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Using Technology to Link Student data-Driven and Standards-Based Instruction

Keywords: Data-driven decision making, instructional technology, standards-based instruction, longitudinal data, mixed methods

Barbara C. Storandt
Hezel Associates
1201 East Fayette Street
Syracuse, NY 13210

Jessica Yusaitis
Hezel Associates

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ABSTRACT

Administrators and teachers nationwide confront a deepening expectation to use student performance data to inform their professional practice. In addition to having access to performance data, this endeavor requires the ability to understand assessment reports and to translate the information to instructional practice, as well as access to targeted instructional resources to address identified needs. Through a U.S. Department of Education Ready to Teach grant, PBS Channel Thirteen/WNET has developed a collaborative effort called VITAL (Video in Teaching and Learning) that seeks to link video teaching resources to comprehensive online reports of student performance on New York State assessments. Baseline survey and case study data gathered during VITAL's first year describe existing data-based decision making practices among teachers and administrators, access to technology for this endeavor, and information needs and gaps, including access to instructional resources. Findings from the research conducted across New York State are consistent with findings from prior case study research in other locations. Administrators and teachers face common challenges in that student performance data are widely available but may not be easily applied to professional practice, and technology-based data interfaces show promise as one solution for bridging this gap. Attending to data system characteristics, the nature of user interactions with data, local cultural elements that facilitate data use and constituents' capacities to overcome common barriers to data use ensure the greatest likelihood for success.

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In today's shifting educational environment influenced by the *No Child Left Behind Act* (NCLB), administrators and teachers nationwide confront a deepening expectation to use student performance data to inform their professional practice. As a result, educational policy and research have become increasingly focused on how data can inform educators' decisions (Salpeter 2004). The success of this work depends on having: (a) useful data system characteristics, (b) positive user interactions with data, (c) cultural elements that facilitate data use and (d) the capacity to overcome common barriers to data use.

Like many states, New York has responded to the call for greater accountability by developing statewide standards and assessments that coordinate and measure student learning annually. Still, the education community has identified gaps in the process. One such gap has been in the system's provision to all critical partners information about student achievement that goes beyond a raw score on a test. A second gap exists with a lack of preparation for and access to instructional strategies and materials that allow administrators and teachers to act effectively on the data.

A collaborative effort funded by the US DOE's Ready to Teach program called VITAL - Video in Teaching and Learning - between PBS Channel Thirteen/WNET, the New York State Department of Education and The Grow Network seeks to address these gaps. VITAL includes three key components - comprehensive online reports of student performance on state assessments developed by The Grow Network (called nySTART), differentiated video-based instructional resources for teaching Math and English Language Arts (ELA) developed by PBS Channel Thirteen/WNET, and careful

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alignment with the New York State Standards for Teaching and Learning at all levels of the project.

To prepare for statewide dissemination, the nySTART online student performance reports were piloted in the New York City school district (see Light et al., 2005 and Breiter and Light, 2006 for studies of this pilot). The nySTART system is presently being scaled to fit user needs across Upstate New York as part of the VITAL project. The baseline survey and case study data presented in this paper represent the VITAL project's initial research efforts to understand the nature of data use across Upstate New York after the NYC pilot and before nySTART became available statewide in September 2006. This data comes from the first year of a three-year investigation into the extent to which educators engage in data use practices that are supported by technology, as well as the degree to which they increase their skills in data analysis and application. This examination takes place in the context of a larger longitudinal study of the impact of data-linked instructional video resources on teachers' instructional practices and student achievement with an emphasis on Title I schools.

To date, case studies occupy center stage in the body of research on data-based decision making. While case studies have provided valuable information about how select schools access and use student performance data, they lack the ability to describe the broader landscape of data-based decision making practices. This paper builds on existing qualitative work by presenting findings from statewide surveys and follow-up case studies of administrators' and teachers' data usage practices across Upstate New York. This research describes existing data-based decision making practices, including

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the extent of – and factors influencing – data-based decision making for instruction and planning, access to technology for this endeavor, and information needs and gaps associated with the effort. The purpose of the research is to understand the state-wide context into which the data-linked instructional video resources developed by Thirteen/WNET will be integrated in Years 2 and 3 of the project.

THEORETICAL FRAMEWORK

For standards and accountability policies to be effective in changing the core technology of educational practice, districts, schools and teachers must view data as a meaningful component of their decision matrices and apply this value to professional practice at all levels. Technology has played a major part in making it possible for educators to access and use student performance data to make informed instructional decisions. Specifically, the relative ease of use and sophistication of data gathering, storage, and delivery systems has made data accessible in meaningful formats to constituents whose access to data in the past was either nonexistent or presented in dense and unintelligible reports (Wayman, Stringfield, & Yakimowski, 2004).

Technology-supported tools are increasingly available to facilitate users' interactions with assessment data. Such tools range in complexity from those that simply aggregate raw data in one location to those that summarize, analyze and present data in more applied formats (Supovitz and Klein, 2003). While growing numbers of school systems and states have responded to NCLB by adopting data tools that develop their capacity to process and disseminate data in an efficient and timely manner (Ackley 2001, Thorn 2002), very few have coupled their technologies with sustained, enriching

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opportunities to facilitate users' meaningful applications of that data to local needs (Hamilton, Stecher, & Klein, 2002). The need to understand the potential that data tools can offer within the broader educational landscape is great because analyzing data, using data to inform instruction, and ultimate instructional delivery all require separate skills and instructional materials and training that support educators' effective use of data is often limited (Mandinach, et al., 2005).

Further, when teachers have access to data describing the strengths and weaknesses of individual students, and when that data aligns with research-based teaching strategies, teachers are able to respond to the needs of individual students in ways that may result in higher student achievement. For example, a two-year implementation study of the nySTART assessment reports in New York City found that (Pasnik & Keisch, 2004):

1. Data-driven decision making requires the transformation of appropriate data into useful information that can both facilitate the construction of knowledge and appeal to educators' individual needs (Ackoff, 1989; Drucker, 1989).
2. nySTART provides a format that bridges standards, testing results, and instructional strategies, and gives educators guidance on constructing a rationale for differentiating instruction.
3. Teachers use the testing data provided by nySTART to plan activities, lessons and units.

4. nySTART presents data in a format from which teachers can draw the information they need to support differentiating instruction and thinking about students' weaknesses as well as their strengths.

While effective tools for collating and presenting performance data show promise as important components of data-based practice, a strong research base on technology-supported data use in schools and districts does not yet exist (Chen, Heritage & Lee 2005). Findings from case studies conducted nationwide suggest four key dimensions of technology-facilitated data use in an educational context. These dimensions encompass data system characteristics, user interactions with data, cultural elements that facilitate data use and common barriers to successful data use. We collate the findings from a brief review of case studies conducted in the area of data-based decision making into these four dimensions.

Data system characteristics

Access to data and ease of system use – To a great extent, successful use of technology-based data systems to facilitate data-based practice relies upon districts' and schools' data storage and access capacity. These capacities depend on the local technological infrastructure, availability of computers to personnel at various levels and the prevalence of a uniform system to collate disparate forms of data from a variety of locations (Choppin 2002). Presently, many districts and schools have computer systems that are outdated and inadequate, as well as software for data analysis that either doesn't exist or is difficult to use (Bernhardt, 2004). In a review conducted by Thorn (2001), data uses and needs

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were found to be diverse across schools, and school data were often presented incoherently. Technology-based tools that include graphic representations of data, aggregates by variables, explanations and longitudinal comparisons can enable users' understanding of how to use assessment data.

Timeliness of data reporting - In many cases, the lengthy time lag between data collection and reporting prohibits effective use of data by decreasing the value users place on the data (Choppin 2002). Technology-based data reports show promise as one solution for decreasing this lag.

Type of data included - Most data systems currently contain only annualized measures of student performance. Yet, annual assessments yields data that may not meet users' instructional planning needs, as would data that identifies the specific areas in which students perform well or indicates why they performed as they did (Chen, Heritage & Lee 2005; Schmoker 1996). A few 'second generation' data systems that have benefited from user feedback on the pioneers' data systems by including the capacity to also house shorter-cycle assessment data that facilitates continuous monitoring and interpretation of student performance between annual measures.

User interactions with data

Frequency and nature of user interactions with data - As users access, analyze and apply data to professional practice with increasing frequency, they develop a greater familiarity with and capacity to deepen their data-based practice.

Frequent interactions with data also suggest users' willingness to integrate

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performance data with their practice. As Supovitz and Klein (2003) report, educators who have access to data and conduct data analyses are more motivated to use information about their students and to provide interventions to meet student needs.

User knowledge, skills and abilities surrounding data analysis - Effective data use necessitates that education practitioners have, at minimum, the skills to collect, analyze and interpret data. Yet, the development of these skills has not routinely been part of administrator or teacher preparation programs (Herman and Gribbons, 2001). Further, in-service professional development opportunities tend to emphasize pedagogy and not analyses, interpretations or applications of data (Cromey 2000).

Nature of data applications/ uses of data - Applying data-based decisions to practice involves yet another set of skills including ongoing reflection and refinement. Administrators tend to use assessment data to identify areas of need and target resources (Choppin 2002), engage in district- or school-wide planning, support conversations with other staff around data and shape professional development (Breiter & Light 2006). Teachers tend to use data to align grading policies with achievement results (Choppin 2002), target instruction, meet the needs of diverse learners and support conversations with other educators (Breiter & Light 2006).

System-wide supports to facilitate data use

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The existence of a professional community is a key factor in promoting school change (Darling-Hammond 1990). Professional communities include various characteristics such as positive attitudes toward using assessment data, collaboration among community members around data use a non-threatening culture in which to try new ideas and resources dedicated to the effort.

Attitudes about the potential of assessment data to inform practice – Educators

differ in their attitudes about the value that annual assessment data can offer professional practice. Teachers often believe that locally-developed assessments of student learning and course grades are more accurate and credible than the state assessments that comprise accountability practices. For example, although Ingram et al (2004) found that approximately 40 percent of teachers use systematic assessment data for decision-making, an equivalent proportion use anecdotal information, experience or intuition to make decisions. Administrators tend to value assessment data for determining school effectiveness, while teachers want to ensure that such data are not used to assess their performance as individuals (Ingram et al 2004). About half of the teachers and administrators in Ingram's (2004) study judge teacher and school effectiveness by some indicator other than student achievement.

Culture for data use – The culture underlying data-based decision making can be

complex (Ingram et al, 2004). Collaboration among personnel at all levels (district, school, classroom) is essential for building a culture that promotes data use by enabling the adoption of new practices (Darling-Hammond, 1990). Strong

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leadership from principals and district administrators can also promote a data-driven culture (Choppin 2002) through frequent conversations with teachers that cite data, using assessment data to diagnose instructional strengths and weaknesses and providing opportunities for teachers to collaborate with one another (Protheroe 2001). When leaders (particularly at the school level) buy-into data use, other personnel are more likely to do so as well (Danna 2004). Districts and schools that have formalized but flexible procedures in place for collecting, analyzing and using assessment data tend to show greater promise for positively affecting student achievement (Choppin 2002), in part because these procedures enable more personnel to sustain focused interactions around data.

Availability of resources dedicated to data use - Dedicated time, resources, personnel, professional development and money are essential for building a community that values and uses assessment data to inform practice (Cawelti & Protheroe 2001; Danna 2004).

Barriers to using data successfully

Lack of time - Administrators and teachers may not have time to collect and analyze information to make decisions, and often view doing so as a trade-off between teaching and interacting with data (Choppin 2002; Ingram et al 2004).

Lack of professional development - Prior research suggests that training educators to use data effectively can have a positive effect on student achievement (Rubenstein & Wodatch 2000). Such training should include opportunities for users to review test data and use performance information to determine

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strengths and weaknesses (Protheroe 2001). Yet, at present, few such professional development opportunities exist and those that do compete with required offerings.

Lack of technology/technical capacity – Technology that does not provide users with rapid access to a wide variety of data in convenient formats on a regular basis falls short of its potential to impact decision making among educational leaders and teachers (Choppin 2002).

Insufficient types of available data – The schools studied by Choppin (2002) cited a dearth of short-cycle and other non-annual assessment data with which to make decisions. Ingram et al (2004) also found that the data teachers want are rarely available and are usually harder to measure than standardized assessment data, which is the only type of data contained in some data systems.

Mistrust of data – While not an explicit concern among administrators, some teachers report ‘mistrusting’ state assessment data (Ingram et al 2004) because they don’t believe a one-time or snapshot measure of performance can accurately capture student knowledge. Teachers generally resist what they perceive to be an overemphasis on testing, citing its unnatural portrayal of ‘real-life’ performance measures. Teachers also perceive assessment data to be used for achieving political gains, which fuels teachers’ mistrust (Ingram et al 2004). As an alternative, many teachers have developed their own personal metric for determining student learning needs and for evaluating their effectiveness that often do not involve standardized assessments.

METHODS

The baseline statewide research presented in this paper builds on our synthesis of findings from existing case studies. The context study that took place during VITAL's first year examined whether, how, and under what conditions administrators and teachers access student performance data and use that data in their professional practice. The research questions guiding these activities included:

1. To what extent do Upstate New York's administrators and teachers use student performance data to inform their instructional decision making and practice?
2. What instructional resources currently exist to support aligning standards, instruction and student performance data?
3. To what extent is technology involved in the use of student performance data and/or instruction?
4. What professional development opportunities exist to support data usage?

Two related strands of activities took place that encompassed key target audiences and considered variations across content areas and grade levels in Upstate New York. First, two survey versions – administrator and teacher - were designed, tested and administered statewide. Second, in-depth case studies in 13 schools within six districts allowed a deeper understanding about data-based decision making. Sixty-six interviews with district administrators, principals and teachers across all case study locations yielded robust findings about the current state of data usage in Upstate New

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York. After the conclusion of the statewide surveys and case studies, data were analyzed and synthesized into a more complete description of the context for data-based decision making in Upstate New York.

Statewide Surveys

Data Collection

Two surveys – one for administrators and one for teachers – were developed from the key findings from a review of literature on data-based decision making and from pilot testing with superintendents, principals and teachers across Upstate New York. Both surveys consisted of closed-ended and open-ended questions targeting access to various types of data and technology integration for this endeavor across various educator levels (superintendent, principal, and teacher), as well as their access to professional development that builds capacity for using assessment data. Similar questions enabled comparisons between administrator and teacher responses. Educators will be asked to complete similar surveys during the second and third years of the VITAL project in order to track any changes that may be attributable to nySTART usage over time.

As the surveys were finalized, the evaluation team created a sampling plan for selecting survey recipients from a database of the State’s districts and schools provided by the Common Core of Data (CCD) and offered through the National Center for Education Statistics (NCES¹). This database represents the universe of schools in New York State and contains contact information and demographic variables (i.e.

¹ <http://nces.ed.gov/>

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district/school type, grades offered, Title I status) for each district and school. The sampling plan included selection criteria for districts, schools and teachers² that resulted in 2449 administrators and 1697³ teachers receiving the statewide survey.

Within the sample's districts, the superintendent and all principals of schools that contain any grades three, four, five, six, seven or eight were surveyed, for a total of 620 superintendents and 1829 principals. The teacher survey was administered to two core area (e.g. Math, ELA, Science, Social Studies) teachers of any grades three through eight within each school corresponding to a principal in our sample for a total teacher sample of 1697⁴. All respondents received a \$50 gift certificate for completing either an online or hard copy version of the survey. Approximately 20 percent of administrators and 30 percent of teachers completed the statewide surveys. (Table 1.)

Table 1. Administrator and teacher survey response rates

Survey type	Total distributed	Total surveys submitted	Response rate
Administrator	2449	511	20.9%
-Superintendent	620	136	21.9%
-Principal	1829	375	20.5%
Teacher	1697	505	29.8%
<i>Total</i>	<i>4146</i>	<i>1016</i>	<i>24.5%</i>

Analysis of Findings

To prepare the district (superintendent) and school (principal and teacher) survey response data files for analysis, the datasets were cleaned and then merged with

² The New York City school district was excluded because it already had nySTART access.

³ While 3658 teachers should have been included in the sample, Market Data Retrieval only had the contact information for 1697 teachers in the schools of interest to us.

⁴ While the sampling plan called for 2368 teachers, we were only able to identify the contact information for 1697 teachers.

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the file of CCD variables that correspond with each level. This resulted in a teacher response file with school level CCD demographic variables, a principal file with school level CCD demographic variables, and a superintendent file with district level CCD demographic variables. Each of the CCD variables were regrouped into manageable subcategories that represent relatively equal proportions of respondents. (Table 2.)

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Table 2. Common Core of Data and demographic variables

Respondents	Variables	Recoding and regrouping
Superintendents	District location	City Urban fringe Town Rural
	Total number of schools per district	1 and 2 as group 1, 3 and 4 as group 2, 5 and 6 as group 3, 7 and higher as group 4
	Expenditure per pupil	Above the median (\$11,298.32 per student) Below the median (\$11,298.32 per student)
Principals	School location	City Urban fringe Town Rural
	Title I eligible	Yes No
Teachers	School location	City Urban fringe Town Rural
	Title I eligible	Yes

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		No
	Gender ⁵	Female Male
	Years teaching	1-10 years 11-20 years 21+ years

Multiple layers of analyses were conducted to identify key findings among administrators and teachers. The first step for analyzing administrator (superintendent and principal) survey responses involved calculating descriptive statistics on each survey question. Administrator responses to key survey questions were further broken down by appropriate CCD variables to see if responses to these questions varied by any of the CCD district or school characteristics. Survey question topics analyzed in this way included:

- Primary method of accessing state test data
- Frequency of using state test data for various purposes
- User needs for improving applications of state test data

After merging teacher survey responses with the school-level CCD variables, the number of teachers in each sampled school was used to generate sample weights. The use of this technique, and the subsequent complex sampling analysis, was necessary to account for the chance of a teacher being selected for the sample.

⁵ Teacher demographic variables were gathered from the survey and were not provided by the CCD.

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Once the complex sampling analysis was complete, the procedure for analyzing teacher survey responses closely resembled the procedure for analyzing administrator responses: (a) calculating descriptive statistics⁶ on each survey question and (b) disaggregating teachers' responses to key survey questions by the appropriate CCD variables. The teacher survey question topics analyzed at this level included:

- Usage of various classroom assessment techniques (not including state test data) for monitoring and adjusting short-term instruction
- Usage of various classroom assessment techniques (not including state test data) for monitoring and adjusting longer--term instruction
- Frequency of incorporating various types of technology into classroom instruction
- Frequency of incorporating various types of technology into classroom assessment
- Frequency of using state test data for various purposes
- Mode of primary access to state test data
- Needs for improving state test data use

Statewide Case Studies

Site Selection

As educators completed the statewide surveys, six case study districts were selected across New York State in order to gain a deeper understanding not achievable by surveys alone. To select these districts, results from a preliminary analysis of administrators' survey responses were combined with publicly-accessible demographic information to determine which locations would provide the most diverse but representative orientations to data and technology use (see Table 3). Due to the small size of most districts in Upstate New York, a total of 10-12 educators per district were

⁶ In the complex sampling analysis, using SPSS, the sample size is not reported and instead percentages are provided to infer results to the population.

interviewed during May 2006 - at least 2 district level officials, the middle and elementary school principals, and 3-4 teachers in each of these schools.

Table 3. Field study district demographics and emphasis on data usage

District Name	N/RC ⁷	Poverty Index ⁸	K-12 Enrollment	FRPL ⁹	Title I Eligible ¹⁰	Testing Grades ¹¹	Data Emphasis and Usage ¹²
District C	5	22	1786	33.8%	Yes	4, 5, 6, 7, 8	Strongly emphasized annual data usage
District S	5	9	2388	25.0%	Yes	4, 6, 8	Moderately emphasized, weekly data usage
District L	5	3	1365	14.0%	Yes	4, 8	Moderately emphasized, monthly data usage
District R	5	0	170	32.0%	Yes	8	Moderately emphasized, monthly data usage
District W	5	6	7637	25.4%	No	4, 5, 7, 8	Strongly emphasized, monthly/annual data usage
District B	4	6	1459	48.6%	Yes	4	Strongly emphasized, monthly/annual data usage

Data Collection

Findings from the statewide surveys and current research informed the semi-structured interview protocols used to address key issues related to data and technology use. Each protocol provided enough questions and prompts to fill a 30-45 minute interview, but allowed interviewers the flexibility to take the conversation in meaningful directions as necessary.

⁷ Districts receive a Need/Resource Capacity rating based on their capacities to meet student needs with local resources, calculated by dividing a district’s estimated poverty percentage by its Combined Wealth Ratio. The Need/Resource Categories are: 1. New York City Public Schools, 2. Large City Districts – Buffalo, Rochester, Syracuse, Yonkers, 3. High Need Urban-Suburban Districts, 4. High Need Rural Districts, 5. Average Need Districts, and 6. Low Need Districts.

⁸ The number of children 5-17 years of age in families below the poverty level, as determined by the 1990 Federal census, divided by the total number of children within the district boundaries who are 5-17 years of age. Higher poverty indices represent districts with greater student needs.

⁹ The percentage of students receiving free or reduced price lunch.

¹⁰ Whether any school within the district is eligible to receive Title I funds.

¹¹ Data reported through the statewide survey on the grade level in which state testing takes place.

¹² Data reported through the statewide survey on the emphasis and frequency of data usage within the district.

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One-on-one interviews with administrators enabled each party to focus on the administrator's perspective without distraction from non-administrators. Interviews with individual, pairs and groups of teachers illuminated contrasts between grade levels and content areas where they existed. In total, over 65 educators in 13 schools across six districts were interviewed during May 2006. (See Table 4).

Table 4. Case study schedule

District Name	Number of Schools	Number of Administrators Interviewed	Number of Teachers interviewed	Case Study Date(s)
District C	2	2	6	May 1-2
District S	3	5	9	May 1-2
District L	2	4	6	May 3
District R	1	1	4	May 8
District W	3	4	15	May 8-9
District B	2	4	6	May 17-18
Total	13	20	46	

Analysis of Findings

Two-person field study teams summarized the findings from each district in the form of individualized cases, noting the process, culture, technology involved and key aspects of using student performance data to differentiate instruction. The similarities and differences across all field study districts presented in this report complement the findings from statewide surveys.

RESULTS

Broadly speaking, findings from the statewide surveys and case studies conducted across Upstate New York, collated into the four dimensions described above, reflect the findings from research previously conducted elsewhere.

Data system characteristics

Some schools have purchased data programs or services in advance of the nySTART rollout. At least three of the field study districts currently use data programs that assess and compare student performance on New York State Standards with other local schools and objective performance cutpoints. Each product provides educators with user-friendly charts that have links to specific content strands and performance indicators that transition users from performance data into curricular and instructional support content. Some products provide instructional resources such video clips, modifiable lesson plans and web links that target the lowest performers, and guiding questions to support districts' systematic gap and trend analyses. Fee-based data analysis services provided by the regional education service center also enable smaller, rural districts to receive data reports, particularly if the district cannot dedicate internal resources to the effort.

Administrators in the State's urban and largest districts have the most convenient and local access to state test data. In districts with five or more schools, electronic access is the primary method of acquiring state test data among administrators, whereas hard copies of state test data are more commonly used in districts with four or fewer schools. Administrators in city schools typically locate state test data locally in the district's or school's central office and less commonly at regional education service

centers. By contrast, principals of rural schools and schools located in towns report that regional storage of state test data at the education service centers is more common.

Teachers in city schools differ from their less urban counterparts in their access to and use of both state test data and Internet-based technologies. City teachers have easy access to state test data in general and electronic formats of these data in particular, and they use these data more frequently than their non-urban counterparts. More city teachers than any others report daily or weekly usage of student data to modify their instruction.

User interactions with data

Teachers typically turn to state test data and formal/structured or externally-generated assessments either annually or monthly for various purposes. The majority of teachers interact with state test data annually, whether in discussions with their administrators, other teachers, parents, and students or to inform their teaching. Formal/structured and externally-generated assessments of student learning can represent a type of assessment that is similar to state tests, but encapsulate learning that takes place over shorter periods of time than one year. Teachers tend to rely on formal/structured and externally-developed assessments of student learning to modify their instruction much less often – monthly and annually – than informal assessments of student learning. Teachers typically rely on informal assessments of student learning to modify their instruction daily and weekly.

Very few teachers currently use Internet-based technologies such as video or websites for instruction and assessment. Nearly one third of all teachers and half of all teachers with 11 or more years of teaching experience have never used Internet-based technologies (e.g. websites, streaming video) in their instruction. Teachers that use Internet-based technologies typically do so for instruction and not assessment purposes. Nearly half of all teachers have never used a website to assess student learning.

Instructional delivery, analyzing data and using data to inform instruction require separate skills. Teachers currently receive extensive preparation and ongoing training in methods of instructional planning, instructional delivery and assessing student learning. Despite their training in these areas, very few teachers are fluent in analyzing data, using data to critically analyze their teaching, or developing curricula in relevant and meaningful ways to improve student achievement. Teachers don't have the time or specific skills necessary to understand the benefits and limitations of state test data. Similarly, teachers typically do not know how to 'unpack' state tests to determine why students haven't acquired a particular set of concepts, or to compare the performance of various types of students.

Cultural elements of data use

While only recently implemented, the annual state testing agenda for ELA and Math in grades three through eight is already changing the way educators in Upstate New

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York approach and use state test data. In all field study districts but one, educators have made recent adjustments to their use of state test data that reflect the State's new annualized testing agenda. Most commonly, these adjustments are at the district level in the form of curriculum alignment and gap and item analyses. Correspondingly, principals and teachers alike note a significant increase in the frequency and nature of communications between and among teachers about how to align curricula and generate parallel instructional tasks. The new testing agenda has also prompted a shift in thinking about the nature of testing among educators in field study districts. Both principals and teachers look forward to the annual tests providing more reliable and valid student performance data but do not recognize the potential benefits of using state test data more frequently than once or a few times a year.

Schools that adopt a data-driven culture with buy-in from both administrators and teachers ensure that educators use state test data to inform instruction. A strong data-driven culture supported by district resources, led by a dedicated principal and operationalized by committed teachers ensures that state test data play an important and unique role in understanding student achievement, rather than enhancing teacher accountability. In these schools, teachers have frequent opportunities during faculty and team meetings, staff development days and after school training sessions to learn about and intensively analyze their students' state test data.

Districts that do not adopt a data-driven culture are characterized by disagreement among administrators and teachers about the urgency and value of using state test data at the classroom level.

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Whereas administrators have sufficient professional development opportunities to develop their capacity to use state test data, teachers want and need more training in this area. Administrators were almost twice as likely as teachers to have enrolled in professional development designed specifically to enhance their usage of student performance data. Although nearly every administrator surveyed felt it is important for teachers to participate in professional development that emphasizes data collection, analysis and/or use, teachers and administrators report less than half of the curricular and instructional meetings these administrators lead involve discussions about state testing or data of any kind. Without school-based opportunities to learn about state test data usage, teachers must seek external development in this area. Teachers are seeking such opportunities, but less than half of the professional development opportunities available to them enhance their usage of technology for either deepening instruction or understanding student performance data.

Common barriers to successful data use

Administrators and teachers need more time to work with state test data.

Administrators agree that having more time to work with student performance data is a greater need than having more data, personnel, knowledge or technology. Teachers also need more time (but not more data), better access to the data, or more technology in order to better utilize state test data in their teaching.

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The technological infrastructure in some districts and schools can severely limit teachers' use of instructional technology for either analyzing data or delivering instructional content. Smaller and more rural school districts do not always have the technological infrastructure necessary to accommodate multiple simultaneous users of the internet, particularly in downloading streaming video. Sometimes this is because the utility lines that provide these services are unavailable locally while sometimes it is due to local network configuration problems and slow classroom machines. Similarly, schools within each district may have different technological capacities because of a staggered building renovation schedule or because one school is located closer to a city or business park than the others. For some teachers, conducting a technology-based lesson involves several weeks of preparation and authorizations in addition to their regular instructional planning efforts.

Student performance reports arrive too late and are difficult to use. Overwhelmingly, educators across Upstate New York are concerned about the delayed reporting of student performance data. By the time reports of student performance arrive, educators have already made the instructional decisions that state test data might have informed. In addition to timely reports, educators want reports that are accessible and user-friendly, and link incorrect test questions with content strands and performance indicators.

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Educators are skeptical about the validity and reliability of state test data, as well as the increased accountability suggested by annualized measures of student performance. All teachers in field study districts are concerned about 'over-testing' students and the possibility that both community members and educational decision makers will overemphasize the importance of student test scores. At least one teacher in every school described a scenario in which (s)he felt as though test scores gather inaccurate student performance data, for example because some students are developmentally incapable of taking a written exam or because of undesirable testing conditions. Teachers and administrators do not want to use inaccurate scores to make important instructional decisions that have long term consequences for students who simply may have had a 'bad testing day'.

Teachers lack the necessary time, training and opportunities to work with data and technology to inform instruction. Teachers lack sufficient amounts of the appropriate time and training necessary to use data and technology to differentiate instruction. Despite their desires, very few meaningful professional development opportunities exist for teachers in any of the field study locations to analyze and use their students' state test data for differentiating instruction. Further, all field study teachers have limited access to technology-based interfaces of student performance data. In most cases, this is a software limitation, while in others hardware presents the limiting factor. Where administrators may have privileges to data programs, teachers receive outputs of leaders' data analyses rather than manipulating data themselves. In some districts,

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teachers not only have limited access to data analysis software, but they also have too few computers available with sufficient technological capacities to serve basic instructional functions such as accessing Internet web pages and downloading streaming video.

CONCLUSION

The complementary findings from this mixed methods research serve two important functions. First, they validate some of the early case study research findings on data-based decision making at a statewide scale. Second, the findings reported here will establish a point of comparison from which subsequent administrations of the same surveys, combined with other methods, will show changes in data usage practices over time.

Administrators and teachers face common challenges in an era of increased accountability, where student performance data are widely available but may not be easily applied to professional practice. Technology-based data interfaces show promise as one solution for bridging this gap. While the statewide survey and case study data presented here illustrate common successes and barriers to using student performance data, training and technology, these data also illuminate fundamental differences in educators' capacities to move toward data-based practice. Attending to data system characteristics, user interactions with data, cultural elements that facilitate data use and capacities to overcome common barriers to data use ensures the greatest likelihood for success.

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