Hammill Institute on Disabilities

Assessment for Effective Intervention
2016, Vol. 41(2) 79–93

DOI: 10.1177/1534508415610322
aei.sagepub.com
SAGE

Data-Based Decision-Making Teams in Middle School: Observations and Implications From the Middle School Intervention Project

Deanne A. Crone, PhD[1], Sarah E. Carlson, PhD[1], Marcia K. Haack, PhD[1], Patrick C. Kennedy, PhD[1], Scott K. Baker, PhD[2], and Hank Fien, PhD[1]

Abstract

The use of data-based decision making (DBDM) in schools to drive educational improvement and success has been strongly promoted by educational experts and policymakers, yet very little is documented about the actual DBDM practices used in schools. This study examines DBDM practices in 25 middle schools through 80 standardized observations of data team meetings and through survey responses. DBDM practices in terms of structure, process, content, quality, and alignment between self-report and observation are described. Key findings include the following: (a) The average amount of time spent discussing an individual student was brief, less than 2 min; (b) on average, actionable decisions following discussions of behavior or reading issues were made 34% to 40% of the time; and (c) there was weak alignment on key topics between self-reported and observed DBDM practices. These findings underscore the need for additional studies of DBDM practices in school and of the impact of DBDM practices on important student outcomes.

Keywords

interventions, middle school, observation

In the past decade, the expectation that educators use data to inform instructional decisions has increased dramatically, as has awareness of the potential that this process, known as data-based decision making (DBDM), holds for improving student outcomes (Mandinach, 2012). This combination has led to more widespread adoption of DBDM practices in schools, across all levels of educational delivery. The types of data collected and the ways in which data are used vary, depending on the role and purpose of the individual or team using the data. The literature on formative assessment, including curriculum-based measurement (CBM), has contributed to the trend toward increased data use in schools. This literature demonstrates that regular, reliable, and valid evaluation of essential skills paired with instructional modifications, as necessary, can have a positive and significant impact on student achievement (see, for example, Fuchs & Fuchs, 1986; Marcotte & Hintze, 2009). Stan Deno and colleagues (e.g., Deno, 1985) pioneered much of the early work on collecting and integrating frequent, current assessment data to identify and address skill deficits in critical academic areas. Their groundbreaking work in CBM is considered by many to be the original model of DBDM in education.

A critical impetus for the increased use of data in schools was the No Child Left Behind Act (NCLB; 2001), which mandated that schools and states systematically collect, report, and respond to data measuring student achievement in key content areas. Because NCLB also legislated sanctions for schools whose achievement data demonstrated inadequate progress toward grade-level standards, schools and districts were strongly incentivized to collect data and use them to improve student achievement, at least on statewide assessment measures. What NCLB did not do, however, was to specify the mechanisms for schools and teachers to effectively implement and evaluate DBDM practices (Wayman & Stringfield, 2006). Thus, although teachers and administrators typically have access to multiple sources of student performance data, relatively little is known about the specific DBDM practices that school personnel utilize to improve student achievement. This study begins to fill that need by describing and evaluating DBDM practices in 25 middle schools, using both standardized

[1]University of Oregon, Eugene, USA
[2]Southern Methodist University, Dallas, TX, USA

Corresponding Author:
Deanne A. Crone, Open Education Analytics, 55 Tanglewood Drive, Lake Oswego, OR 97035, USA.
Email: openeducationanalytics@gmail.com

observations of data team meetings and responses from a survey on school DBDM practices.

Current Recommendations for Best Practices in DBDM

Despite dramatic increases in access to data, few educators have been adequately prepared to efficiently and effectively navigate the information available to them (Mandinach, 2012), resulting in a substantial discrepancy between the amount of student data accumulated and the corresponding knowledge of how to use those data to improve outcomes for students. Recently, researchers have begun working to bridge this gap by developing and disseminating recommendations for how districts, schools, and teams, across all grade levels, should use data (e.g., Hamilton et al., 2009; Kekahio & Baker, 2013). For example, the National Center on Intensive Intervention (NCII, www.intensiveintervention.org) offers multiple resources and implementation and instructional support on using DBDM to deliver intensive and individualized interventions to students with significant behavioral and learning needs. These recommendations all offer similar definitions of DBDM and share a number of common themes.

One common theme is that effective DBDM processes are based on an iterative cycle of data collection, analysis, decision making, and follow-up (Hamilton et al., 2009; Mandinach & Jackson, 2012). Mandinach, Honey, Light, and Brunner (2008) have developed and popularized a data use framework that elucidates how raw data can be transformed into useable knowledge and data-driven actions. Within their framework, raw data are *collected* from a number of available sources and *organized* so that users (e.g., teachers, administrators, specialists, etc.) can make sense of the data. In the next level, users *analyze* patterns and trends in the data and *summarize* their findings to explain how a specific student or group of students is performing, typically in relation to pre-established criteria or expectations. Finally, summarized data are transformed into actionable *knowledge.* Data users *synthesize* the information they have generated so far and *prioritize* what actions to take first. Identified actions should be implemented, and the effect of those actions should be monitored and evaluated. These new data can then serve as the foundation for another iterative cycle of DBDM.

Other common themes regarding best practices for DBDM include recommendations that instructional decisions be based on multiple sources of (reliable and valid) data, and that the DBDM process incorporate effective professional development regarding understanding and using data, an infrastructure of support to build and maintain capacity, and the use of *data teaming*, rather than relying on a single, qualified individual to drive the DBDM process (Hamilton et al., 2009; Kekahio & Baker, 2013; Mandinach, 2012). Data teaming provides a unique opportunity for teachers, administrators, and related service personnel to collaboratively discuss the needs and progress of students in the context of classroom or school issues, such as response to instructional groupings based on statewide assessment results or alignment of instruction within and across grade levels. Furthermore, data teaming allows staff without data analysis skills to learn how to collect, analyze, and apply data from more experienced colleagues or data coaches (Means, Padilla, & Gallagher, 2010).

Current Understanding of Data Teaming Practices in Schools

Over the years and in response to different legislation or priorities, schools have used the concept of teaming to provide support to students and teachers. Problem-solving teams have long served multiple purposes, including diagnostic assessment, teacher support, and identification of behavioral and academic challenges (Bahr & Kovaleski, 2006). In addition, more recent legislation (Individuals With Disabilities Education Act [IDEA], 2004) encouraged schools to adopt a team-based multi-tiered Response to Intervention (RtI) model for all students.

Nevertheless, direct evidence of how these school-based teams access, review, and use data is limited. Most research on data use in schools relies primarily on self-report, focus groups interviews, or surveys, rather than on standardized, direct observations of DBDM in practice. One exception comes from the positive behavioral and interventions support (PBIS) literature. Newton, Horner, Todd, Algozzine, and Algozzine (2012) conducted observations of PBIS teams to document fidelity of implementation to their specific data teaming process, called the Team-Initiated Problem Solving (TIPS) model. Four elementary school data teams in two states received professional development at a workshop to implement the TIPS model. The researchers then used a standardized observation protocol to document adherence to the TIPS model, and found that data teams were in fact able to implement the TIPS model with fidelity. Although this study is encouraging in that it demonstrates that typical school staff can effectively implement a DBDM process when provided with adequate professional development and coaching, it does not answer the question of how typical data teams examine and use data in the absence of a specified framework and associated professional development. Findings from other studies including observations of data team meetings, in elementary, middle, or high school, are primarily reported as vignettes or case descriptions (e.g., Feldman & Tung, 2001; Marsh, Farrell, & Bertrand, 2014), rather than quantitative summaries of structured observations. The present study begins to address this gap in the literature.

Middle School Intervention Project

The data presented here were collected as part of the Middle School Intervention Project (MSIP), an effort to evaluate the impact of a multi-component intervention on improving academic and behavioral outcomes among middle school students with low reading performance. We worked with middle school teams because the participating districts had identified struggling middle school readers as one of their top priorities for schools' improvement. At the outset of MSIP, each participating school district had systems in place for examining student data and agreed to integrate regular review of academic and behavioral data for MSIP students into each school's data team practices. We conducted multiple, direct observations of data team meetings over the course of the school year, providing an opportunity to examine how data teams operate in typical middle school settings.

Research Questions

We addressed the following research questions:

> **Research Question 1:** How is DBDM implemented in the middle schools in the sample?

We describe the structure, process, content, and decisions made in the observed data team meetings.

> **Research Question 2:** To what extent do self-reported data team practices align with observed data team practices?

We examine the alignment between responses on a standardized survey of school practices with the findings from multiple, standardized observations of data team meetings at each participating school.

Method

In this article, we report on findings from the third year (2012–2013) of a 5-year longitudinal study, when the student sample was in eighth grade. Participating schools utilized a three-pronged intervention to support their at-risk, struggling readers: (a) a reading intervention component that provided targeted reading support to struggling readers, (b) a school engagement intervention component to strengthen students' behavioral and psychological engagement with school, and (c) a DBDM team component. Reading interventions were typically offered as a reading class. Curricula, teacher to student ratio, and duration of the intervention varied across districts and schools. School engagement interventions varied widely across schools, including, for example, extracurricular clubs, tutoring, and behavior-based check-in/check-out programs. In the DBDM component, data teams met with the intention of reporting academic achievement and student engagement data for intervention students, using those data to evaluate the effectiveness of the interventions for a particular student or group of students, and modifying interventions as necessary to improve outcomes.

Setting

This study was conducted in 25 middle schools within six school districts in the Pacific Northwest. One of the six districts (four schools) began participation in the second year of the study. Districts ranged in size from 5,865 to 39,488 students, with 348 to 1,064 students in each middle school. Within the districts, 36.2% to 63.2% of students were eligible for Free or Reduced Lunch, 29.30% to 48.4% were minority students, and 11% to 26% of students were English learners.

Participants

DBDM teams. In each year of the study, we observed DBDM team meetings in the fall, winter, and spring. Schools held a variety of teacher or staff-led meetings each week. To identify which meetings to observe, school staff, in collaboration with a district-based liaison to the project, identified which of those meetings focused on DBDM for eighth grade students. In some schools, these meetings focused only on students in the MSIP intervention. In other schools, these meetings included discussion of both MSIP and non-MSIP intervention students. DBDM teams were observed for the duration of each meeting that was focused on discussion of student and/or group data.

Survey respondents. The staff member most familiar with the school's DBDM practices was asked to complete the DBDM portion of the School Interventions Survey (SIS; Crone, Smith, et al., 2010), described below. Respondents self-identified as principals (n = 8, 32%), assistant principals (n = 5, 20%), literacy coaches or reading specialists (n = 5, 20%), school counselors (n = 3, 12%), classroom teachers (n = 2, 8%), and RtI or intervention specialists (n = 2, 8%).

Measures

SIS. The SIS is a 45-item questionnaire designed by the research team to collect self-reported data regarding each school's practices on reading interventions, student engagement interventions, and DBDM teams. The survey consists of both multiple-choice and open-response questions. Respondents completed the survey using Qualtrics (2015), a secure, online survey collection tool.

Data Team Tool for Observation (DTTO). The DTTO is an observation protocol developed during the first year of MSIP to capture the content and quality of data team meetings. Revisions to the protocol occurred at the end of each academic year, resulting in three slightly different versions of the tool (DTTO 1.0, 2.0, and 3.0). DTTO 3.0 was used for the eighth grade year of the study. A copy of the DTTO 3.0 and corresponding manual (Crone, Nelson-Walker, Cohen, Coughlin, & Schwartz, 2012) are available from the first author. The DTTO 3.0 consists of four sections, described below.

Data team cover sheet. Observers use the cover sheet to document background information (e.g., date, school, team name, team purpose) and structural features of the data team (e.g., start and end times, number of team members present, whether or not an agenda was used). This part of the protocol also requires the observer to meet with the data team leader immediately following the meeting to answer questions about topics that cannot be ascertained during the meetings (e.g., follow-up behaviors to support plan implementation).

Data team participant list. The data team participant list is used to document meeting participants and their roles on the data team and in the school.

Students reviewed summary sheet (SRSS). Observers use the SRSS to document information regarding data team discussions about individual students and groups of students. For each separate discussion, problem areas (e.g., academic, behavioral), quantitative and qualitative data sources referenced, and action plans are recorded. Examples of quantitative data sources include state test scores for reading or math, attendance records, and scores on other reading tests. Examples of qualitative data sources include relevant discussions of the child's home life, discussions of the child's peers, and work samples. Detailed definitions of each data source are provided in the DTTO 3.0 manual, available from the first author.

The SRSS also allows observers to indicate, within the discussion of a particular student or group, whether any actions were considered and/or adopted. Observers indicated "decision made" when a specific action to be taken was discussed or written down. Sometimes, the decision made was to maintain the student in the current intervention(s). Observers marked "goal set" when the team enumerated the expected outcomes for the decision made within a given content area. "Timeline established" was selected if the team indicated when outcomes were expected and when they would be reviewed, given any decision(s) made. "Person assigned" was selected when the team designated an individual to facilitate implementation and disseminate information for any decisions made.

Quality of data team structure and process. At the conclusion of each data team meeting, observers completed a quality ratings form consisting of 29 items divided into four sections—structure, process, student-level discussions, and group-level discussions. Observers rated data team structures and processes using a 3-point scale: 0 = *element absent or not observed*, 1 = *inconsistent level of implementation*, 2 = *high level of implementation*.

Procedures

Calculating inter-observer agreement (IOA). Members of the MSIP research team conducted all data team observations. After training on the DTTO 3.0, paired observations were conducted until IOA criteria were met in three areas: (a) the number of students and groups identified, (b) total score on the Quality of Data Team Structure and Process sheet, and (c) the information captured for each sub-category and total on the SRSS. IOA for the number of students or groups observed was calculated by dividing the total number of agreements by the total number observed by the primary observer. IOA criteria for students or groups were set at 90% or greater agreement.

IOA for the quality ratings sheet was calculated by obtaining the difference in total score between primary and secondary observer and dividing by the total number of points possible. This number was subtracted from 1 and multiplied by 100 to obtain a total percent agreement. The IOA criterion for the quality ratings page was set at 90% or greater on the total score.

IOA for the SSRS was calculated as follows: An agreement on the SRSS was defined as any time both observers endorsed (fill in a bubble) *or* both observers did not endorse (leave a bubble blank) a given item on the sheet. In contrast, a disagreement on the SRSS occurred any time one observer endorsed an item, while the other observer did not endorse that item. The total number of agreements was tallied for the entire observation, as well as the total for each of the following sub-categories: (a) areas discussed, (b) nature of quantitative data, (c) nature of qualitative data, and (d) action plan. The total number of agreements for each category was divided by the total number of possible items within that category multiplied by the number of rows of data completed. This number is multiplied by 100 to obtain a percent agreement for each category as well as for the overall total. IOA criteria for the SRSS were set at 85% or greater for each sub-category, and an average of 90% or greater across all sub-categories.

Observation sampling plan. Observers completed three separate rounds of data team observations, observing a total of 80 distinct data team meetings across the six participating districts. In 25% of the observations, two observers were paired for purposes of computing IOA. Average IOA for the

number of students/groups was 97.1%; average IOA for total score on the quality ratings was 95.5%; and average IOA for the overall total on the SSRS was 97.9%.

Data teams at each school were observed between 2 and 7 times throughout the school year. Across districts, 19 observations were conducted in the fall, 33 were conducted in the winter, and 28 were conducted in the spring. Three or more observations per school were achieved at 80% of schools (20 schools); 5 schools were observed only twice, either because (a) those data teams met fewer than 3 times during the year, or (b) the first opportunity to observe the team at the beginning of the school year occurred before observations began.

Results

How Is DBDM Implemented in the Middle Schools in the Sample?

Structure of data team meetings. On average, 7 data team members (SD = 2.0) attended each observed DBDM meeting, with a range of 2 to 12 participants. At least one administrator attended 78.4% of the meetings, a special education instructor attended 68.9% of the meetings, and reading intervention and English language learner (ELL) specialists attended 54.1% and 35.1% of the meetings, respectively. The most frequent participants on DBDM teams were grade-level teachers, mostly in language arts and math content areas, who were present at 74.3% of meetings, and made up 40.7% of all participants. The number of teachers per meeting ranged from 0 to 12.

During observed data team meetings, an agenda (written or verbally delivered) was used 96.2% of the time, and notes were taken in 92.0% of meetings. Data were typically visually displayed in some format (67.53% of observations), and most teams were able to readily access electronic records during the meeting (67.11%). Some teams used a participant rotation approach, so that key individuals (e.g., the teacher for a specific subject) attended the meeting only to discuss specific students. Participant rotation was used in 32% of the meetings observed.

Process characteristics of data team meetings. The frequency and duration of DBDM meetings to discuss MSIP students varied within and across districts. When asked about meeting frequency on the SIS, the most common response (n = 8) was "once per month." Two schools indicated that data teams met weekly. The average duration of observed data team meetings, by school, was 49.5 min (SD = 18.47).

At the conclusion of each data team meeting, observers asked data team leaders a standard set of questions about non-observable aspects of the DBDM process, including whether and how data were shared with key stakeholders. Most data team leaders reported that team members were asked in advance to bring data to the meetings (76% of observations), and in most cases, agenda items, such as a list of the students to be discussed, were distributed prior to the meeting (87.5%). Team leaders further indicated that decisions made in the meeting were typically shared with important stakeholders: 91% of teams provided summaries of meeting notes to team members, and nearly all reported sharing their rationale with the teachers (93.6%), students (84.4%), and parents (82.3%) likely to be affected by decisions or action plans.

Data team follow-up. The extent to which data teams followed up on decisions made during the data team meetings could not be assessed directly through observation. Thus, here we report on SIS responses to related questions. Schools were asked, "Does the school collect data and/or conduct observations to assess if the reading intervention is being implemented the way that it is intended by the publishers of the program?" Only four schools (16%) indicated this was "firmly in place," and another four indicated that this was "partially in place." The remaining 17 schools indicated either that they had a plan to put this in place in the coming school year, or were not aware of any plans to put this in place. Encouragingly, however, of the eight schools that responded "firmly in place" or "partially in place" to the previous question, six then responded to the follow-up question, "Does the team use data regarding the implementation of the published program to make modifications to the implementation of the reading intervention?" with "firmly in place." The remaining two schools responded with "partially in place."

Content of data team meetings. The DTTO 3.0 captures details about the content of the discussions in which data teams engage. A discussion was defined as any time one or more team members talked about an individual student or particular group. This might involve just a brief presentation of a test score or a lengthy conversation about a student's performance. A discussion ended as soon as the focus of the discussion switched to a different student or a different group. In some meetings, the team had multiple discussions about the same individual or group. We organize our description of the content into three areas: (a) the extent to which data teams focused on students and groups, (b) the types of data sources discussed, and (c) the frequency with which actionable decisions were made.

Focus on students and groups. The number of discussions about students or groups at each meeting varied dramatically across schools. Some data teams chose to focus an entire meeting on just a few students, whereas others used the meetings to briefly review standardized assessment data for a large number of individual students identified as struggling readers. Although most data team discussions

focused on individual students (92.6%), some data teams also discussed groups of students. For example, a team might discuss the progress of an entire reading intervention class and make decisions about modifications to interventions at the group, rather than student level. Across all meetings observed, the number of discussions of *groups* ranged from 0 to 18 ($M = 4.4$, $SD = 5.4$). Across all meetings, the number of discussions about *students* ranged from 0 to 147. Multiple discussions of the same student or group within or across meetings were treated as separate discussions in the DTTO protocol. Thus, meetings with a high number of discussions focused on multiple students, and often returned to discuss the same individuals on multiple occasions within the meeting. Averaged across schools, the mean number of discussions about students per meeting was 18.2 ($SD = 6.8$). Some students were discussed at every observed meeting for a given school.

The average length of time spent per discussion also varied dramatically across schools. Averaged across schools, discussions of individual students ranged in length from 53 s to 7 min, 35 s long ($M = 2$ min, 29 s; $SD = 1$ min, 39 s). Discussions of groups ranged in length from 1 min, 35 s to 47 min, 3 s ($M = 7$ min, 24 s; $SD = 11$ min, 24 s). The average number of discussions about students and groups and the corresponding average amount of time spent for each discussion are summarized, by school, in Table 1. The percent of discussions devoted specifically to MSIP intervention students (out of all the students discussed) is also presented. On average, almost half of all student discussions (47.5%) were focused on MSIP intervention students, although they only represented about a quarter of the student population. However, the mean length of discussion for intervention students ($M = 1$ min, 37 s; $SD = 2$ min, 43 s) was even shorter than the mean for all students.

Actionable decisions. The extent to which discussions of students or groups resulted in an actual decision made and action taken (i.e., goal set, timeline established, and/or person assigned) is presented in Table 2. Data are presented for each school, across all observations for that school. Schools displayed substantial variability in the extent to which data teams concluded a discussion of a student or group by making a decision on what to do next. The percent of discussions that led to decisions made ranged from 0 to 92. Given that a primary objective of DBDM is *decision making*, it is instructive to find such an enormous range in the amount of actual decision making that occurs. This finding indicates that in some data team meetings, there were no decisions made whatsoever, whereas in others, almost every discussion of a student or group ended with some type of decision made. On average, 40% of discussions of reading issues resulted in a decision ($SD = 24\%$), whereas 34% of discussions of behavior or school engagement issues resulted in a decision ($SD = 26\%$).

Data sources. The SIS asks respondents to indicate which data sources are regularly reviewed at the data team meetings. Scores on standardized state assessments and attendance data were the data sources most frequently endorsed (by 80% of schools). Respondents further indicated that grades (72% of schools) and anecdotal reports about daily functioning in class (76%) were important data sources for the DBDM teams.

These SIS self-reports were compared with the DTTO protocol, on which observers recorded when quantitative or qualitative data were discussed in regard to a specific student or group and indicated the specific data source used. In discussions of individual students, the most frequently used data source was quantitative data on students' test scores. Performance on the state standardized reading test was referenced in 35.0% of student discussions, and other quantitative reading scores were referenced in 36.9% of student discussions. Work samples were referenced in only 1.0% of student discussions. In discussions regarding student behavioral issues, quantitative data were referenced in only 6.14% of discussions, whereas qualitative data were referenced in 31.8% of discussions. Attendance data were referenced in about a tenth of all student discussions (quantitative = 10.3%; qualitative = 10.5%). During group discussions of reading, qualitative data were referenced more frequently (35.5%) than quantitative data (19.1% to 23.6%). Additional details regarding the observed use of data sources are provided in Table 3.

Quality ratings. The quality of the team meetings as rated by observers is summarized as a percentage of total possible points received for each of the four sections. In general, observers rated teams high on items related to data team structure ($M = 84.5\%$; $SD = 17.7\%$) and data team process ($M = 79.5\%$; $SD = 16.6\%$). Data teams were rated lower on student-level ($M = 64.0\%$; $SD = 23.1\%$) and group-level items ($M = 52.8\%$; $SD = 23.8\%$), but still received a majority of the possible points.

To What Extent Do Self-Reported Data Align With Observed Data Team Practices?

Our second research question was to determine the extent to which schools' self-report of data team practices aligned with what was actually observed in data team meetings. To answer this question, selected questions from the SIS were compared with the data team observations. Results of these comparisons are reported in Tables 4 and 5.

On the SIS, respondents were asked, "Are there systems in place to collect and manage data regarding the academic achievement of all the students in your school," and "Is there a systematic process in place for reviewing data and making decisions about the progress of individual students?" Respondents could answer "yes, firmly in place," "partially in place," or "no, not in place," or indicate that there was nothing

Table 1. Mean Number of Discussions and Duration of Discussions for Students and Groups.

Schools		Student discussions									Group discussions		
Middle school	Number observed meetings	*M* discussions per meeting	Number discussed in school year	Minimum	Maximum	*SD*	*M* duration	*SD* duration	Number discussions about intervention students in school year	% discussions devoted to intervention students	Number discussions in school year	*M* duration	*SD* duration
A	3	19.3	58	7	29	7.1	0:01:50	0:01:44	9	15.5	6	0:05:21	0:02:17
B	3	10.0	30	4	26	7.6	0:00:53	0:00:51	7	23.3	17	0:02:31	0:02:16
C	3	42.0	126	16	58	13.4	0:01:01	0:01:25	75	59.5	9	0:02:45	0:04:04
D	3	49.0	147	4	82	15.3	0:00:53	0:01:30	42	28.6	1	0:10:52	NA
E	3	22.3	67	16	28	4.7	0:02:10	0:02:17	42	62.7	1	0:01:35	NA
F	3	15.7	47	14	17	1.2	0:03:17	0:04:42	28	59.6	0	NA	NA
G	4	14.0	56	10	20	4.3	0:02:43	0:02:48	17	30.4	3	0:02:24	0:01:39
H	7	16.4	115	5	39	12.0	0:02:15	0:03:12	52	45.2	0	NA	NA
I	4	12.5	50	11	20	3.6	0:01:25	0:01:26	5	10.0	12	0:06:03	0:12:00
J	3	0.0	0	0	0	NA	NA	NA	0	NA	7	0:02:34	0:02:40
K	4	13.0	52	3	27	8.8	0:04:35	0:05:57	7	13.5	5	0:01:57	0:02:32
L	2	24.0	48	24	24	0.0	0:03:01	0:03:43	3	6.3	0	NA	NA
M	3	8.0	24	4	11	2.5	0:05:17	0:04:50	2	8.3	0	NA	NA
N	2	8.5	17	8	9	0.5	0:02:25	0:02:58	2	11.8	0	NA	NA
O	3	13.7	41	6	23	6.8	0:01:19	0:01:21	14	34.1	5	0:02:29	0:02:01
P	2	3.5	7	2	5	1.5	0:03:28	0:03:30	4	57.1	1	0:03:15	
Q	2	4.0	8	4	4	0.0	0:03:55	0:03:18	3	37.5	10	0:02:58	0:03:32
R	7	8.4	59	3	24	8.8	0:03:39	0:03:11	5	8.5	0	NA	NA
S	2	12.5	25	5	20	6.1	0:01:01	0:00:56	20	80.0	18	0:02:30	0:03:29
T	3	43.0	129	20	72	21.1	0:00:53	0:00:59	116	89.9	0	NA	NA
U	3	32.0	96	18	50	13.5	0:00:51	0:00:41	86	89.6	0	NA	NA
V	3	4.7	14	2	12	3.6	0:07:35	0:10:30	6	42.9	4	0:10:30	0:07:18
W	2	26.0	52	26	26	0.0	0:01:15	0:01:29	38	73.1	0	NA	NA
X	3	11.0	33	1	27	9.4	0:02:30	0:05:48	29	87.9	10	0:08:47	0:07:45
Y	3	22.3	67	11	37	10.8	0:01:37	0:01:27	38	56.7	1	0:47:03	NA
All schools (n = 25)	80	18.2	1,368	0	82	6.8	0:02:29	0:01:39	650	47.5	110	0:07:24	0:11:24

Table 2. School Action Plans for Reading Intervention and Student Engagement.

	Reading intervention				Engagement issues			
School ID	Discussions	Decisions made	Actions taken	% discussions that led to decisions	Discussions	Decisions made	Actions taken	% discussions that led to decisions
A	56	28	13	50	15	10	2	67
B	15	6	5	40	25	2	1	8
C	130	65	63	50	52	2	2	4
D	138	99	52	72	33	2	2	6
E	13	4	3	31	59	16	14	27
F	2	0	0	0	42	20	13	48
G	20	7	2	35	46	28	23	61
H	77	39	37	51	53	17	12	32
I	46	29	25	63	12	1	0	8
J	7	6	6	86	0	0	0	0
K	35	22	15	63	27	21	19	78
L	5	2	2	40	38	17	16	45
M	13	9	5	69	17	11	9	65
N	0	0	0	0	14	5	4	36
O	6	3	1	50	16	2	0	13
P	5	1	1	20	4	1	1	25
Q	16	6	6	38	11	2	1	18
R	37	6	2	16	44	17	14	39
S	34	6	5	18	8	6	6	75
T	128	31	30	24	58	3	3	5
U	54	12	9	22	71	15	4	21
V	7	3	1	43	12	11	9	92
W	45	18	18	40	23	10	10	43
X	38	31	28	82	28	3	3	11
Y	56	4	1	7	38	11	8	29

Note. Discussions, decisions made, and actions taken are all raw total counts across all meetings at a school.

currently in place. Most schools indicated that they had systems in place for collecting and managing reading intervention data (76%) and behavior/engagement data (68%). Conversely, fewer than half indicated that a systematic process for *reviewing data and making decisions* was firmly in place for reading intervention (44%) and behavior/engagement data (40%).

Next, we examined corresponding evidence for *observed* use of quantitative and qualitative data and frequency of decision making by school. We defined *strong evidence* as data sources or decision-making behavior that were observed for 75% or more of discussions across meetings, *partial evidence* as data sources or decision-making behavior that were observed for 26% to 74% of the discussions, and *limited evidence* as data sources or decision-making behavior that were observed for 25% or less of the total number of discussions.

When looking across these two sources of evidence (i.e., self-reports and data team meeting observations), we found that although 76% of schools reported having systems firmly in place for collecting and managing reading intervention data, DTTO observations demonstrated strong evidence of actually using quantitative data for only 48% of schools and qualitative data for only 8% of schools. With regard to engagement interventions, 68% of schools reported having systems firmly in place for collecting engagement data, but observations showed that no schools demonstrated strong evidence for use of quantitative engagement data, whereas 84% of schools demonstrated strong evidence for the use of qualitative engagement data. Furthermore, the discrepancy between self-report on the frequency with which decisions are made and the observed evidence for those decisions is even greater. Although 44% of schools reported having a systematic process firmly in place for making decisions regarding reading interventions, strong evidence was observed for only 8% of the discussions that concluded in a decision. Similarly, 40% of schools reported having a systematic process firmly in place with regard to decision making for engagement/behavioral support, but strong evidence for this was observed for only 12% of schools.

Discussion

Many educational experts have advocated for the utility of DBDM as a mechanism for driving educational improvement

Table 3. Frequency Counts and Percentages for Types of Data Discussed in Data Team Meetings (n = 80).

	Student discussions (n = 1,368)		Group discussions (n = 110)	
Types of data discussed	Frequency counts	% discussions	Frequency counts	% discussions
Academic reading				
Quantitative				
State reading Test	479	35.0	21	19.1
ORF	301	22.0	21	19.1
All other	505	36.9	26	23.6
Qualitative	321	23.5	38	34.5
Other academic areas				
Quantitative				
State math test	174	12.7	5	4.5
All other	255	18.6	10	9.1
Qualitative				
Work sample	14	1.0	6	5.5
All other	323	23.6	28	25.5
Attendance				
Quantitative	141	10.3	4	3.6
Qualitative	144	10.5	3	2.7
Behavior				
Quantitative	84	6.1	1	0.9
Qualitative				
Motivation	190	13.9	12	10.9
All other	435	31.8	22	20.0
English language learning				
Quantitative				
English lang. status score	11	0.8	1	0.9
All other	8	0.6	0	0.0
Qualitative	77	5.6	1	0.9
Special education-related				
Quantitative	6	0.4	0	0.0
Qualitative	119	8.7	4	3.6
Health				
Quantitative	0	0.0	0	0.0
Qualitative	111	8.1	1	0.9
Other				
Qualitative				
Family	276	20.2	1	0.9
Peer	113	8.3	5	4.5

Note. ORF = oral reading fluency.

(Hamilton et al., 2009; Mandinach, 2012). However, very little has been published detailing the actual DBDM practices used in schools, including the extent to which schools' data team practices lead to data-driven decisions; affect student performance; or align with schools' own perceptions of their DBDM practices.

We attempted to begin addressing this practice to research gap by documenting the DBDM practices of 25 middle schools in six school districts, each of which had prioritized intervention for struggling readers as a key goal for school improvement. In this section, we focus on four findings that we believe warrant further consideration: (a) the amount of time spent on discussions of individual students or groups, (b) the extent to which data (quantitative and qualitative) were presented at DBDM meetings, (c) the frequency with which discussions led to actionable decisions, and (d) the degree to which self-reported DBDM practices aligned with observed practices.

Time

Given the duration of the meetings and the number of school staff members who participate, significant school

Table 4. Proportions and Frequencies for Self-Reported Responses Regarding Middle School Data-Based Decision Making (n = 25).

Survey focus	Survey question topic	"Yes, firmly in place"		"Partially in place"		"No, not in place; other"		Total frequency
		Proportion	Frequency	Proportion	Frequency	Proportion	Frequency	
Reading intervention	Systems for collecting/managing intervention data	.76	19	.16	4	.08	2	25
Behavior/ Engagement		.68	17	.20	5	.08	2	24
Reading intervention	Systematic process for reviewing data/ making decisions	.44	11	.36	9	.12	10	23
Behavior/ engagement		.40	10	.32	8	.20	5	23

Note. "No, not in place; other" included the following response options: "plan to put in place in 2012–2013"; "no, not aware of a plan to put in place"; "not applicable, no team that examines the data"; and "don't know." "Frequency" represents the number of schools. One to three expert representatives (i.e., in reading, engagement, and/or data) from each school were assigned to fill out the survey or sections of the survey.

Table 5. Proportions and Frequencies for the Processes of Middle School Data Team Meeting Observations (n = 25).

Observation focus	Strong		Partial		Limited		Total frequency
	Proportion	Frequency	Proportion	Frequency	Proportion	Frequency	
Reading support							
Evidence for use of data							
Quantitative	.48	12	.40	10	.12	3	25
Qualitative	.08	2	.52	13	.40	10	25
Decisions made	.08	2	.64	16	.28	7	25
Engagement support							
Evidence for use of data							
Quantitative	.00	0	.40	10	.60	15	25
Qualitative	.84	21	.12	3	.04	1	25
Decisions made	.12	3	.48	12	.40	10	25

Note. Strength of the evidence is defined as the proportion of students and groups for which a given area was discussed during an observation at each school. "Strong evidence" indicates that the focus was observed 75% or more of the total number of discussions had for students and groups; "partial evidence" indicates that the focus was observed between 26% and 74% of the total number of discussions had for students and groups; and "limited evidence" indicates that the focus was observed 25% or less of the total number of discussions had for students and groups. *Reading* data could include discussions around the students' state standardized reading scores, oral reading fluency, other reading scores (e.g., CBMs), and classroom assignments and tests; *Behavior/engagement* data could include discussions around attendance, behavior reports, and motivation. "Frequency" represents the number of schools. CBM = curriculum-based measurement.

resources and time are being devoted to the DBDM process. However, we question whether staff time and resources are being used efficiently and productively. Presumably, the students who were discussed at the observed data team meetings were those students who were struggling the most in school, either academically or behaviorally, or both. Data team meetings likely represent one of the few opportunities school personnel have to review students' progress and performance data, make data-based decisions regarding interventions or instructional modifications, and monitor the outcomes of those plans. Given the high stakes associated with students' failure (e.g., Finn & Owings, 2006; Harlow, 2003), and school personnel's limited opportunity to consider evidence of students' growth, one might expect that conversations about individual students would be lengthy enough to be substantive, based on multiple sources of quantifiable data, and likely to result in actionable decisions. Unfortunately, in our sample of 25 middle schools, this does not seem to be the case.

On average, teams spent fewer than 2½ min per individual student discussion, even less if the student was an intervention student (just more than 1½ min). The school with the greatest average length of discussion spent an average of just more than 7½ min per discussion. We frequently observed meetings in which student "discussions" consisted mainly of one person reading out state test scores and/or attendance

data for a long list of at-risk students. It is difficult to imagine how 1½ min could be an adequate amount of time to identify effective strategies to help a child struggling with significant reading, attendance, or engagement issues.

An important question for consideration is why the data teams devoted so little time per student in their meetings. Perhaps the teams used the meetings to highlight which students were struggling, with the expectation that teachers would then address those individual concerns on their own, in their own classrooms. In cases where a large number of students within a school were struggling, perhaps a very short period of time is all that could be afforded per student. Under such circumstances, it may be more effective for teams to accept that not all children can be discussed at every meeting, and instead implement a process by which specific students are prioritized per meeting. More time could be allotted to lengthy discussions of prioritized children rather than a very limited amount of time for all children (see, for example, Crone, Hawken, & Horner, 2010). Prioritization of specific students could rotate from meeting to meeting. In addition, schools could hold more frequent meetings (weekly, rather than monthly or quarterly) to avoid the tendency to use the data team meeting as a nonproductive update of numerous students rather than a data-driven discussion leading to actionable decisions for a smaller number of children.

Data Sources

A review of the data used during observed meetings suggests that teams typically adopted a somewhat limited approach in their utilization of available data sources. The data presented were current and relevant, yet generally limited to a few key performance measures, a finding largely at odds with schools' self-reports of how they used data. Most schools self-reported using a wide range of data in their DBDM meetings, from quantitative measures of academic achievement and progress to qualitative measures of family functioning. Yet, many of the data sources schools reported using were rarely considered in observed student (or group) discussions.

It is important to note there was a difference in how we surveyed schools about data use and how we recorded data use during observations. In the survey, we asked schools to indicate which data sources were used during meetings, independent of frequency of use. During observations, we summarized the percentage of student (and group) discussions for which each data source was used. This difference in data collection could lead to some spurious discrepancies between self-reported and observed data use. Even so, we believe the limited use of multiple data sources in observed meetings is important to discuss.

In discussions of reading issues, data team participants frequently chose to focus on high-stakes state test scores, at the expense of examining student performance on specific skills and content (e.g., via work samples). This observation is in line with our perception that schools were under a great deal of pressure to meet annual "adequate yearly progress" goals, and that much of the energy of DBDM meetings and reading intervention efforts seemed to go toward those students who were closest to achieving a score of "meets expectations" on the state test. Given this set of pressures and incentives, it is understandable, though not necessarily effectual, that schools' primary source of academic data was state reading scores.

In contrast, quantitative data were referenced in only 6% of discussions of student behavioral issues. Quantitative behavioral data (e.g., number of office discipline referrals, attendance) have been established as an important barometer and predictor of student behavioral success or failure (Sugai, Sprague, Horner, & Walker, 2000). The observed data teams' relative neglect of such sources of behavioral data may be an artifact of the core focus of MSIP (i.e., struggling readers). Regardless, it appears that simultaneous consideration of quantitative data sources for both academic and behavioral issues was not commonly tried at these middle schools.

Rather, schools seemed to rely primarily on qualitative information when discussing student behavior. This is not unexpected, as individuals often try to use contextual or historical information (e.g., family background, peer relations) to understand why a student acts a certain way. The discrepancy between reliance on quantitative data for academic issues and qualitative data for behavioral issues highlights one area in which DBDM practices at these schools could be improved. Obtaining a clearer picture of how students function across behavioral and academic domains by utilizing quantitative *and* qualitative data could help schools respond more effectively to the challenges faced by these students, based on a more complete picture of each individual student's situation.

Another important issue for struggling students is attendance. These children are at higher risk of absenteeism, truancy, and eventual school dropout (Hernandez, 2011). We were surprised, therefore, to find that attendance data (whether qualitative or quantitative) were used in only 10% of discussions, although 80.0% of schools self-reported using them in their meetings.

We recommend that schools utilize more data sources in each student's case, and attempt to use those multiple sources of data to triangulate a data-driven definition of the problem and proposed solution. We also recommend that data teams use a wider range of both quantitative and qualitative data sources across multiple contexts, to develop a more comprehensive picture of how each student is functioning. Furthermore, allotting more time for each discussion of a student would encourage team members to incorporate more data into their discussions of individual students.

Actionable Decisions

Perhaps the most unexpected finding was the infrequency with which teams concluded a student or group discussion with an actionable decision. The intended functions of DBDM teams are to use current and relevant data to identify student needs, propose interventions, examine progress, and determine whether modifications to existing interventions are warranted. It is important to remember that even deciding to maintain a student in his or her current intervention was recorded by the observers as a decision made, as was identifying a goal, assigning a person, or establishing a timeline to implement any action. Even with such a low threshold for defining "decision," we found that data teams actually made relatively few actionable decisions: Only 40% of student discussions of reading issues and 34% of discussions of behavioral concerns resulted in *any* decision made.

We speculate some possible reasons for the infrequency of actionable decisions. One possibility is that the meeting itself was only a starting point for staff to make decisions about instructional programming. That is, perhaps the meetings served the purpose of alerting teachers to the needs of each struggling student, and teachers later made their own decisions about how to help the students in their classrooms. Alternatively, perhaps having an opportunity to share concerns about struggling students with colleagues was helpful and cathartic to team members, and felt productive and useful, even if very few actionable decisions were made.

Data teams may have perceived that they had a very limited range of actions from which to choose. If a middle school student continues to struggle after receiving months of intensive instruction in a small group setting, DBDM teams may not feel that the school has any options that would be effective with this student. Without options for interventions, it may be difficult to make data-based decisions that will lead to improvements in student performance.

Finally, as noted previously, we observed two to seven meetings per school. It is possible that more actionable decisions were made at meetings that we were unable to observe. However, we believe this is unlikely as the district liaisons to the project scheduled observations of data team meetings that were representative of each school's data team process.

Once students were placed into interventions, it appears that data teams were also unlikely to follow up on whether or not interventions were implemented with fidelity. On the SIS, only 16% of the schools indicated that a system for collecting data and conducting observations of reading intervention fidelity was firmly in place. Another 16% indicated such a system was partially in place. Without consistent attention to actionable decisions and follow-up on fidelity to intervention, it is hard to conceive how the actions of the DBDM teams could have a significant impact on student outcomes. If DBDM teams are to fulfill the potential that many experts argue is possible (e.g., Hamilton et al., 2009; Mandinach, 2012), then attention to critical details of the DBDM process must become integrated into the regular team routines.

Based on our findings, we recommend that DBDM teams conduct a post-meeting assessment to determine whether the team has met key objectives. The assessment could be simple and require the team to consider important questions, such as the following: (a) What decisions have we made that we expect to lead to improved student performance? (b) Did we have all of the relevant data we needed to make the decisions? (c) Is the process for implementing the decisions clear (e.g., person assigned, goal set, timeline established), and (d) To what extent did we address the needs of the students that we designated as highest priority? If data teams were to regularly use such a self-assessment, these meetings might begin to more closely resemble the iterative process laid out in recommended frameworks of DBDM (e.g., Hamilton, 2009; Kekahio & Baker, 2013; Mandinach, 2012). Participants would notice whether the majority of their meetings centered on conversation rather than action, and be prompted to make more decisions.

Alignment Between Self-Report and Observations

This study incorporates both self-report and standardized direct observations of school-based DBDM practices, providing an opportunity to examine the alignment between actual practice and self-report. On a number of key variables, we found weak alignment between survey responses and observation data. For instance, although most schools reported having strong systems in place to collect student data, our observations suggest that relatively few schools actually use the majority of this data on a regular basis. Furthermore, although almost half of schools reported having a systematic process for decision making, most data teams actually made decisions less than 25% of the time. Clearly, there is a strong disconnect between what these schools felt they had in place at their data meetings and what was actually occurring.

Generalizability of Findings

This study describes the DBDM practices of 25 middle schools in six school districts in the Pacific Northwest. Participating schools served a wide range of students in terms of academic standing, economic need, ethnicity, and English Language Learner (ELL) status. Almost all (25 out of 28) of the eligible middle schools in the six districts participated. If anything, the fact that these schools had used DBDM teams as one component of a multi-component intervention for 2 or 3 years might have led us to expect that

the schools' DBDM practices would be more closely aligned with expert recommendations than they would for a school without this focus. In fact, we suspect the challenges identified in this study may be even more pronounced in schools in the early stages of developing a DBDM team process.

We expect that it is not atypical to have a gap between what staff believe they are accomplishing within their DBDM meeting and what they are actually completing. These findings call into question previous studies of *self-reported* DBDM practices and lead us to believe that even less is understood about actual DBDM practices than the current, slim literature reports (e.g., Feldman & Tung, 2001; Marsh et al., 2014). Thus, we argue that additional studies of actual observations of DBDM practices are greatly needed.

Limitations

Newly developed observation tool. The instrument used to observe data teams, DTTO 3.0, was developed specifically for this study, rather than a published observation protocol with established validity and reliability criteria. This was necessary as an extensive literature review yielded no other published tool adequate for our purposes. We developed the tool as an instrument to reflect the structure and process of school-based data team meetings, and were able to capture the wide variability of practices in use across schools. The DTTO went through several iterations, from the pilot year to the third year of the study. The purpose of each iteration was to make the DTTO more usable, functional, and reflective of actual practices in schools. IOA was high and considered strong enough to demonstrate the reliability of these findings. However, the psychometric properties of the instrument have not been studied in detail, and will need to be a focus of future investigation with this tool. Furthermore, in an attempt to create an instrument general enough to be used across multiple teams, the specificity of unique, individual team practices may have been lost—as in the type of detail one might get from an in-depth ethnographic or case study approach. Although such an approach could provide a more detailed picture of practices within a school, it was not feasible for us to provide that level of specificity across all 25 schools in this study.

Observation of DBDM process limited to data team meetings. It is also possible that by focusing our observations on only data team meetings, we neglected to document important aspects of the full DBDM process in each school. We chose to focus our observations on the DBDM team meeting, as we expected this would be the most efficient manner to gather the most information about each school's actual DBDM practices. As suggested previously, school personnel may have actually used the information shared during a team meeting to make individualized instructional decisions and modifications on their own, information not included in our analyses. In addition, we were not able to observe every single data team meeting that occurred at a school. We attempted to observe three meetings per school, across the entire school year to obtain a representative sample of each school's data team meeting process. However, many schools met more frequently than 3 times per year, and the data practices from those meetings were also not documented or incorporated into our current analyses.

One aspect of our data team observation tool required self-report data by the team leader, that is, interview questions about the non-observable preparation and follow-up elements of the data team process. Given the challenges noted with weak alignment between self-report and observational data, the utility of that information should be considered with caution.

Implications for Practice

Need for a well-specified model for implementation of DBDM practices. First, we believe these findings underscore the strong need for effective professional development and capacity building in the area of school-based DBDM practices. Although schools in the present study had already focused for 2 to 3 years on DBDM teams as one piece of a multi-component intervention, observations of DBDM team meetings revealed a number of challenges to effective practices. The current literature on school-based DBDM practices concurs and calls out the importance of integrating effective DBDM practices into the routine school culture (Hamilton, 2009; Means et al., 2010), while lamenting the dearth of adequate training and support for building these DBDM skills with both pre-service and in-service educators (Mandinach, 2012).

To address this need, a model for the effective implementation and capacity building of school-based DBDM is needed. Such a model could be defined, tested, and modified by researchers and educators working in partnership. The model should be based on a realistic understanding of schools' needs, abilities, and what can be accomplished given current resources and goals. The work described in the current article offers a reasonable starting point for building this model, as it provides insights into the DBDM practices of 25 typical middle schools and describes a tool, the DTTO 3.0, that could be used to document and compare changes in DBDM practices over time. A model for implementation of DBDM practices should be specific, including recommended time frames for student discussions, timelines for frequency of meetings and following up on action items, and a self-assessment tool that data teams could use to determine whether they had met key objectives during each meeting. A well-defined DBDM model would also address capacity building, both within the school and the school district.

Impact of DBDM practices on student outcomes. A number of studies, reports, and practice guides have underscored the need for data teams to regularly use effective DBDM practices in schools (Hamilton, 2009; Kekahio & Baker, 2013; Means et al., 2010), especially in connection with students struggling academically or behaviorally. The assumption of these calls to action is that students will benefit from data teams' effective use of data-driven practices. The literature on formative assessment supports the expectation that effective use of current and relevant data will positively affect student achievement (e.g., Fuchs & Fuchs, 1986; Marcotte & Hintze, 2009). However, the extent to which data teams can and do achieve these goals has yet to be documented. We identify a need, not only for additional studies of the actual DBDM practices in schools but also to examine the impact of those practices on important student outcomes, both academic and behavioral. If a causal and beneficial link between effective data team practices and student outcomes can be tested and found, this would provide additional support for investing more time, effort, and resources on data team DBDM practices and professional development.

Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute of Education Sciences or the U.S. Department of Education.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305E100041 to the University of Oregon.

References

Bahr, M. W., & Kovaleski, J. F. (2006). The need for problem-solving teams: Introduction to the special issue. *Remedial and Special Education*, *27*, 2–5.

Crone, D. A., Hawken, L. S., & Horner, R. H. (2010). *Responding to problem behavior in schools: The behavior education program*. New York, NY: Guilford Press.

Crone, D. A., Nelson-Walker, N. J., Cohen, J., Coughlin, C., & Schwartz, M. (2012). *Revised data team tool for observation (DTTO 3.0) and manual*. Eugene: University of Oregon, College of Education, Center on Teaching and Learning.

Crone, D. A., Smith, J. L. M., Cohen, J., Kennedy, P. C., & Coughlin, C. (2010). *Middle School Intervention Project School Survey*. Eugene: University of Oregon, College of Education, Center on Teaching and Learning.

Deno, S. L. (1985). Curriculum-based measurement: The emerging alternative. *Exceptional Children*, *52*, 219–232.

Feldman, J., & Tung, R. (2001). Using data-based inquiry and decision making to improve instruction. *Spectrum*, *19*(3), 10–19.

Finn, J. D., & Owings, J. (2006). *The adult lives of at-risk students: The roles of attainment and engagement in high school. Statistical analysis report* (No. NCES 2006-328). Washington, DC: National Center for Education Statistics.

Fuchs, L., & Fuchs, D. (1986). Effects of systematic formative evaluation: A meta-analysis. *Exceptional Children*, *53*, 199–208.

Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., & Wayman, J. (2009). *Using student achievement data to support instructional decision making* (NCEE 2009-4067). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications/practiceguides/

Harlow, C. W. (2003). *Education and correctional populations*. Washington DC: Bureau of Justice Statistics Special Report, U.S. Department of Justice.

Hernandez, D. J. (2011). *Double jeopardy: How third-grade reading skills and poverty influence high school graduation*. Retrieved from http://www.aecf.org/KnowledgeCenter/Publications.aspx?pubguid={8E2B6F93-75C6-4AA6-8C6E-CE88945980A9}

Individuals With Disabilities Education Act, 20 U.S.C. § 1400 (2004).

Kekahio, W., & Baker, M. (2013). *Five steps for structuring data-informed conversations and action in education* (REL 2013–001). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Pacific. Retrieved from http://ies.ed.gov/ncee/edlabs

Mandinach, E. B. (2012). A perfect time for data use: Using data-driven decision making to inform practice. *Educational Psychologist*, *47*, 71–85.

Mandinach, E. B., Honey, M., Light, D., & Brunner, C. (2008). A conceptual framework for data-driven decision making. In E. B. Mandinach & M. Honey (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 13–31). New York, NY: Teachers College Press.

Mandinach, E. B., & Jackson, S. S. (2012). *Transforming teaching and learning through data-driven decision making*. Thousand Oaks, CA: Corwin and Division 15 of the American Psychological Association.

Marcotte, A. M., & Hintze, J. M. (2009). Incremental and predictive utility of formative assessment methods of reading comprehension. *Journal of School Psychology*, *47*, 315–335.

Marsh, J. A., Farrell, C. C., & Bertrand, M. (2014). Trickle-down accountability: How middle school teachers engage students in data use. *Educational Policy*. Advance online publication. doi:10.1177/0895904814531653

Means, B., Padilla, C., & Gallagher, L. (2010). *Use of education data at the local level: From accountability to instructional improvement*. Washington, DC: U.S. Department of Education, Office of Planning, Evaluation, and Policy

Development. Retrieved from http://www.ed.gov/about/offices/list/opepd/ppss/reports.html#edtech

Newton, J. S., Horner, R. H., Todd, A. W., Algozzine, R. F., & Algozzine, K. M. (2012). A pilot study of a problem-solving model for team decision making. *Education and Treatment of Children*, *35*, 25–49.

No Child Left Behind (NCLB) Act of 2001, 20 U.S.C.A. § 6301.

Qualtrics. (2015). Qualtrics Survey Software (Version 61204) [Software]. Available from http://www.qualtrics.com

Sugai, G., Sprague, J., Horner, R., & Walker, H. (2000). Preventing school violence: The use of office discipline referrals to assess and monitor school-wide discipline interventions. *Journal of Emotional and Behavioral Disorders*, *8*, 94–101.

Wayman, J. C., & Stringfield, S. (2006). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education*, *112*, 549–571.