Abstract Title Page

Title: The Urban Data Study: Linking Teacher and School Data Use to Improved Student Achievement

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Abstract Body

Background / Context:

Educators have long used test scores to make educational decisions, but only within the last decade has the availability of data been systematic (Abelman, Elmore, Even, Kenyon, & Marshall, 1999). In recent years, interest has spiked in data-driven decision-making in education (Marsh, Pane, & Hamilton, 2006). With technological advances and growing pressure for “data driven” instruction under accountability reforms, many schools, districts, and states have invested significant resources in tools designed to provide educators with regular access to data (U.S. Department of Education, 2009). States and districts have also heavily invested in interim assessments (also known as benchmarks) for gauging student performance prior to end-of-year accountability tests. Interim assessments are an increasingly available source of student data. Administered at regular intervals (e.g., every six to eight weeks) in core subjects, they are often adopted at the district level and are used to predict student performance on end-of-year state tests, diagnose student strengths and weaknesses on specific topics, and to evaluate curricula or instructional programs (Heppen et al., 2011; Perie, Marion, Gong, & Wurtzel, 2007).

The increased emphasis on data use is based on the belief that student data can be an important lever for improved teaching and learning. However, there is little consensus on what being “data driven” means and a lack of clear information available to practitioners about exactly how to use data to inform their classroom instruction (Spillane, 2012).

We conducted the Urban Data Study from 2009-2012 to examine relationships between key dimensions of interim assessment data use and student achievement. Exhibit 1 (in Appendix B) shows a theory of action that explicitly links these key dimensions. The diagram flows from left to right, with key dimensions on the left leading to instructional change and ultimately improved student achievement.

Purpose / Objective / Research Question / Focus of Study:

The overarching goal of the study was to understand the links between school- and teacher-level practices and perceptions related to using interim assessment data and student achievement. Our analysis focused on the relationships between the four key dimensions of data use and student achievement on the state assessments in reading and mathematics. We also examined the links between perceived barriers to data use and student achievement in both subjects.

This study was designed to address two broad research questions about using student data from interim assessments.

1. What are the relationships between teachers’ data-use practices and perceptions and their students’ achievement?
2. What are the relationships between school policies, practices, and resources for data-driven instruction and student achievement?

Setting:
We conducted the study in four geographically diverse urban districts, all members of the Council of the Great City Schools (CGCS). Inclusion criteria stated that participating districts (1) had administered interim assessments continuously for the past three years; (2) planned to continue administering interim assessments for at least the next several school years; (3) administered interim assessments at least three times in a school year; and (4) had a data system with the capacity to meet the requirements of a quantitative study that would link school- and classroom-level data use practices with student achievement. The selected districts also had to be willing to participate in the in-depth study, which included a series of principal and teacher surveys and a two-day site visit.

The four districts ranged in size from one of the largest urban districts in the nation to a mid-sized district. District 1 serves about 90,000 students in 126 schools with a staff of about 6,500 teachers. District 2 is one of the largest school districts in the country, serving approximately 311,000 students in 324 schools, with a staff of about 14,800 teachers. District 3 serves close to 98,000 students in 155 schools and employed more than 6,000 teachers. Finally, district 4, the smallest participating district, serves close to 24,000 students in 53 schools with a staff of approximately 1,900 teachers.

Population / Participants / Subjects:

The sample included teachers of grades 4, 5, 7, or 8 (n = 1,581) and principals (n = 212) in a sample of 193 randomly selected elementary and middle schools in the four participating districts. The analyses linked teacher and principal survey data about their own data use with a total of 61,798 students in grades 4, 5, 7, or 8.

Intervention / Program / Practice:

The study did not implement an intervention but rather studied perceptions and practices related to interim assessment initiatives already being implemented by each district.

Research Design:

The study uses a correlational design to generate foundational information about the relationship between data use and student achievement. We used multilevel modeling to empirically test links between school- and teacher-level data use measured via surveys with student achievement on the end-of-year state assessments. The study was powered to detect relationships that are approximately 0.07 standard deviations for teacher-level effects and 0.18 for school-level effects.

Data Collection and Analysis:

There were two sources of data for the study: (1) teacher and principal survey data, and (2) district records including individual student achievement and demographic information and class rosters that enabled us to link students to their teachers.

Teacher and principal surveys. We developed web-based surveys to measure key concepts in the theory of action, including the nature and frequency of benchmark assessments, their perceived alignment to standards, validity, and usefulness, infrastructure for accessing student data,
participation in training and support, frequency with which data are used and the level of collaboration around data, and the manner and extent to which data inform instruction and decision-making. Participants were asked to respond to the survey three times during the 2009-2010 school year. The schedule for survey administration was timed to coincide with the completion of benchmark assessment testing in each district. For subscales of data use, internal consistency was adequate with Cronbach alphas ranging from 0.70 to 0.93 for teachers and 0.76 to 0.97 for principals. The survey also included measures of background characteristics, used as control variables in the analyses.

District records data. We collected individual student-level demographic and achievement data from district databases. Our primary outcome measures are spring 2010 state assessment scores in reading and mathematics. Student characteristics and prior achievement are used as control variables in the analyses.

We also collected from each district class rosters for the reading and mathematics teachers in each participating school. These data enabled us to link teachers in the survey sample to the individual records for the students in their classrooms during the 2009/10 school year.

We conducted two sets of analyses to examine how teacher- and school-level data use practices and perceptions were related to student achievement. Because students were nested within teachers, which were in turn nested within schools, a multilevel framework was used for both sets of analyses. The first set of analyses used structural equation modeling (SEM) to examine the relationship between a general construct of data use and student achievement. The second set used hierarchical linear modeling (HLM) to examine the unique links between each dimension of data use and student achievement, independent of the other dimensions.

Findings / Results:

Teacher findings. SEM results suggested that teachers’ general data use practices and perceptions are positively related to student achievement in elementary grades reading and middle grades mathematics. That is, teachers with higher levels of general data use (and perceptions of data supports) have students with higher state assessment achievement scores in middle grades mathematics, $\beta = 0.10, p < 0.05$, and elementary grades reading $\beta = 0.17, p < 0.05$. However, there was no statistically significant relationship between teacher data use and student achievement in elementary grades mathematics or middle grades reading. HLM findings also suggested significant links between some key dimensions of teacher data use and student achievement. Specifically, in middle grades mathematics and elementary grades reading, Attention to Data in the Classroom was significantly and positively related to student achievement $\beta = 0.09, p < 0.01$ and $\beta = 0.06, p < 0.05$, respectively. This key dimension was a compound construct that included the measures of Working with Data and Instructional Responses as depicted in Exhibit 1. Though not consistently across grades and subjects, Attention to Data in the Classroom was the strongest predictor of student achievement that we tested. Teacher perceptions of Barriers to using data also predicted lower student achievement in elementary mathematics, $\beta = -0.08, p < 0.05$. In combination, these findings partially supported the theory of action.

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1 The paper will provide additional information about instrument development.
**Principal findings.** SEM analyses suggested that principals’ *General Data Use* also was positively related to student achievement, but only in middle grades mathematics $\beta = 0.23, p < 0.05$. The link between general data use and student achievement was not statistically significant in elementary mathematics, elementary reading, or middle grades reading. HLM analyses of each key dimension of data revealed that principal perceptions of *Supports for Data Use* were positively related to student achievement in elementary mathematics, $\beta = 0.11, p < 0.05$, and elementary reading, $\beta = 0.09, p < 0.05$. Principals’ *Attention to Data in the School* also was positively related to student achievement in elementary mathematics, $\beta = 0.10, p < 0.05$. The other dimensions of principal data use, including *Context* and *Barriers* to using data, were not significantly related to student achievement.

**Conclusions:**

We hypothesized that general and specific data-use practices and perceptions would be positively related to student achievement. The findings partially supported this hypothesis. For both teachers and principals, *General Data Use* was related to student achievement in some grade levels and subjects. As for more specific practices and perceptions, teachers’ *Attention to Data in the Classroom*, principals’ *Attention to Data in the School* and principals’ perceptions of *Supports for Data Use* were related to higher student achievement, while teachers’ perceived data use *Barriers* were related to lower student achievement. In other words, the more that teachers and principals reported reviewing and analyzing student data and using this information to make instructional decisions, the higher their students’ achievement, at least in some grades and subjects. Moreover, for principals, the more they reported having support in the form of data infrastructure, adequate time for review and discussion of data, professional development, and the appropriate human resources, the higher their students’ achievement.

However, the findings revealed heterogeneity of effects, where results varied by grade and content area, with significant links observed in both elementary grades and middle grades, as well as in mathematics and reading. More research is needed to better understand why there is a relationship between data use practices and perceptions, sometimes, in some grades, in some content areas. However, of the six significant relationships between data use practices/perceptions and student achievement that emerged in this study’s analyses, five were observed in the elementary grades. This finding suggests that something about the structure of the elementary grades may be more conducive to the successful use of interim assessments, when compared with the middle grades.

Finally, although this study provides evidence of a relationship between some key dimensions of data use and student achievement, it is essential to understand that no causal claims about the nature of these relationships can be made on the basis of this correlational study. Interim assessments and the use of their data are just one of a number of policies, practices, and interventions being implemented within schools and school districts. It is not our claim that supports for data use and attention to data use in the classroom or school directly cause improved student achievement in certain grades and subjects. Rather, this study provides foundational evidence that as some aspects of data use increase, so too does student achievement.
Appendices

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Appendix A. References


Appendix B. Tables and Figures
Not included in page count.

Exhibit 1. Using Data from Interim Assessments to Improve Student Achievement