Helping Administrators Get Data on How Teachers Use Data: The Teacher Data Use Survey

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Paper presented at the 2017 annual meeting of the American Educational Research Association, San Antonio, TX

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The authors wish to thank REL Appalachia at CNA and The Institute of Education Sciences for the funding that supported this study.

Introduction

Teachers are being asked to use more and diverse data to support their practice (Datnow, Park, & Wohlstetter, 2007; Mandinach & Gummer, 2013; Supovitz, 2010; Wayman, Shaw, & Cho, 2017**)**. The use of these data requires a complex set of knowledge, actions, and supports. Accordingly, it is important that district and school personnel have a consistent, reliable tool to measure the various components of this set in order to identify strengths and weaknesses in teacher data use. The Teacher Data Use Survey (TDUS) provides such a tool.

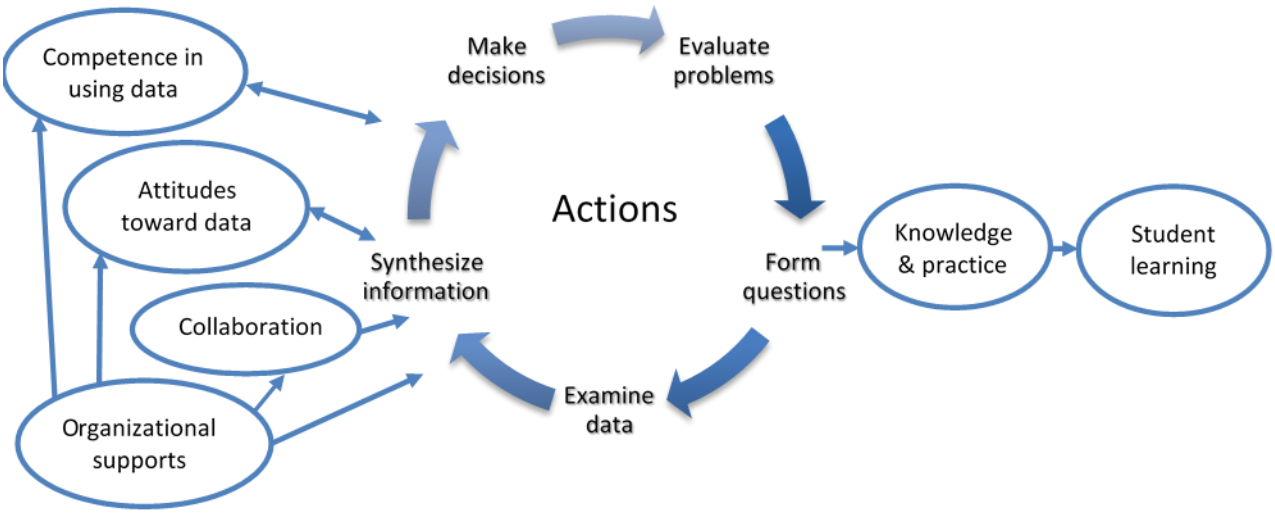
The TDUS was developed by a team of five researchers who are leading experts in data use. The work of this team was conducted through Regional Educational Laboratory (REL) Appalachia at CNA (2012-2017), funded by the U. S. Department of Education's Institute of Education Sciences. Although it was developed through REL Appalachia, it was not targeted at the Appalachian region. Thus, the survey is generalizable across the United States. The survey has been subjected to the internal review process of REL Appalachia and IES's stringent peer review process.

In the following sections, we first describe a conceptual framework for how data can be used to support improved instruction and learning. This framework guided survey development. Next, we describe the research supporting this framework. These sections are followed by a section describing the piloting of the TDUS and a section discussing future TDUS work.

Conceptual Framework

Survey development for the proposed project was guided by a conceptual framework that presents the actions that teachers take with data as critical to improving their knowledge and practice, and in turn, student learning. This framework also articulates that these actions are influenced by teacher competence in using data, teacher attitudes toward data, collaboration, and organizational supports. Figure 1 represents this framework graphically.

Figure 1. Data use survey conceptual framework



In this conceptual framework, teachers are viewed as engaging in a variety of actions—data uses—that help them draw meaning from data. For example, a teacher may use data to identify students who need further assistance, to select instructional materials, or to help a

student understand their learning (Hamilton, Halverson, Jackson, Mandinach, Supovitz, & Wayman, 2009; Supovitz, 2012; Wayman, Snodgrass Rangel, Jimerson, & Cho, 2010).

In this framework, teachers' processes as they engage in these actions are guided by a cycle of inquiry: data are examined in response to problems and questions, and the resulting meaning informs a decision (Gummer & Mandinach, 2015). These actions are the driving force behind changes in knowledge and practice; that is, teachers are conceived as gaining new knowledge through the effective use of data and using that knowledge to make improvements in their teaching practice. Increased knowledge and improved practice thus translate into improved student learning (Boudett, City, & Murnane, 2005; Gummer & Mandinach, 2015).

The actions that teachers take with data are influenced heavily by a variety of organizational supports, implemented at either the school or district level (Datnow et al., 2007; Supovitz, 2010; Wayman, Jimerson, & Cho 2012). Examples of such supports include technical elements, such as the data that are available to teachers and the technology (data systems) that enable data access. Such supports also include the professional learning that teachers receive to help them improve their data use. Personnel supports are also important, including principal leadership and instructional support (e.g., instructional coaches or data coaches).

We also conceive of teachers' data actions as being influenced by their attitudes toward data, their competence in using data, and the collaborations in which they partake (Goertz, Oláh, & Riggan, 2009; Supovitz, 2010; Wayman, Midgley, & Stringfield, 2006). That is, teachers' attitudes about how—and whether—data are effectively used to support instruction can influence the specific actions they take with data and the depth to which they will engage in these actions. Similarly, actions are influenced by teachers' competence in examining data and drawing meaning from it. Furthermore, teacher actions are influenced by the groups in which they work and the way they collaborate.

Beyond these influences on data-related actions, we believe there is reciprocity between the attitudes-actions relationship and the competence-actions relationship. Attitudes and competence change as teachers engage in data use. Further, attitudes, competence, and collaboration are also affected by systemic supports for using data.

With that background, the focus of the present project is on the attitudes, uses, and supports pertaining to educational data. Teacher instructional knowledge and practice, and student learning (the other two components of the conceptual framework), are larger issues that encompass more than just data use, and are beyond the scope of this project. Accordingly, this survey only measures data use and does not measure these two components.

Research Support for Conceptual Framework

In this section, we discuss the components of the conceptual framework in terms of underlying research. In doing so, we first provide a section relating to the actions component. This description sets the stage for sections on sections for organizational supports, attitudes, competence, and collaboration. We conclude with a section that discusses the relationship between actions and student learning.

Actions with Data

Teachers use data in many different ways. In our framework, we refer to these as *data uses*, or alternatively, as the actions that teachers take with data. Most of the actions that teachers take involve their classrooms. For instance, teachers commonly use data to help them plan which materials to use in class, group students, tailor individual instruction, identify additional

instructional supports, or simply decide what to teach (Datnow et al., 2007; Lachat & Smith, 2005; Supovitz, 2012; Wayman, Snodgrass Rangel, Jimerson, & Cho, 2010). Other actions occur outside the classroom. For instance, teachers may use data to facilitate conversations with students, parents, instructional support staff, or other teachers (Datnow et al., 2007; Hamilton et al., 2009; Wayman et al., 2010).

We conceive these actions as occurring within a cycle of inquiry. Research has described many forms of such cycles (e.g., Boudett et al., 2005; Copland, 2003; Gummer & Mandinach, 2015), and all follow a similar approach. Gummer and Mandinach's (2015) articulation of the cycle fits particularly well into our framework. Thus, teacher actions are couched within a cycle beginning with a practice-based question. They examine data relevant to that question, producing information that helps them reach a decision. They then evaluate that decision, and revisit the problem as needed.

Regardless of the formal nature of these actions, many occur in varied forms of collaboration. One such example is collaborative inquiry, defined by Donohoo (2011) as a professional learning process that engages educators in using a systematic, self-directed, research-oriented approach to examining their teaching practice. The collaborative inquiry process involves multiple stages, including making predictions and uncovering assumptions, problem framing and question identification, collecting evidence from multiple data sources, analyzing evidence, and making conclusions from the data that guide decision making (Lipton & Wellman, 2012). It is also important to note that less formally guided forms of collaboration are also common, such as teachers partnering for grade-level work or even meeting during a lunch period (Datnow et al., 2007; Wayman, Cho, & Shaw, 2009; Wayman et al., 2006).

Organizational Supports

Many of the actions that teachers take in using data are facilitated (or impeded) by a wide range of organizational supports. Examples of such supports include the data available to teachers and the computer data systems that help them access these data, instructional support staff, data-related professional learning, and principal leadership. In the following paragraphs, we will describe the nature of these supports.

It stands to reason that teachers are more likely to use data that are easily available to them, and computer data systems are a large influence on such availability. For more than a decade, most educators have had access to systems that connect disparate forms of data (e.g., data warehouses) and deliver these data to teachers (Means, Chen, DeBarger, and Padilla, 2011; Mieles & Foley, 2005; Wayman, Stringfield, & Yakimowski, 2004). These systems can be outfitted with many different features and functionalities, the presence or lack of which can affect how teachers access data. For instance, systems can provide user-friendly interfaces that enable system use with little training, preformatted reports of common analyses, and robust query systems that enable user-specified browsing of data. Further, research suggests that teachers are more likely to use systems that closely align with teachers' own views of what "data" are and how they support learning (Cho & Wayman, 2014). As a result, research has reported widespread use of a variety of data in the presence of effective systems (Lachat & Smith, 2005; Wayman & Stringfield, 2006) and limited use of data where systems were not perceived as effective (Wayman et al., 2009; Wayman et al., 2017; Wayman et al., 2010).

Human supports often include "coach" positions (e.g., instructional coaches or data coaches). These coaches serve a variety of functions; for instance, they often meet with teachers or teams of teachers, providing them with information on how to interpret data and how to make

instructional changes based on data (Goertz et al., 2009; Marsh, McCombs, & Martorell, 2010; Means, Padilla, DeBarger, & Bakia, 2009). Also, coaches often support collaborative inquiry processes, providing tools, data, and expertise (Love, 2009; Mandinach & Jackson, 2012).

Data-related professional learning is yet another support that can help or hinder a data initiative. Data-related professional learning can be an effective support, when it is timely, connected to other professional learning, and coherent to work in which teachers are engaged (Jimerson & Wayman, 2015; Mandinach & Jackson, 2012; Wayman & Jimerson, 2014). One method to create learning with these characteristics is to situate data-related professional learning within the collaborative inquiry process (Boudett et al., 2005; Jimerson & Wayman, 2015; Lipton & Wellman, 2012). The structured nature of collaborative inquiry lends itself well to creating timely, relevant learning opportunities. Further, by definition, collaborative inquiry is focused on the immediate problems that teachers face.

Unfortunately, research suggests that data-related professional learning often is lacking in practice: teachers rarely are provided adequate training by their college preparation programs (Mandinach & Gummer, 2013), and teachers often report that their data-related professional learning opportunities are not relevant to their current work (Means et al., 2011; Wayman & Jimerson, 2014; Wayman et al., 2010).

Principal leadership is a support that is touted as important to teacher data use (Copland, 2003; Knapp, Swinnerton, Copland, & Monpas-Huber, 2006; Wayman, Spring, Lemke, & Lehr, 2012). Principals are often responsible for facilitating organizational supports such as those mentioned above. For instance, districts usually provide data systems, but it is often the principal's responsibility to ensure that teachers know how to use these systems (Cho & Wayman, 2014; Wayman, Spring et al., 2012). Principals can also be responsible for ensuring that instructional coaches are used effectively and provide proper support (Knapp et al., 2006; Marsh et al., 2010). Principals also can play a role in supporting data-related professional learning by identifying opportunities and instituting collaborative inquiry structures (Copland, 2003; Jimerson & Wayman, 2015; Lipton & Wellman, 2012). Principals also can employ a variety of other strategies to support teacher data use, such as protecting scheduled time for teachers to use data, enabling frequent discussions that involve data, and periodically meeting with collaborative teams (Datnow et al., 2007; Hamilton et al., 2009; Knapp et al., 2006, Wayman, Spring et al., 2012).

Attitudes Toward Data

Teacher attitudes toward data affect how they engage in data use. In exemplary data-using contexts, teachers commonly were described as having positive attitudes about how data can improve pedagogy and how they can support instructional practice (Datnow et al., 2007; Lachat & Smith, 2005; Wayman & Stringfield, 2006). Conversely, contexts where data use was more difficult were characterized by teachers who were skeptical of the value of data to their practice (Ingram, Louis, & Schroeder, 2004; Valli & Buese, 2007; Wayman et al., 2009).

Research suggests that the relationship between attitudes and actions is a reciprocal one, however (Datnow et al., 2007; Lachat & Smith, 2005; Wayman & Stringfield, 2006). An illustration of this relationship is offered by a study in a large urban district that demonstrated a significant one-year improvement in teachers' perceptions of how data can help pedagogy (as measured by a survey); this was associated with a significant one-year increase in use of the district's data system (Wayman, Shaw, & Cho, 2011). Further, the study described how

educators who previously had negative attitudes toward data use developed more positive ones after a series of supported projects in using data (Wayman et al., 2011).

Research suggests that organizational supports also can affect attitudes toward data. In exemplary data-use contexts, educators who were previously negative or neutral toward data were found to develop positive attitudes toward data as a result of the efforts of their principals (Datnow et al., 2007; Wayman & Stringfield, 2006). Teachers' notions of data also have been shown to be affected by leadership messages about which data were important (Cho & Wayman, 2014). Further, these attitudes affected the actions that teachers took with their computer data system (Cho & Wayman, 2014).

Competence in Using Data

Educators must be competent in using data in order to engage in effective actions with data (Goertz et al., 2009; Mandinach & Gummer, 2013). It stands to reason that without a certain level of competence, educators would not be able to engage effectively in examining data or determining information as described in the cycle of inquiry (Gummer & Mandinach, 2015). In fact, a lack of competence has sometimes been cited as a reason for avoiding data use (Wayman, Cho, & Johnston, 2007; Wayman et al., 2010).

As with attitudes, competence also is reciprocally related to actions. Educators report that the more they engage in effective data use, the more data skills they learn (Lachat & Smith, 2005; Wayman & Stringfield, 2006). To this end, organizational supports are particularly important for gaining competence. A variety of such supports have been associated with gaining competence, such as data-related professional learning (Hamilton et al., 2009; Jimerson & Wayman, 2015; Wayman & Jimerson, 2014), data coaches (Marsh et al., 2010; Wayman et al., 2010), and effective principal leadership (Copland, 2003; Hamilton et al., 2009; Wayman, Spring et al., 2012).

Collaboration

Collaboration also influences the actions that teachers take with data. Teachers enjoy working collaboratively (Datnow et al., 2007; Lachat & Smith, 2005; Wayman & Stringfield, 2006) and that they believe their actions are more effective when informed by a group process (Lachat & Smith, 2005; Wayman et al., 2006).

Collaboration does not happen without proper organizational supports (Datnow et al., 2007; Lachat & Smith, 2005; Wayman et al., 2010). For example, support staff (e.g., data coaches) can help teachers better understand data and brainstorm potential decisions (Jimerson & Wayman, 2015; Marsh et al., 2010). Also, computer data systems enhance collaboration by reducing the time it takes to access data (Means et al., 2011; Mieles & Foley, 2005; Wayman et al., 2004), and by guiding educators in the sense they make of data (Cho & Wayman, 2014). Principal leadership is a particularly important support, in terms of structuring dedicated time for collaboration, establishing guiding protocols, and participating in collaborative meetings (Copland, 2003; Hamilton et al., 2009; Wayman, Spring et al., 2012).

Structured time is necessary for effective collaboration to occur. Research about effective collaboration describes how teams took advantage of structured, protected time in which to collaborate (Datnow et al., 2007; Hamilton et al., 2009; Lachat & Smith, 2005; Wayman & Stringfield, 2006). Conversely, research also describes that when time is not structured, collaboration becomes burdensome on teachers – failure to structure time has been found to

require teachers to either collaborate on their own time (e.g., lunch periods, weekends) or not at all (Valli & Buese, 2007; Wayman et al., 2007; Wayman et al., 2011)..

Actions and Learning

Some research links the use of student data is linked to increased student achievement (Carlson et al., 2011; Lai et al., 2009; Slavin et al., 2013). It is important to note, however, that the link is not to the *uses* of data, but to the *changes in educators' knowledge and practice* that occur as a result of careful examination of data.

Slavin's studies (Carlson et al., 2011; Slavin et al., 2013) addressed knowledge and practice by using data to properly tailor school reform models. Lai et al. (2009) approached knowledge and practice through collaborative data examination coupled with collaborative discussions about the implications these data held for practice. These effects appear to be sustainable: Slavin et al. (2013) demonstrated four-year literacy effects and Lai et al. (2009) demonstrated three-year literacy effects.

Studies such as these provide an often missing link in instruction. Teachers typically know sound practices to improve learning, but must identify which students would benefit from these interventions, and match them appropriately. The literature reviewed here provides insight into the processes that teachers may use to accomplish these aims.

Summary

It is our belief that providing proper supports for teacher data use and attending to their attitudes toward data can enable healthy and insightful uses of data. With proper support, teachers can work collaboratively to gain knowledge from these data and determine appropriate practical approaches to help their students. In turn, these actions should result in improved learning. For these reasons, there can be a benefit to surveying teachers, administrators and other instructional staff about teacher attitudes toward using data, the degree to which teachers use data to inform instruction, and if teachers perceive that they have the organizational supports necessary to use data effectively. The information gained from such a survey effort can inform training and other administrative efforts in a way that should promote using data to inform instruction.

The Teacher Data Use Survey

The Teacher Data Use Survey (TDUS) asks respondents about their perceptions of teacher data use. There are three versions of the survey: a teacher version, a building administrator version, and an instructional support version. All three versions, along with a manual for implementation (Wayman, Wilkerson, Cho, Mandinach, & Supovitz, 2016), are available for free download from the Institute for Education Sciences website: https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=2461.

The teacher version of the TDUS asks teachers about their data use, while the administrator and instructional support versions ask these roles about their teachers' data use. The three versions contain identical content, with wording changed such that questions are appropriate for each role. Thus, the three versions can be described interchangeably when discussing their scales and underlying constructs.

The questions on the survey are all set on a four-point Likert scale. Questions are grouped together to form scales; these scales map onto various components of the conceptual framework. The following sections describes these scales in sections corresponding to each component of the

conceptual framework that is measured. The final section outlines descriptive items that are not mapped to the conceptual framework. A full description of the items, their uses, and their corresponding scales can be found in the implementation manual (Wayman et al., 2016).

Actions with Data

The actions with data component of the framework is measured by two types of scales: (1) The Collaborative Team Actions scale and (2) multiple scales assessing actions that teachers take with specific forms of data.

The Collaborative Team Actions scale comprises 10 items asking how often a team engages in various data-related actions. For example, one item reads, "we discuss our preconceived beliefs about an issue." Response options are never, sometimes, often, and a lot.

There are also scales corresponding to specific actions teachers take with multiple forms of data. District personnel in charge of administering the survey are asked to choose up to four specific data elements (e.g., state achievement test or locally-developed assessment) that are most important in their context. They then insert those elements into a block of survey questions, generating a separate block of questions for each data element. Each block is preceded by the question, "In a typical month, how often do you do the following," except for questions about state achievement tests, which are asked in terms of a year. For example, "…use [insert specific data element] to identify instructional content to use in class."

These questions follow a block of questions that ask about a larger set of data elements (see *Other survey questions* below). If the participant indicates in the preceding block that they do not use a specific data element, the block asking about their actions is not offered to them (i.e., there is a skip-pattern approach used in the surveys). For all data elements except state achievement tests, response options are less than once a month, once or twice a month, weekly or almost weekly, and a few times a week. For state achievement tests, response options are one or two times a year, a few times a year, monthly, and weekly.

Questions in each block may be combined into a scale for that specific data element, or they may be examined individually and ranked (Wayman et al., 2010; Wayman et al., 2009).

Organizational Supports.

The organizational supports component of the conceptual framework is measured by three scales: *Computer Data Systems, Principal Leadership,* and *Support for Data Use*. Response options for all items on these scales are strongly disagree, disagree, agree, and strongly agree

The *Computer Data Systems* scale consists of five items, asking about various characteristics of respondents' data systems. For example, one item reads, "I have the proper technology to efficiently examine data."

The *Principal Leadership* scale consists of five items and asks about actions principals and assistant principals take regarding data[1]. For example, one item reads, "My principal or assistant principal(s) encourages data use as a tool to support effective teaching."

[1] An additional question may be added to the principal leadership scale: "My principal or assistant principal(s) creates protected time for using data." This question appeared on the pilot survey with the Collaborative Team Trust items and asked specifically about protected time for collaborative inquiry using data. Upon review of the survey and data, we determined the question did not conceptually relate to the other Collaborative Team Trust items. We believe this more general version may fit well with the other items on the Principal Leadership scale, but we do not have statistics for a scale that includes this item.

The *Support for Data Use* scale consists of six items asking about various support structures present for teachers. For example, one item reads, "I am adequately supported in the effective use of data."

Attitudes Toward Data

The attitudes toward data component of the conceptual framework is measured by two scales: *Attitudes Toward Data* and *Data's Effectiveness for Pedagogy*. Response options for all items on these scales are strongly disagree, disagree, agree, and strongly agree.

The *Attitudes Toward Data* scale consists of four items about teachers' beliefs about data. For instance, one item reads, "I think it is important to use data to inform education practice."

The *Data's Effectiveness for Pedagogy* scale consists of five items that ask whether data helps improves teaching. For instance, one item reads, "Data help educators plan instruction."

Competence in Using Data

The competence in using data component of the conceptual framework is measured by the *Data Competence* scale. It consists of four items asking whether teachers believe they are good at various aspects of data use. For instance, one item reads, "I am good at using data to diagnose student learning needs." Response options are strongly disagree, disagree, agree, and strongly agree.

Collaboration

The collaboration component of the conceptual framework is measured by the *Collaborative Team Trust* scale[2]. It consists of five items asking about a climate of trust within collaborative data teams. For instance, one item reads, "Members of my team trust each other." Response options are strongly disagree, disagree, agree, and strongly agree.

Other Survey Questions

Besides the previously described scales there are four sets of questions that do not map onto the conceptual framework. These questions are to be used for descriptive purposes. They are:

- Questions about frequency of use of various data elements specified by the district. For these questions, survey administrators are asked to generate a list of commonly used data elements in the district. These elements come from four primary categories:
    1. State achievement test data,
    2. Periodically-administered assessments (e.g., periodic benchmarks, commercially-available periodic assessments),
    3. Locally-developed assessments (e.g., common formative assessments), and
    4. Personally-created data (e.g., tests, quizzes, homework).

  Survey administrators can select as many elements as they like within each category. On the survey, respondents are asked how frequently they use each data element, with the following response options: never, less than once a month, once or twice a month, weekly

[2] We note that the Collaborative Teams Actions scale could also fit into this component of the conceptual framework. We believe it generally fits better in Actions with Data because of its focus on actions, but certain contexts may find it fits better in Collaboration.

or almost weekly, and a few times a week. There is also an option for the respondent to mark that the data element is not available to them.

- Questions about the usefulness of various data elements specified the district. Survey administrators specify the same set of data elements as in the previous set and respondents are asked how useful these data elements are to them. Possible responses are not useful, somewhat useful, useful, and very useful. There is also an option for the respondent to mark that the data element is not available to them. This block of questions is new for the current project.
- Open-ended questions inviting the respondent to write in thoughts and comments about various aspects of data use. One question, "What else would you like to share with us about data use?" is intended to be the final question of the survey. Two other questions were included to collect data for the pilot survey and are not intended to be included on the final survey: "Are there any questions we should have asked, but didn't?" and "Were there any questions you answered that you thought were irrelevant?"
- Demographic questions are not part of the TDUS but may be added by survey administrators. Examples of such questions include years of experience, current school, or subject taught. These questions may be specified in any way that survey administrators choose.

Pilot Test

Methods

The survey was piloted in a large (approximately 80,000) urban district in the southern United States. Approximately 45% of students in this district are African American, 30% White, 15% Latino, and 10% other ethnicities.

For the pilot test, the study team drew a random sample of 150 teachers, 60 school administrators, and 25 instructional support staff. Of those invited, 47 teachers (31 percent), 19 administrators (32 percent), and 17 instructional support staff (68 percent) completed the survey version corresponding to their respective role.

There were a number of quantitative analyses conducted to explore the various scales in this survey. First, descriptive statistics (means and standard errors of means) were computed for each scale, separated by role. Second, scale reliability analyses were computed for each scale, separated by role, using Cronbach's alpha (Cronbach, 1951). Alpha reliabilities greater than 0.85 were interpreted to indicate strong scale reliability. Third, item discrimination analyses were conducted by computing item-total correlations for each survey question within each scale, separated by role. Fourth, since the actions, organizational supports, and attitudes toward data components of the conceptual framework were measured by multiple scales, pairwise Pearson correlations were computed to assess the degree to which these scales measured the same larger component.

Results

Table 1 describes descriptive statistics that were computed for each scale. Most scale means tended toward the center of the response scale. Standard errors were typically between 0.10 and 0.20, indicating that high response variability did not need to be considered in further analyses.

Table 1. Mean, standard error, and n of each component by survey version

Scale	Teacher (N=47)			Administrator (N=19)			Instructional Support Staff (N=17)		
	Mean	SE	n	Mean	SE	n	Mean	SE	n
Actions									
Collaborative Team Actions 10 items (1=never, 2=sometimes, 3=often, 4=a lot)	2.66	0.11	47	3.12	0.14	19	2.72	0.18	17
Actions with State Achievement Test Data 8 Items (1=one or two times a year, 2=a few times a year, 3=monthly, 4=weekly)	2.59	0.13	42	2.38	0.19	19	1.96	0.17	17
Actions with Common Formative Assessment Data 8 items (1=less than once a month, 2=once or twice a month, 3=weekly or almost weekly, 4=a few times a week)	2.64	0.08	45	2.88	0.13	19	2.47	0.14	17
Actions with Quiz Data 8 items (1=less than once a month, 2=once or twice a month, 3=weekly or almost weekly, 4=a few times a week)	2.57	0.08	46	2.71	0.51	19	2.19	0.15	16
Organizational supports									
Computer Data Systems 5 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	2.96	0.09	47	3.06	0.16	19	3.42	0.14	17
Principal Leadership 5 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	3.24	0.08	47	3.29	0.13	19	3.38	0.19	17
Support for Data Use 6 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	2.94	0.08	47	2.82	0.12	19	2.83	0.15	17
Attitudes toward data									
Attitudes Toward Data 4 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	3.22	0.07	47	3.73	0.16	19	3.66	0.11	17
Data's Effectiveness for Pedagogy 5 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	3.21	0.06	47	3.53	0.16	19	3.58	0.10	17

Scale	Teacher (N=47)			Administrator (N=19)			Instructional Support Staff (N=17)		
	Mean	SE	n	Mean	SE	n	Mean	SE	n
Competence in using data									
Data Competence 4 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	3.15	0.07	47	2.89	0.14	19	2.75	0.17	17
Collaboration									
Collaborative Team Trust 5 items (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)	3.13	0.10	44	3.11	0.09	19	3.23	0.14	17

Table 2 shows reliability estimates for each scale. Alphas are presented for each component of the conceptual framework and are separated by survey version. All alpha reliabilities were greater than 0.80 and most were greater than 0.90.

Table 2 also shows item discrimination ranges (item-total correlations) for each scale. Item-total correlations were typically high—greater than 0.70 for almost every scale. There were instances of a particular question showing an item-total correlation less than 0.40, but these instances were infrequent, they were not consistent across role. In all cases, the alpha reliability did not increase appreciably if the item was removed. Consequently, these isolated low correlations did not warrant rewording the question or eliminating it from the scale.

Table 2. Cronbach's alpha and item discrimination range of each scale by survey version

Scale	Teacher (N=47)	Administrator (N=19)	Instructional Support Staff (N=17)
Actions			
Collaborative Team Actions			
Alpha	0.97	0.96	0.95
Item discrimination range	0.78–0.92	0.73–0.91	0.60–0.89
Actions with State Achievement Test Data			
Alpha	0.94	0.95	0.92
Item discrimination range	0.66–0.87	0.71–0.92	0.54–0.92
Actions with Common Formative Assessment Data			
Alpha	0.84	0.91	0.88
Item discrimination range	0.33–0.78	0.62–0.86	0.37–0.86
Actions with Quiz Data			
Alpha	0.86	0.93	0.90
Item discrimination range	0.38–0.81	0.56–0.89	0.39–0.89
Organizational supports			
Computer Data Systems			
Alpha	0.93	0.95	0.95
Item discrimination range	0.75–0.86	0.82–0.88	0.87–0.92

Scale	Teacher (N=47)	Administrator (N=19)	Instructional Support Staff (N=17)
Principal Leadership			
Alpha	0.91	0.91	0.96
Item discrimination range	0.65–0.86	0.72–0.83	0.83–0.92
Support for Data Use			
Alpha	0.89	0.82	0.91
Item discrimination range	0.62–0.81	0.33–0.74	0.63–0.87
Attitudes toward data			
Attitudes Toward Data			
Alpha	0.92	0.98	0.95
Item discrimination range	0.77–0.86	0.89- 0.98	0.83–0.96
Data's Effectiveness for Pedagogy			
Alpha	0.91	0.94	0.91
Item discrimination range	0.69–0.84	0.73–0.96	0.70–0.85
Competence in using data			
Data Competence			
Alpha	0.96	0.93	0.96
Item discrimination range	0.84–0.92	0.78–0.88	0.88–0. 94
Collaboration			
Collaborative Team Trust			
Alpha	0.95	0.95	0.95
Item discrimination range	0.74–0.92	0.85–0.92	0.74–0.92

Correlations were computed when components of the conceptual framework were measured by multiple scales. Table 3 shows pairwise correlations among the scales measuring actions, Table 4 shows the pairwise correlations by survey version of the three scales that comprise organizational supports, and Table 5 presents correlations by survey version for the attitudes toward data component. With scattered exceptions, most correlations were between 0.3 and 0.8.

Table 3. Correlations among scales for the actions with data component

Scale/Version	Actions with State Test Data	Actions with Common Formative Assessment Data	Actions with Quiz Data	Collaborative Team Actions
Actions with State Achievement Test Data	1.00	0.45**	0.44**	0.44**
Teacher	1.00	0.40	0.37	0.53*
Administrator	1.00	0.27	0.27	0.21
Instructional Support Staff				
Actions with Common Formative Assessment Data	–	1.00	0.53**	0.35*
Teacher		1.00	0.55*	0.81**
Administrator		1.00	0.66**	0.66**
Instructional Support Staff				

Scale/Version	Actions with State Test Data	Actions with Common Formative Assessment Data	Actions with Quiz Data	Collaborative Team Actions
Actions with Quiz Data	–	–		
Teacher			1.00	0.38*
Administrator			1.00	0.23
Instructional Support Staff			1.00	0.57*
Collaborative Team Actions	–	–	–	
Teacher				1.00
Administrator				1.00
Instructional Support Staff				1.00

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

Table 4. Correlations among scales for the organizational supports component by survey version

Scale/Version	Computer Data Systems	Principal Leadership	Support for Data Use
Computer Data Systems			
Teacher	1.00	0.63**	0.56**
Administrator	1.00	0.06	0.26
Instructional Support Staff	1.00–	0.41	0.67**
Principal Leadership	–		
Teacher		1.00	0.57**
Administrator		1.00	0.68**
Instructional Support Staff		1.00–	0.67**
Support for Data Use	–	–	
Teacher			1.00
Administrator			1.00
Instructional Support Staff			1.00–

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

Table 5. Correlations among scales for the attitudes toward data component by survey version

Scale/Version	Data's Effectiveness for Pedagogy	Attitudes Toward Data
Attitudes Toward Data		
Teacher	1.00	0.89**
Administrator	1.00	0.91**
Instructional Support Staff	1.00	0.84**
Data's Effectiveness for Pedagogy	–	
Teacher		1.00
Administrator		1.00
Instructional Support Staff		1.00

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

Future TDUS Work

The results of the pilot study suggest that the TDUS surveys are sound and properly measure components known to be associated with effective data use. The various scales were shown to be reliable and the survey operates similarly to the survey on which it is based (Wayman et al., 2010; Wayman et al., 2009). Still, there are some unknowns about the TDUS that will be shown through future research.

In particular, there are ways that the survey may be varied that were suggested by the pilot study. While the results of the present study suggest the surveys should be administered in the current form, they also suggest nuances that could be considered in future administrations or future studies. Future research will bear these out, as the TDUS is administered more times and in more contexts. In the following narrative, we discuss potential changes to scales and variations in measuring components of the conceptual framework.

Potential Changes to Scales

There are additions that could be made to two scales: First, we note that the *Collaborative Team Actions* scale assesses the parts of a cycle of inquiry that a collaborative team might undertake. Since individual teachers might also conduct data use following such a cycle, an individual version of this scale could be considered.

Second, as described in the "Survey Description" section, the question asking whether principals allow time for collaborative data inquiry could be reworded to ask whether principals allow time for data inquiry, regardless of whether it is collaborative or not. This question could then be added to the *Principal Leadership* scale. See the "Survey Description" section above for further discussion.

Variations in Measuring Components of the Conceptual Framework

There are also considerations regarding how components of the conceptual framework are measured. First, results show that the correlation between the *Attitudes Toward Data* and *Data's Effectiveness for Pedagogy* scales is high, suggesting that these two scales separately may not be providing unique information toward the Attitudes component. Based on this correlation, one could argue for combining these scales into one scale. We chose, however, to leave them separate because the content of the two scales suggests different dimensions. Further, the scales have operated well separately in prior research (Wayman et al., 2009; Wayman et al., 2010).

Second, diagnostics of scales that measure the Actions component indicate the scale is internally consistent, a few individual items showed low item-total correlations. While these did not warrant removal or editing, it may be that Actions are better understood by ranking and comparing the individual questions within a scale, as has been done previously (Wayman et al., 2010; Wayman, Cho, & Johnston, 2007; Wayman et al., 2009).

Third, the low correlations for administrators for the *Computer Data Systems* scale within the Organizational Supports component could be interpreted as suggesting that this scale does not belong within a component for administrators. We chose to leave these scales within this component because it is reasonable that administrators may see data systems as an organizational support that is divorced from their own leadership and other supports. Further, removal of this scale from the larger Organizational Support component would demand a separate conceptual framework for administrators, and this is not yet supported by research.

Fourth, it is conceivable that multiple scales in a particular component of the conceptual framework may be combined to yield an overall scale score for that component of the

framework. While this is attractive in terms of reducing data, it does present problems. For instance, correlations of the scales that measure the Actions component suggest that combining these scales may be appropriate for teachers, but may not be appropriate for administrators or instructional support staff. Further, combining scales within components may obscure important information provided by examining the scales separately.

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