit schools we identified as high data-use schools. The latter emphasized, for example, the importance of ensuring that teachers had access to appropriate professional knowledge to adapt or differentiate instruction in response to findings from the collective analysis of student data. This was accomplished through various professional learning strategies, such as training by district/external consultants, book study by teachers, and sharing and discussion of results of teaching strategies, including those created by teachers themselves. The significance of this finding warrants our attention. Whereas the development of teachers’ expertise to interpret student-focused data receives a lot of attention in discussions of data-informed decision making in schools, these principals reminded us about the importance of ensuring that teachers have the knowledge and

skill to respond to the problems that they may identify through the collection, examination, and interpretation of those data. Datnow, Park, and Wohlstetter (2007) reported similar comments from teachers who emphasized the need for professional development that helps teachers develop their knowledge and skill to effectively modify or differentiate instruction to address problems identified through analysis of data.

In sum, our school interview data from principals (and from teachers in the case-study schools) indicate that principals and teachers typically have access to considerable amounts of data about student performance and characteristics available to inform decision making related to student programming and school improvement. Ultimately, the general types of student-related data available to school personnel may be less different in high and low data-use schools than the uses that they make of it (or not) to understand and respond to student learning needs. A possible exceptions to this generalization pertains to the amount and quality of formative and diagnostic assessment data gathered and used in schools we identified as high data-use schools. Principals and teachers made more frequent reference to the collection and use of continuous assessment data in these schools, and they spoke with greater authority and confidence about the fit of those data to externally prescribed curriculum standards. Our findings also suggest that on the whole, principals have and use little systematically collected evidence about organizational conditions that might need to change in order to improve the status of student learning.

### Nature and Extent of Analysis

The scope, frequency, and complexity of data use were greater in high data-use schools, as were the potential contributions of data use to improvement in teaching and learning. Principals in most schools, for example, cited state test results as a factor in setting school improvement goals. The number of sites where principals and teachers were actively extending the use of these data to monitor the outcomes of school improvement plans, however, was more limited. Schools differed in the degree to which they targeted goals for improvement associated with accountability test results to specific subgroups of students (i.e., those not meeting targeted proficiency standards) and to specific curriculum expectations within tested curriculum areas (e.g., grade 3 expository writing, versus grade 3 writing). The capacity of school personnel to engage in more detailed analysis of state test results for purposes of defining goals for improvement was influenced by the tools and assistance provided by the state and/or district to encourage and facilitate this level of data analysis.

We also observed that in schools where all or the vast majority of students were already meeting minimum state proficiency standards on the state's accountability tests, these test data were less prominent in school

personnel accounts of how school goals for improvement were set. In one high-performing suburban elementary school, for example, where over 95% of the students were at or above state proficiency standards, the principal called in a district measurement and evaluation specialist to help the faculty figure out what they might set as a goal for improvement. They settled on a goal of increasing the number of students who would qualify for the highest rating on the state tests (having only missed two or three questions on a test). While this might seem an absurdly test-driven goal for improvement, it calls attention to an important issue. What other “evidence” about student learning needs might be used to inform school goal setting beyond that available from standardized test results in targeted curriculum areas, especially in schools where large numbers of students are already performing at minimum proficiency levels in terms of the formal accountability system policies?

Teachers and principals in many schools reported the use of diagnostic assessment instruments as a basis for identifying struggling students and placing them in remedial programs at the beginning of the school year. School personnel in higher data-use schools were more likely to report the use of formative assessments of student progress at periodic intervals across the school year, and cyclical decisions about which students need additional help through remedial or enrichment programs, after-school tutoring, and differentiated instruction in the classroom. Teachers have always evaluated their students for grading and report cards. But the incorporation of student performance data into teachers’ instructional decision making was more evident in settings where district and school leaders had linked data use to specific purposes.

Data-informed decision making about teachers’ individual and group professional development plans, and teacher use of data to support conversations with parents about student performance and programming, were the less commonly reported purposes for data use.

We observed a key supporting condition in the formative assessment practices of teachers and principals where the collection and use of these kinds of data were more intensive. In these settings, district office leaders had engineered the development of local benchmark assessment tools that were closely aligned with state and district curriculum expectations and that were being administered as part of the regular assessments of student performance by classroom teachers. That is, routine classroom assessments corresponded to assessments of student progress and performance on mandated curriculum expectations and standards. Therefore, the ongoing adjustments in student programming made by teachers individually and collectively on the basis of these assessments had a greater potential for contributing to improvement of student performance on the standards than the use of assessments whose alignment to either state or district expectations was not guaranteed. In sum, district actions simplified the process of linking diagnostic

and formative assessments to curriculum standards and increased the likelihood that the data would be used to good effect at the school level.

We previously noted the trend across districts and states (regardless of district size) toward the purchase of computerized data storage and management systems that allow student personal, assessment, and program placement data to be recorded and retrieved electronically for both individual students and for groups of students (e.g., by class, by grade, by program, by student subgroup, etc.). Principals, district administrators, and some teachers described the potential for more complex analysis of patterns of student performance for students in varied groupings, for examining correlations between student characteristics and programming and performance, and for studying longitudinal records of student performance for individuals or groups. Perhaps because these products are so new, school personnel offered few examples of the actual exploitation of this analytical potential for understanding or responding to student needs. In one of the high-performing elementary schools that was in its second year of implementation of one of these computerized data warehouses, the principal reported that she now required teachers to present a student's entire academic history when raising concerns about individual student progress and needs for intervention. She admitted that she and her faculty had yet to undertake any complicated correlational or longitudinal analysis of patterns of student performance and relations to instructional programming. Datnow, Park, and Wohlstetter (2007) provide more positive illustrations of the incorporation of computerized information management systems into instructional decision-making processes from the schools they studied in school systems acknowledged as in the vanguard of data-driven decision making.

School personnel in all of the schools in our study were using student performance data to comply with external accountability reporting requirements, and to identify problems at the school, student subgroup, or individual student levels. In only a minority of settings had principals and teachers, often following the example of district leaders, progressed beyond the use of data for problem identification to problem solving. In these settings they were gathering and analyzing additional data to better understand the factors contributing to identified problems, and to monitor the effects of interventions implemented in order to ameliorate those problems.

In one elementary school, for example, the principal and teachers identified improvement in children's expository writing as a school goal. The principal mobilized teachers to develop midyear writing prompts to supplement beginning and end-of-year assessments developed by the district. She called on district consultants to provide in-service training for teachers not only on the use and interpretation of assessments based on the district's standards-based writing rubric, but also on teaching methods associated with the goals for improvement in writing. She organized the teachers into professional learning communities dedicated to studying student progress

and the effects of teacher interventions to improve student writing. And she and the teachers implemented a process whereby teachers interviewed students about their responses to the strategies for teaching writing that teachers were using.

### Who is Involved in Data-Related Processes?

The normative literature on effective data use strongly recommends the engagement of teams or groups of people in the collection, analysis, and interpretation of data. Seventeen of the 27 principal interviewees in our study provided evidence about collaboration with others in these processes. In sum, use of data was largely a collective activity in our sample of typical schools. It happened in grade-team meetings, subject groups, professional learning community groups (may overlap with grade or subject teams), committees convened to assess and monitor at-risk student needs, school leadership or improvement teams, or in whole staff events, such as data retreats and faculty meetings.

Our study and analysis did not systematically explore the users and uses of data in a specific set of decision-making contexts across all the site-visit schools (e.g., school-improvement goal setting and progress monitoring; identifying students for special program interventions, such as tutoring or accelerated programs). However, principals and teachers referred to these contexts for decision making and action with sufficient frequency to enable us to highlight some key patterns and variations in regards to participation in the uses of data in those contexts. First, it would be overstating the role of principals to infer that their participation in these contexts necessarily implies that they personally were collecting and interpreting data. In fact, it appears not infrequently to be the case that principals have taken on the role of data use enablers rather than data users per se. In these instances, teacher leaders or regular classroom teachers are typically the street-level data users. The principals may be providing them access to data, providing tools and time to help collect or interpret the data, accessing external expertise or trying to develop and facilitate access to in-school expertise, and holding teachers accountable by requiring them to justify recommendations for school improvement or for student interventions and program placements with data, yet not directly engaging in the processes of data analysis and use themselves (see, e.g., the preceding example of principal-led action research on student performance in expository writing). A minority of the principals interviewed directly identified themselves (or were identified by their teachers) as sources of expertise in the analysis of evidence for improvement.

In a few schools, Ikemoto and Marsh's inquiry-oriented data use was modeled by the principal, but had not evolved into a more collective activity involving teachers (Ikemoto & Marsh, 2007). The principal in one school,

for example, did her own investigation of why so many Hispanic students entering the school at grade 3 had not transitioned to English-medium classrooms as expected by grade 6, and presented her findings and plans to her staff. In another school, the principal sought out comparison data on state test results from other sites to help understand why the schools' performance had slipped below the state's exemplary rating, and took action based on his analysis of the finding. The fact that a principal was engaged in more complex levels of data analysis did not necessarily mean that the school scored as a high data-use school in the combined data-use measure from our principal and teacher surveys. Our findings suggest that more complex patterns of data use to inform instructional decision making and school improvement are most likely to arise in schools where this is pursued collectively by the faculty with principal leadership.

### Engagement of Special Expertise

Expertise considered useful in the normative literature includes expertise in both data collection and analysis (e.g., statistical expertise), and/or expertise in the subject area about which data have been collected (e.g., literacy, math problem solving). Among our site visit schools, 16 of the 27 principals reported that they and their teachers had benefited from the assistance of expertise in the collection and interpretation of data for decisions related to school improvement and instructional programming. Our interview data point to five potential sources of expertise in data use in schools: central office personnel (superintendents, curriculum or assessment specialists); state-supported regional education center specialists; principals; key teachers trained to serve as assessment and data experts; and classroom teachers in general. In lower data-use settings there was a tendency to depend on external expertise, or to rely on the principal or a key teacher (e.g., counselor, literacy coach) as the resident data expert. In higher data-use schools, expertise to guide and support data use was more widely distributed. Principals and teachers reported increasing efforts to develop the capacity of teachers to engage collectively in data analysis for instructional decision making, supported by but not dependent on other experts. This was often the focus of professional learning community initiatives, and assisted by district interventions such as training in the use of curriculum-linked classroom assessments, schoolwide data analysis events, coaching of teacher teams (grade or subject teams, professional learning community groups), and the purchase and training in the use of data software. Expert input and assistance is primarily sought and used to assist with the organization and interpretation of data (e.g., mentioned by 21 of the principals interviewed), rather than its collection (only mentioned by ten principals). Expert assistance with data collection, where it occurs, tends to focus on the use of diagnostic and formative assessment tools by classroom teachers, and more

recently, training in how to input information into computerized data management systems.

### Number of Data Points

Ikemoto and Marsh (2007) reported that in the schools they studied, they found variation in the number of data points for which data were collected and examined relative to particular decisions, such as school-improvement goals or student placement and programming. Twenty-three of the 27 interviewees reported that the data they and their teachers used annually for school goal setting and/or instructional decision making were collected at more than one point in time. Thus, the difference among schools may be less whether longitudinal data are collected and available than the nature, frequency, and active use of that data during the school year. The most obvious area of variability in our school sample concerns the collection and use of diagnostic and formative assessment data on individual student performance. In some schools diagnostic testing is used at the start of the year for decisions related to student placement and programming, but there is little further assessment to check student progress until the end of the year. In other schools, those we associate with more intense use of data-informed decision making, formative assessment data are systematically gathered at multiple points over the course of the year, and teachers by grade level/team, perhaps with counselor or principal advice, check student progress and modify program intervention and placement decisions accordingly.

Principals (and district administrators) in districts that had invested in the purchase of computerized data-management systems spoke about the potential for longitudinal display and analysis of individual and group patterns of student performance by school faculty. We did not hear of any robust examples of this being done at the school level. However, in some of the high-use districts and schools, we did find examples of district leaders and of principals who had undertaken longitudinal analyses of student performance using existing records available to them prior to the adoption of these new data systems (e.g., the example of an elementary principal studying the progress of Hispanic students from grades 1 to 5; the example of a superintendent organizing an investigation of the decline in student reading scores from grades 3 to 5; the example of a district administrator who led an investigation of the complete student records of all African American students who failed to graduate from high school on time). It appears that longitudinal analysis of aggregate patterns of student performance is probably more dependent upon leadership than on the availability of these new kinds of data-management systems, though these new tools may increase the capacity and motivation of greater numbers of school and district leaders to do that work.

Our analysis of patterns of data-use practices across the site visit schools can be summarized with the following key findings.

- While principals and teachers typically have access to considerable data about student performance and characteristics, schools differ in the uses they make of those data to identify, understand, and respond to student learning needs.
- Principals, overall, make little use of explicit and systematically collected data about conditions that might help explain the status of student performance, or that might need to change in order to improve student learning.
- Student performance data are commonly used to comply with accountability requirements and to identify curriculum and learning problems in need of attention. In only a minority of settings, however, are principals and teachers moving beyond the use of data for problem identification to problem solving.
- Data use in schools is largely a collective activity involving principals with teachers in multiple contexts (e.g., school improvement teams, grade or subject team meetings, at-risk student committee meetings, faculty meetings). Principals often act more as enablers of data use by teachers (e.g. providing access to data, tools, time, and expertise, and holding teachers accountable for data use), than as data users themselves.
- Expertise in data collection and interpretation in schools can come from central office personnel, state-supported regional education centers, principals, key teachers, or classroom teachers in general. In higher data-use schools expertise in data use is more widely distributed, and less dependent upon the principal or a key teacher designated as a data expert.
- School personnel in higher data-use schools are more likely to report the use of formative assessments of student progress aligned with state/district curriculum expectations at periodic intervals during the year, and cyclical decisions about students needing help through remedial or enrichment programs.
- Longitudinal analysis of aggregate patterns of student performance is rare in schools, and seems more dependent on principal (and district) leadership than on the availability of sophisticated data analysis tools.

Our overall findings suggest less prominence and complexity of data use across our sample of typical schools than reported in research about data-driven decision making in schools where data use is known to be given high priority and support, or where schools are participating in initiatives designed explicitly to promote and facilitate data use by principals and teachers (e.g., Boudette & Steele, 2007; Datnow, Park, & Wohlstetter, 2007; Mandinach & Honey, 2008). The patterns of data use that were evident in our six high data-use elementary and middle school case studies, however, were consistent with findings from case-study findings in similar settings in

terms of the salience of district and principal leadership in data use; the variety of data sources and purposes for which data are collected and used; the intense use of formative assessments of student learning during the school year for student programming and tracking progress; the importance of teacher and principal access to tools for data analysis and decision making that are aligned with expectations for curriculum and learning; and the collective nature of data-use activity facilitated by district/school educators who have learned to be local experts in data-use processes.

## DATA USE AND STUDENT ACHIEVEMENT

We inquired about the relationship between data use and student achievement quantitatively and qualitatively. The quantitative analysis was based on principal and teacher survey responses and our combined measures of student achievement in literacy and math on state tests. To address this question, the three measures of data use (principals' view of district data use, their own data use, and teachers' perceptions of principal data use) were entered, as a block, into a regression equation first. Four demographic variables (student diversity, poverty, school level, and school size) were entered in the final equation. None of the measures of data use had a significant effect on student achievement when added to the equation on their own, nor did they contribute any unique explanatory value when combined with the four demographic measures in the final equation. (See Table 4.)

The demographic variables explained about 19% of the variance in student achievement, with school level and diversity each explaining about 5% of that variance. The same variables were used for another analysis that reversed the order of entry for the data use and demographic variables. The results were essentially the same as for the first analysis. A third analysis was done with these variables using only the elementary schools (52).

**TABLE 4** Results of Hierarchical Regression Measuring Effects of Data Use on Student Achievement When Mediated by Demographic Variables ( $N = 107$  Schools).

	R2	F
Mean Student Achievement		
Step 1: District, principal, teacher data use	0.03	ns
Step 2: Add demographic variables	0.19	4.63***
Step 2: Significant Unique Effects	Beta	t
Level	-.30	2.44*
Diversity	-.29	2.49*
		Unique R2
		0.05

\*Significant at the 0.01 level.

\*\*\*Significant at the 0.05 level.

In this analysis, data-use variables did have a significant effect on achievement, explaining 19% of the variance with the first equation [ $F(3,51) = 5.03$ ,  $p < 0.05$ ]. The explained variation increased to 24% in the second equation with the demographic measures, but only perceptions of district use had a significant effect. However, the reduction of the number of cases to fewer than 10 per variable for the regression analysis limits the reliability of this result.

Given this weak statistical evidence of positive relationships between student achievement and district or school data use (as reflected in the principal and teacher survey items), we turned to our qualitative data which provided the following insights:

- The availability of student assessment data in the context of current federal, state, and district accountability requirements is causing district and school personnel to justify their goals and plans for improvement, focusing, in particular, on students and schools that are not meeting standards-based performance expectations and targets.
- The potential for these focused improvement plans to make a difference in the quality of student learning is highly dependent on the degree to which local educators are able to align local curriculum and teaching and assessment practices with the external measures against which they are being held to account.
- District and school efforts to improve student learning are more likely to have a positive effect when the data and the analysis performed by local educators goes beyond the identification of problem areas to an investigation of the specific nature of and factors contributing to the problem for the students and settings where it is situated. It is not data use per se that affects the quality of teaching and learning; rather it is the appropriateness of actions actually taken based on data-informed decisions about the nature of the problem and how it might be solved.

Our quantitative and qualitative findings lead us to speculate that there may be both a lower and an upper threshold beyond which increased use of data by school and/or district personnel simply will not make much difference. One of the large low-SES urban districts in our sample, for example, had been classified under federal/state “Adequate Yearly Progress” regulations as in need of district-level intervention by the state, because so many of its schools were not meeting AYP targets. In this situation there were likely fundamental social, resource, and perhaps leadership issues affecting student engagement and performance and school capacity to improve that will not be resolved through detailed analysis of student assessment data.

On the other end of the spectrum, our sample included some high-performing districts and schools, relative to state standards. While these settings can exemplify greater complexity in the types of data and analysis of data for decision making, there may be a saturation point beyond which

additional forms of data or expectations for data use do not add much value, only work. In these situations the real imperative for improvement may have more to do with rethinking the goals for student learning than with increasingly complicated patterns of data use.

## CONCLUSION

Part of a larger project inquiring about how leadership influences student learning (Leithwood et al., forthcoming), this study was prompted by the unqualified encouragement embedded in much current educational policy for district and school leaders, along with teachers, to become more data-informed in their decision making (Herman & Haertel, 2005). Underlying this policy direction is the assumption that greater attention to formal student test results, along with systematically collected evidence about related organizational conditions, will lead to more effective practices in classrooms and schools with considerable payoff in the form of greater student learning (McDonnell, 2005).

Although a dominant feature of much current policy, most notably the No Child Left Behind Act of 2001, there is not actually much empirical research to justify this foundational assumption and the evidence that does exist reports mixed results (e.g., Carnoy & Loeb, 2002; McDonnell, 2005). Nor do we know much about what district and school leaders are doing in the name of evidence-informed decision making or the conditions that either foster or inhibit the use of systematically collected data in their decision making (Spillane, Diamond, Burch, Hallett, Jita, & Zolmmers, 2002; Coburn et al., 2009). Our study aimed to better understand the data-use practices of principals in typical schools, to gain insight into the organizational conditions influencing principals' engagement in data use, to explore variations in patterns of principal-led data use, and to investigate whether data use had any discernable relationship to students' academic performance. Evidence to help answer these questions included survey responses from a large sample of principals and teachers, in-depth interviews with 27 principals, and case-study data from six high data-use schools. Key findings associated with these four purposes are highlighted in detail at the conclusion of each subsection. In our concluding comments, we draw attention to selected themes and issues that emerged in our analysis, and that we believe warrant the attention of education policymakers, practitioners and researchers alike.

We began this analysis with an overly narrow focus on data use by principals, but quickly realized that the broader concern has to do more with principal leadership for data use in schools, than with the specific uses of data by principals themselves. School data use was a collective activity involving principals working with their teachers in those schools where we observed what seemed to be the most intensive and potentially productive

patterns of data use for improvement in student learning. Principals in these schools were data savvy, but did not always present themselves as data-use experts. They took strategic action to develop or access expert assistance as needed. In sum, principals play a key leadership role in establishing the purposes and expectations for data use, structured opportunities (collegial groups and time), data-use training and assistance, access to expertise, and follow-up actions. Where principals do not make data use a priority, mobilize expertise to support data use, and create working conditions to facilitate data use in instructional decision-making contexts, teachers are not doing it on their own.

Stepping back from specific patterns of data use by principals and teachers in individual schools, we were impressed by the powerful role of school district leaders (administrators, professional staff) in setting the tone, directions, and expectations for data use, in modeling data use, and in addressing some of the key technical and organizational conditions that influence the potential for data use by principals and teachers within their particular state accountability-systems context. Indeed, many of the organizational conditions affecting school data use identified in prior research—such as accessibility, timeliness, quality of data, plus time and human resource capacity to make good use of data (e.g., Ikemoto & Marsh, 2007)—are more susceptible to influence at the district level than at the level of individual principals, due to technical complexity, resource requirements, and policy constraints. In short, the potential for effective data collection to inform school-level decisions related to improvement in student learning is highly dependent upon leadership and support at the district level.

As we have become more sensitive to the emphasis that states, districts, and schools are placing on a relatively narrow band of systematically collected data for decision making, we have a growing concern that a “data-driven decision making” conception of how to improve schools is in danger of seriously misrepresenting and underestimating the education improvement challenges that schools actually face. The term “decision making” implies that the improvement challenge for schools is to choose among a set of known solutions for their readily understood improvement problems. Indeed, this view is fuelled by educational policies encouraging schools to select, for example, reading or math programs with “proven” effects on students. If simply buying and faithfully implementing developed programs were enough to improve schools, educational nirvana would have been achieved decades ago.

The term “problem solving” rather than “decision making” invokes a more accurate picture of the improvement challenge faced by most educational leaders and their teacher colleagues. And the systematically collected data that our results suggest are available to and used by most principals and their staffs plays a potentially important yet decidedly limited role in such problem solving. Mostly these data describe the current status of students’

learning and reveal something about students' backgrounds. But problem solving (and school improvement) is about closing the gap between the current status and a more ideal or preferred status (Frederikson, 1984). Where do school staffs look to better understand the underlying causes of current states? Where will they find the knowledge they need about how to close the gap? Faced with comparable challenges, scientists engage in quite a bit of "informal reasoning" (Tweney, 1991)—lots of tacit knowledge artfully combined with rational thought. It seems likely that sophisticated school staffs do the same (e.g., Davis, 2004). Subsequent research would do well to inquire about how systematically collected data of various sorts are used in combination with principals' and teachers' informal reasoning to construct approaches to their school improvement problems. In particular, what types of systematically collected evidence, if it were available, would significantly improve the quality of school staff's improvement efforts?

Finally, we worry that a laser-like focus on systematically collected data might increase the power of "single-loop learning" (refining current understandings and practices without changing assumptions) but significantly discourage "double-loop learning" (challenging the assumptions on which current understandings and practices are based) (Argyris & Schön, 1974). This concern is also reflected in the distinction between information-intensive organizations and knowledge (or expertise) intensive organizations (KIFs); the former process large amounts of evidence, much of which often does not actually get used for decision making, while the latter typically process very little such information, relying instead on high levels of expertise about the work that needs to be done (Starbuck, 1996). Professional organizations are typically KIFs. Evidence in this study might be interpreted to suggest that many schools are used to behaving as KIFs (whether or not they genuinely have the levels of expertise they need) and this raises an intriguing question for both research and policy: What is the relative benefit to the quality of schooling of spending resources on providing schools with more information as compared with spending the same resources on building the instructional and related expertise of those in schools? It is possible to do both, and that seems to be the path followed in most current reform initiatives. But that means dividing the available resources between the two options, thereby reducing the resources available for either one. We need more and better evidence than is currently available about the consequences of advocating greater use of data for decision making in schools before the tradeoffs between these two options for improvement can be discerned.

## NOTE

1. Teacher results should likely be privileged in the face of evidence that principals often perceive their schools and their own work more positively than do teachers (e.g. Desimone, 2006).

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