UNIVERSITY OF CALIFORNIA

Santa Barbara

# An Exploratory Study of Data-Driven Decision Making Supports in a Northern California School District

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Education

by

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**ABSTRACT**

An Exploratory Study of Data-Driven Decision Making Supports

in a Northern California School District

by

Raymond Tjen-A-Looi

This exploratory research study employed a mixed methods research design to examine the data-driven decision making supports of data system infrastructure, analytic capacity, and data-use leadership from the perspective of the DDAs (district data administrators that oversee the provisions of data-driven decision making supports throughout the school district) and from the perspective of school and district personnel (teachers, school and district administrators, school support staff, and district staff that actively use data-driven decision making toward their educational practices). Qualitative data were collected through five individual interviews of DDAs. Quantitative data were collected through a district-wide online survey of school and district personnel (*N* = 218). Qualitative and quantitative data were used together to capture the overall state of the data-driven decision making supports within the school district.

Findings indicate the district under study is still in the early phases of implementing quality data-driven decision making supports such that supports are provided, but they

have limitations and are “a work in progress.” The quality of the district’s data-driven decision making supports is reflected in the perceptions of the school and district personnel. On average, the school and district personnel were between somewhat disagree to somewhat agree that the district provides quality data driven-decision making supports in the three areas of data system infrastructure, analytic capacity, and data-use leadership. The findings also show predictive relationships between data-driven decision making supports and data-driven decision making processes, indicating the importance of having quality data-driven decision making supports. The findings of the study also highlight notable considerations for implementing quality data-driven decision making supports such as implementation phase, district size and breadth, organizational structures, and time.

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# CHAPTER I
# INTRODUCTION

In a world immersed in data, a broad range of businesses and organizations rely heavily on the utilization of data to drive performance and improvement. Education has attempted to follow suit. With the emergence of standards based education and standardized testing in the mid-90s, the use of student data has gained considerable momentum—beginning with a primary focus on student test score data. Since then, student data have expanded beyond just student test score data and have become to include all types of achievement, behavioral, climate, demographic, and instructional data on students (Bernhardt, 2004). Such data are intended to reveal background information on students, what students know, where students need improvement, and what can be done to meet all students' educational needs. Ideally, when student data are analyzed and interpreted appropriately, educators can better make informed decisions to improve educational outcomes for all students. This data-use concept of "systematic collection, analysis, examination, and interpretation of data to inform practice and policy" is known as data-driven decision making (Mandinach, 2012, p. 71).

Data-driven decision making has become a main priority at all levels of the education system (Mandinach, 2012). The No Child Left Behind Act (NCLB) of 2001, a reauthorization of the Elementary and Secondary Education Act, mandated reporting requirements for student achievement of multiple subgroups, institutions and upgrades of student information data systems, and strict accountability over student achievement. Succeeding federal legislations (e.g., NCLB Flexibility, Race to the Top, and Every Student Succeeds Act) over the last 15 years have enacted policies that incorporate data-use practices for driving

improved educational outcomes. State Education Agencies have pushed for major improvements in quality of student information systems, assessment systems, and student data analysis—with the aims of better linking education system variables to student outcomes (Means, Padilla, & Gallagher, 2010). Furthermore, at the local level, school districts have been implementing student data systems and broadening their sets of data-use practices for not only reporting purposes, but toward monitoring students' progress and evaluating their district-wide programs and actions (Knapp, Swinnerton, Copland, & Monpas-Huber, 2006).

This push for becoming data-driven has led school districts to collect and report extensive amounts of student data with the implicit assumption that the mere presence of data, regardless of the usefulness of the data, will result in improved educational practice. This has caused reasonable critiques over the use of data (Booher-Jennings, 2005). School districts can be more focused on simply being labeled as "data-driven" rather than on utilizing the potential capabilities of using data to meet the needs of individual students. For example, school districts and schools may place an overemphasis on standardized test data. However, an end-of-year test score hardly can encapsulate a student's learning profile nor can it solely guide improvements in curriculum and instruction (Shen & Cooley, 2008). Moreover, school districts and schools might use test data to simply target "bubble kids" (i.e., students that score just under the designated level of proficiency) and move them just over the proficiency cut-off without truly addressing any deficiencies (Booher-Jennings, 2005).

Numerous additional issues have emerged for districts attempting to implement such data-driven decision making systems. For example, educators have traditionally lacked the skill sets of using data effectively, such as interpreting and analyzing data to improve evaluative and instructional practices, and there have not been consistent supports providing the help teachers, staff, and administrators need for using data appropriately (Wayman, Cho, & Johnston, 2007). In addition, questions about how educators can use data to make sound instructional decisions continue to arise without clear-cut answers (Hamilton et al., 2009). There also exist frequent impediments in data systems such as difficult usability, inconsistencies and inaccuracies, as well as untimely data reporting (Wayman, 2005). Furthermore, the commitment to integrate an approach as complex as data-driven decision making into daily school practice can conflict with a culture that has not traditionally emphasized using data by teachers, staff, and administrators (Coburn & Talbert, 2006). As a result, school and district personnel can experience difficulties and struggle with using data to improve educational practice because they may lack appropriate supports to use data effectively.

This exploratory research study sought to examine how one large school district in Northern California, Dawn Peak Unified School District (DPUSD), currently supports the use of student data to drive decision making. The approach to this investigation was to focus on the district's data-driven decision making supports—particularly from the perspective of district administrators that oversee the provisions of those supports throughout the district and from the perspective of school and district personnel that use data-driven decision

making toward their educational practices. In doing so, the study sought to capture the general state of the data-driven decision making supports at DPUSD.

The data-driven decision making supports being examined in this study have emerged from research and literature as key factors that prominently affect the use of data in educational settings (see Datnow, Park & Wohlstetter, 2007; Dembosky, Pane, Barney, & Christina, 2005; Gill, Borden, & Halgren, 2014; Hamilton et al., 2009; Heritage, Lee, Chen, & La Torre, 2005; Knapp, Copland, & Swinnerton, 2007; Lachat & Smith; 2005). They are as follows:

a.) Data System Infrastructure (e.g., technological hardware and data systems that store and maintain student data);

b.) Analytic Capacity (e.g., ability to analyze, summarize and interpret data); and

c.) Data-Use Leadership (e.g., the vision and culture surrounding the use of data within the organization).

The use of data-driven decision making relates to the transforming of data into actionable decisions and the steps to do so can be broken down into sequential data-driven decision making processes (see Mandinach, Honey, & Light, 2006). The sequential data-driven decision making processes entail collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing knowledge to formulate actionable decisions. These data-driven decision making supports and processes will be further elaborated on later in this chapter and particularly in the literature review.

The school district, in the matters of providing data-driven decision making supports, is represented by key administrative figures that oversee the provisions and maintenance of

the data-driven decision making supports. These key figures are known as district data administrators (DDAs), and they refer to pertinent district administrators with knowledge and control over the provisions of organizational supports for using data to drive decision making (i.e., data system infrastructure, analytic capacity, and data-use leadership). School and district personnel include teachers, school and district administrators (not including the DDAs), school support staff, and district staff that actively use data-driven decision making toward their educational practices.

Performance of a system depends heavily on how the strategy is structured and implemented (Olson, Slater & Holt, 2005). Thus, the focus of this study was on the data-driven decision making supports—the provisions over them, the extent of their quality, their relationship with the use of data-driven decision making, and their general state within the school district. Based in the findings, the study implications contribute insight into better supporting the use of data-driven decision making within school districts and help school districts to alleviate some of the struggles experienced with incorporating data-driven decision making in their day-to-day activities and overarching actions. Furthermore, the study aims to expand the knowledge and understanding of a data-driven decision making system in a school district setting and bring about further research in the field of study.

## Background of the Problem

In the last 15 years, states have made concerted efforts to support data capacity. They have built longitudinal data systems to track multiple types of student data (e.g., achievement, behavioral, and demographic) and also created data systems housing online

assessments and a library of instructional resources. These developments have made student data more readily available for educational institutions, local education agencies, school districts and schools. According to a Data Quality Campaign (2013) survey of state actions in ensuring effective data-use, there has been notable growth in the development and implementation of data systems. From 2000 to 2013, most states (up to 41) have initiated implementation policies and plans, and have provided funding support for data systems throughout their local school districts. In 2010, federal education funding for states for technological infrastructure to support data systems and tools reached nearly $516 million (National Center for Education Statistics, 2010). And in only two years, that spending has amassed over $610 million nation-wide (Mandinach & Gummer, 2012).

Traditionally, student data collection has primarily consisted of end-of-year student assessment results. How many students are proficient on state-wide summative assessments? What is the percentage of English language learners attaining academic proficiency? What is the state-wide student performance disaggregated by ethnicity? The early uses of data had provided a limited snapshot of student performance at the end of each school year in the form of high-stakes testing (see Hursh, 2007)—an archaic byproduct of the push for increased accountability. However, the growing demands for better evaluating educational effectiveness, tracking student progress, and improving instructional practices have changed the usages of data. Educators, more than ever, are exposed to an extensive and wide-variety of data—beyond just summative assessment data. And with some exceptions such as the use of test data to move “bubble kids” (see Booher-Jennings,

2005), few would argue that the use of data to gain more information on instructional improvement and student learning would be detrimental.

As a result of this day-in-age in education of rigorous academic standards, high-stakes testing and heightened accountability, local school districts are being asked to think about decision making very differently and consequently, confronted with a challenging task: take a vast amount of student data, report it to fulfill particular accountability demands set forth in federal and state education provisions, alter education processes and operations based on the evaluations of the data, and most importantly, use the data results to help meet the needs of all their students. For example, a major component of California's new school funding formula, enacted in 2013, requires local education agencies to prepare and abide by a Local Control Accountability Plan—which details how districts plan to meet and evidence annual set goals for all pupils with specific attention to address state and local priorities (California Department of Education, 2014).

Thus, local school districts are playing a major role in whether or not student data can be utilized in an effective manner. School districts and schools collect student data on a regular basis, whether it is student background information, course enrollment, attendance, credits, grades, or assessment scores; a various and considerable amount of data is compiled on students throughout just a single school year, let alone their entire tenure in the education system (Bernhardt, 2004). In addition, school districts are required to report specific student data to state and federal education agencies to meet accountability requirements (Gross & Hill, 2016; Mandinach, 2012). By no means is there a shortage of

available student data. A concern is how to support and ensure the effective usages of collecting all that student data.

Effective data-use can be flexible and powerful. It can provide a way to link results to desired outcomes (Datnow et al., 2007; Mandinach, 2012; Supovitz & Klein, 2003; Wayman et al., 2007) as well as highlight notable areas of strength and weakness (Dembosky et al., 2005). Data can also be used to measure current conditions, monitor progress, evaluate performance, and provide feedback information allowing for responsive changes (Datnow et al. 2007; Hargreaves & Braun, 2013; Mandinach, 2012; Supovitz & Klein, 2003; Wayman et al., 2007). Mandinach (2012) notes these uses of data have become important in education because of the emphasis on rigor and hard evidence in educational practice, research, and decision making.

If used actively, data-use can not only fulfill student reporting purposes, but has the potential to help guide school reform and improve educational practices (Wohlstetter et al., 1997). Education leaders can utilize data to better determine relative effectiveness of schools and teachers (Hargreaves & Braun, 2013) and to make better decisions centering around student performance, interventions, and instructional practices (Hora, Bouwma-Gearhart, & Park, 2014). Teachers, on a daily basis, use information about students' development and progress to plan their curriculum and instruction (Chen, Heritage, & Lee, 2005), and with the support of data, teachers can better identify explanations in student performance, behavior, attendance, and other potential trends (Mandinach, 2012). With effective data-use, a continuous improvement system (such as a data-driven decision making system) can be established of ongoing goal setting, measurement, and feedback

processes (Gill et al., 2014)—where results can be translated into information that educators can use to make decisions toward improving educational practices (Halverson, Grigg, Prichett, & Thomas, 2007).

Nevertheless, as education evolves and there continues to be a proliferation of computer technologies, the process of using data to drive decision making can become more automated and systematized, but also it can become more extensive and complex—particularly in acquiring such a system. Data-driven decision making, to many of its advocates, can provide educators a continuous-improvement perspective. However, data alone does not directly result in improved teaching and learning (Hora et al., 2014). Data-driven decision making requires a process of translating data into information that teachers, staff, and administrators can find meaningful and useful, and then transforming it all into executable actions (Spillane, 2012).

Thus, in applying data-driven decision making, handling and using such a variety of student data effectively can be a challenging undertaking and there can be several barriers preventing the incorporation of using data in education decision making. Detractors note that there can be too much data to sift through and educators are overwhelmed with the mere prospect of using data (Celio & Harvey, 2005; Ingram, Louis, & Schroeder, 2004; Shen & Cooley, 2008). Educators' attention can also be redirected away from students with the most pressing educational problems (Booher-Jennings, 2005) and data can be misleading if not interpreted correctly resulting in negative consequences (Spillane, 2012). Issues can arise in the accessibility, manipulation, interpretation, transformation, and application of data (Wayman, 2005). Moreover, understanding how to use tangible evidence, such as

student data, is not simple and straightforward (Ikemoto & Marsh, 2007), rather it is a skill that needs to be cultivated and supported (Mandinach & Gummer, 2013). Unfortunately, school administrators often lack the capabilities and support to implement research-based practices surrounding data-use, especially within a data-driven decision making system (Datnow et al., 2007). Furthermore, teachers and staff are often not provided sustained training and support for analyzing and interpreting data as well (Protheroe, 2001).

## Statement of the Problem

A common assumption is that educators should be using data to improve student outcomes; however, there are many challenges and barriers to incorporating and supporting a system of effective data-use for decision making. Prior research and literature suggests that using student data to inform decision making has the potential to improve instruction and increase student performance (e.g., Datnow et al., 2007; Hamilton et al., 2009; Lachat & Smith, 2005; Means, Padilla, DeBarger, & Bakia, 2009). Frameworks have emerged on what the data-driven decision making process should resemble (see Datnow et al., 2007; Gill et al., 2014; Halverson et al., 2006; Ikemoto & Marsh, 2007; Mandinach, Honey, & Light, 2006; Wohlstetter, Datnow, & Park, 2008). Further studies have identified key factors that help or hinder the use of data in educational settings (e.g., Datnow et al., 2007; Dembosky et al., 2005; Hamilton et al., 2009; Lachat & Smith, 2005; Means, Padilla, DeBarger, & Bakia, 2009). Nevertheless, there are still many issues that arise in attempting to utilize a data-driven decision making system (see Celio & Harvey, 2005; Protheroe, 2001; Wayman, 2005). Moreover, there is a lack of strong empirical evidence about outcomes of implementation strategies for a data-driven decision making system (Dembosky et al., 2005;

Wayman et al., 2007) and their impact toward supporting the use of data-driven decision making and its processes (Gill et al., 2014). Overall, there is a need for greater understanding of how particular data-driven decision making supports (i.e., data system infrastructure, analytic capacity, and data-use leadership) are implemented by an organization and received by personnel, and how those supports relate to the data-driven decision making processes carried out by personnel (i.e., the use of data-driven decision making to transform data into actionable decisions).

Education institutions, such as school districts, are still developing procedures for incorporating data-driven decision making into their everyday practices and organizational activities. DPUSD is a district in the midst of instituting a data-use system such as data-driven decision making and of becoming data-rich whilst wavering in its abilities to specify comprehensive data-driven decision making strategies outlined with effective practices. Similar to many other school districts and education institutions, the appeal of using data is attractive, but the issues surrounding data-use and challenges that come with it have surfaced in research (e.g., Booher-Jennings, 2005). District administrators understand that effective data-use is vital to the future of their school districts. Nevertheless, they also recognize that effective data-use, especially data-driven decision making, is a complex and complicated undertaking. Thus, there is a strong need for an exploratory research study, such as this one, to examine how data-driven decision making is supported in a school district, how those supports are provided and received, and how they relate to data-driven decision making processes.

## Purpose of the Study

The purpose of this exploratory study was to examine how one school district supports data-driven decision making within its central offices and throughout its schools. The approach to this study was to focus on the district's data-driven decision making supports (i.e., data system infrastructure, analytic capacity, and data-use leadership) from the perspective of the DDAs (district data administrators that oversee the provisions of data-driven decision making supports throughout the school district) and from the perspective of school and district personnel (teachers, school and district administrators, school support staff, and district staff that actively use data-driven decision making toward their educational practices). The study examined how DDAs seek to ensure quality data-driven decision making supports throughout the school district and what DDAs perceived as the current strengths and weaknesses of the district's data-driven decision making supports. The study also examined the quality of the data-driven decision making supports as perceived by school and district personnel and how the supports relate to the processes of data-driven decision making carried out by school and district personnel (i.e., collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing information). By examining the data-driven decision making supports from the perspectives of the administration providing the supports and the personnel receiving the supports to utilize data-driven decision making, the study sought to capture the general state of the data-driven decision making supports within the district. The study aimed to shed some light on the matters of improving provisions for using data to drive decision making so better educational decisions can be made.

## Research Questions

The focus of the study was to examine the data-driven decision making supports at DPUSD through the perspectives of the district data administrators (DDAs) and school and district personnel. The study used semi-structured interviews to collect qualitative data from DDA participants. The DDA participants were selected because as district data administrators they have particular knowledge and control over the provisions of data-driven decision making supports throughout the school district. The study also used a district-wide online survey to collect quantitative data. The rationale for selecting these school and district personnel (which included all teachers and particular administrators and staff) was that they actively use data-driven decision making toward educational practices. The research questions addressed in the study were as follows:

<u>Qualitative Research Questions</u>

(1) How do district data administrators describe their efforts to ensure data-driven decision making supports are being provided throughout the school district?
(2) What are district data administrators' perceptions of the weaknesses and strengths of the data-driven decision making supports?

<u>Quantitative Research Questions</u>

(3) What are the general perceptions of the data-driven decision making supports by school and district personnel?
    a. Are there any significant differences in the general perceptions of the data-driven decision making supports by school and district personnel?
(4) What are the general perceptions of school and district personnel of how the data-driven decision making supports relate to their use of data-driven decision making?
    a. Are school and district personnel's general perceptions of the data-driven decision making supports significant predictors of the data-driven decision making processes carried out by school and district personnel?

<u>Combined Research Question</u>

(5) What is the general state of the data-driven decision making supports within the district?

## Significance of the Study

The study is important in the context of the research community and practitioners focusing on school district data-use, namely implementing and maintaining a data-driven decision making system. First, because school district data-use is still a burgeoning research topic, the study contributes to a growing field. The study appears significant in the context of recommendations that districts implement data-driven decision making, and specifically highlights the importance of data-driven decision making supports.

Relatedly, in the context of an increasing call for district administrators to develop effective, integrated systems centering on using data, the study provides administrators and personnel with some considerations on the state of a data-driven decision making system within this school district and in similar school districts. The study addresses the benefits and impediments that one Northern California school district is experiencing in developing a working, data-use initiative, specifically a data-driven decision making system. Such an effort has provided recommendations needed to better support data-driven decision making and its processes within school districts.

## Research Design Overview

Given the nature of the research questions and the practical setting of the school district under examination, the study employed a mixed-methods research design in conducting this exploratory research. A mixed-methods research design was used to seek greater validity through the corroboration of interview (qualitative) and survey (quantitative) data, completeness to allow for a more comprehensive view of the area of inquiry, and contextual understanding of the structures of the school district organization (see Bryman,

2006; Greene, Caracelli, & Graham, 1989). More specifically, a concurrent triangulation design type was used allowing for converging or discrepant findings to emerge from multiple viewpoints (Creswell, Plano Clark, Gutmann, & Hanson, 2003).

The data-driven decision making supports examined are data system infrastructure, analytic capacity, and data-use leadership—which will be elaborated on in further detail in the next two chapters. Qualitative data were collected through individual interviews of DDAs (district data administrators that oversee the provisions of data-driven decision making supports throughout the district) to capture the district's efforts in ensuring data-driven decision making supports are being provided throughout the school district. Qualitative data were also collected to capture the DDAs' perceptions of the strengths and weaknesses of the data-driven decision making supports. Quantitative data were collected through a district-wide online survey of school and district personnel (i.e., teachers, school and district administrators, school support staff, and district staff that actively use data-driven decision making toward their educational practices) to capture their perceptions of the quality of data-driven decision making supports being provided and the relationship of those supports with school and district personnel's use of data-driven decision making and its processes (i.e., the collection of data, organization of data, analysis of data, summarization of information, synthesis of information, and prioritization of knowledge that inevitably lead to data-driven decisions being made). An examination of the results of the qualitative and quantitative data together was used to depict the general state of the data-driven decision making supports within the district.

## Limitations of the Study

The study was conducted in a single school district in Northern California and was restricted to data collection from the administrators and personnel within the central district office and schools. This restriction limits the extent and generalizability of the findings that may be applicable to other school districts. However, in using an (adapted) data-driven decision making framework incorporating organizational supports (which will be extensively addressed in the literature review), the study provides relevant information and knowledge surrounding data-driven decision making that other school districts can take into consideration within their own context. Additionally, because the results of the study reflect only the perceptions of the participants in the study, the results do not reflect the sum of all the agents, thus limiting generalizations to be applied to all staff throughout the district and across schools.

Further, the study presents only a snapshot in time of the status of data-driven decision making in the district under study. Because data-driven decision making in school districts is still a growing field of study, it may experience potential rapid changes upon new findings. Therefore, the conclusions reached may only be applicable for an incremental period and become less accurate as districts' experience with the data-driven decision making system grows and evolves.

Another limitation (and strength in some circumstances) was that the researcher does possess a working and professional relationship with the staff at DPUSD. This status was helpful in achieving access to the district and participants. Nevertheless, the researcher

made consistent efforts to limit bias and influence on the perceptions of participants (see Merriam, 2009).

## CHAPTER II
## LITERATURE REVIEW

### Introduction

The use of data in education has become a reform strategy to respond to the increase in accountability requirements and the urgency for improved student achievement (Massell, 2001). It has enabled educators to gather information and base decisions not on intuition, instinct, and assumptions alone (Datnow et al., 2007; Mandinach, 2012), but allows them to better display performance, highlight strengths, weaknesses and challenges, evaluate effectiveness, and guide improvement (Mason, 2002). The use of data has been linked to potential improvements in overall educational practice (Wayman et al., 2007) and been a useful predictor of school efficacy (Chrispeels, Brown, & Castillo, 2000). More importantly the use of data to guide educational decision making has the potential to increase student performance (Datnow et al., 2007).

The use of data for decision making is becoming ubiquitous in education; thus data-driven decision making has emerged as a conceptual schema for using data for problem solving and decision making within educational settings. Data-driven decision making pertains to a "systematic collection, analysis, examination, and interpretation of data to inform practice and policy" (Mandinach, 2012, p. 71). In education, data-driven decision making generally refers to teachers, principals, administrators, and educators using various types of applicable data to guide decisions aimed at improving educational outcomes for all students (Marsh, Pane, & Hamilton, 2006). Data-driven decision making incorporates the transformation of raw data into something meaningful that education administrators and teachers can use in their overarching and day-to-day work (Spillane, 2012).

Despite the growing interest and potential benefits of using data to drive decision making in education, there has been limited empirical evidence of both: the exact effects of using data-driven decision making on student and educational outcomes and the impact of implementation strategies for incorporating a data-driven decision making system. Because performance of a system is strongly influenced by how well the strategy is implemented and the process activities are carried out (Olson et al., 2005), there is a strong need to understand how a data-driven decision making system is to be properly supported before there is a determination of the precise effects of using the system. Thus, the following literature review will focus on the organizational aspects of a data-driven decision making system rather than the relationships between using data-driven decision making and student performance. This will best serve the direction of the study as well.

This chapter reviews existing works on general types of data-use and data-driven decision making in education, and addresses major themes and lessons that have emerged from the current research and literature. First, there is a brief discussion on the types of data being used (e.g., Bernhardt, 2003; Heritage & Yeagley, 2005), how it may be analyzed (Ikemoto & Marsh, 2007), and how it is being used at different levels in the education system (e.g., Dembosky et al., 2005; Gill et al., 2014; Heritage et al., 2005; Means, Chen, DeBarger, & Padilla, 2011). This provides some context into general data-use within educational settings. Second and foremost, this literature review discusses several organizational components as enabling factors that impact the use of data and the implementation of a data-driven decision making system (e.g., Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Hamilton et al., 2009; Heritage et al., 2005; Knapp et

al., 2007; Lachat & Smith; 2005). Three components are discussed: data-system infrastructure, analytic capacity and data-use leadership. Third, a commonly conceived data-driven decision making framework is presented that maps out the data-driven decision making processes—explicating how data are transformed into actionable information used for decision making (e.g., Datnow et al., 2007; Gill et al., 2014; Halverson et al., 2007; Mandinach et al., 2006). Fourth, an explanation of the connection between the organization components and data-driven decision making processes are discussed. And last, there is the presentation of an adapted data-driven decision making framework with organizational supports (see Gill et al., 2014; Mandinach et al., 2006)—which guided this exploratory research study.

## Types of Data & Analysis

Many studies investigating general data-use and data-driven decision making begin with identifying different types of data that are collected and analyzed (e.g., Bernhardt, 2003; Dembosky et al., 2005; Heritage & Yeagley, 2005). The main type of data that initially comes to mind is test data which ranges from state-developed standardized assessments to benchmark or formative assessments (Heritage & Yeagley, 2005). This is all considered student achievement data; however this type of data can also consist of student grades, classroom assignments, portfolios, teacher observations, writing journals, progress checks, and conference logs (Bernhardt, 2004; Supovitz & Klein, 2003). Student achievement data represents the observable measures for student learning and performance.

Bernhardt (2004) has identified three other types of data in addition to student achievement data: demographics, instructional processes, and perceptions data.

Demographics data provide descriptive information such as grade, gender, parent education level, ethnicity, language proficiency, home language, socioeconomic status, attendance, and disciplinary records. Instructional processes data depict aspects of pedagogical strategies aimed at teaching and learning. These data include information about course pathways, curriculum, pacing guides, teaching practices, professional development, school programs and interventions, and parent communication and involvement. Perceptions data provide insight into what students, parents, teachers, and others think about the learning environment. These data can include individuals' views, attitudes, values, and beliefs of the school climate, the instruction, and faculty and staff.

In addition to the determining questions of what type of data should be used by educators, there are the questions of how to analyze it. The most common analyses focus on tracking students' progress and on guiding adjustments in instruction to improve student learning (Dembosky et al., 2005). These approaches can entail observing for and explaining patterns, summarizing assessment data, comparing data within and across different levels (e.g., class, school, district, or state), disaggregating data by groups or programs (e.g., by ethnicity or language proficiency), identifying growth and trends, or linking performance to standards, learning objectives, and instruction (Mandinach & Gummer, 2012).

In recognizing the variability in both the types of data and analyses, Ikemoto and Marsh (2007) note that the data-driven decision making process is affected by the nature of the data used and the data analyzed. They suggest data-driven decision making processes depend on a range of both simple-to-complex data and simple-to-complex analysis. By identifying the complexity of the data and analysis, one can conceptualize the variation in

the data-driven decision making process and distinguish the form of data-driven decision making being utilized. Because of these data and analyses considerations, the direction of the data-driven decision making process is influenced on a case-by-case basis. A particular direction may be suited for a given situation but less appropriate for another. Thus, there is no universal form for all cases but such that, the form depends on the purpose of the decision making situation and the resources available.

Simple data consist of less complicated and more straightforward data that are often taken from one perspective and one point in time. Complex data tend to be multidimensional involving multiple time points, different types and sources, and differing levels of detail. Comparatively, simple analysis consists of straightforward techniques such as using descriptive analyses, assumptions for interpretation, and basic knowledge reliance; whereas complex analyses tends to refer to sophisticated techniques such as modeling, evidence-based interpretation, and expert knowledge reliance.

The simple versus complex data-driven decision making framework (see Figure 1) displays four quadrants that embody the varying permutations of data-driven decision making processes. Ikemoto and Marsh (2007) identify the four permutations as *basic*, *analysis-focused*, *data-focused*, and *inquiry-focused*. *Basic* forms are a combination of simple data and simple analysis such as a principal using the distributions of state test scores to focus teacher professional development time on certain instructional strategies, or adapting schedules based on state test results of the English language learner population. *Analysis-focused* forms consist of simple data and complex analysis; for example, this can be district and school administrators, instructional coaches, and teachers

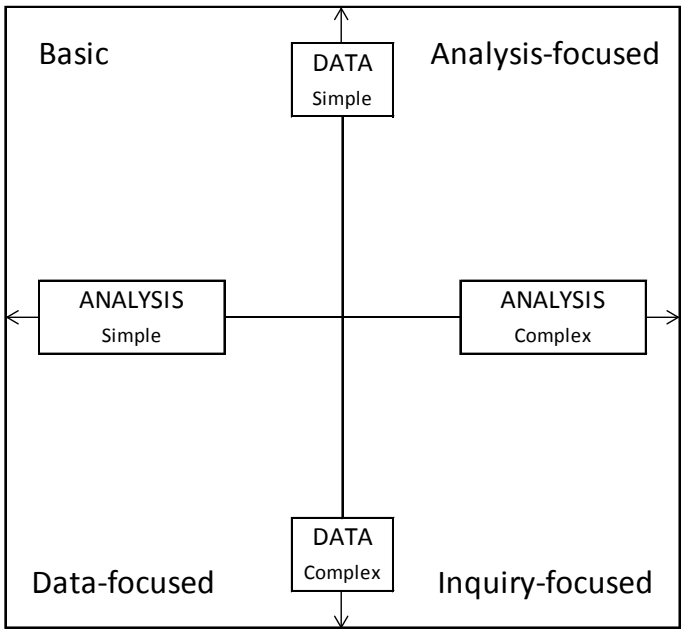


*Figure 1*. Simple versus Complex Data-Driven Decision Making Framework (Ikemoto & Marsh, 2007).

using collaborative and iterative methods to examine state test results as means to differentiate services for low-performing students, or disaggregating state test results to find patterns in students with low-performing literacy scores. *Data-focused* forms are a combination of complex data and simple analysis such as a school drawing on multiple types of data to reveal where to allocate resources toward reading specialists. *Inquiry-focused* forms entail a combination of complex data and complex analysis. This can include high school administrators and teachers disaggregating multiple types of high school student data and using collaborative efforts to predict patterns in graduation rates of high school students.

## Data-Use within Education System Levels

A major determinant of the type of data used and how it is being used is based on the education system level in which the decision making occurs. Gill et al. (2014) highlight the

meaningfulness of the data depends on the personnel that accesses, analyzes, and reviews the data and for what purpose. Numerous studies have examined the use of data on particular levels of the education system (e.g., Dembosky et al., 2005; Heritage et al., 2005; Means, Chen, DeBarger, & Padilla, 2011). Many of these studies sought to identify how data was used by classroom teachers, school administrators, district administrators, and state education agency officials. Some of these uses of data were similar and crossed levels, but many were specific to an education system level for each level possessed different needs, problems, and questions—thus requiring different uses of data.

Classroom teachers were found to use data for: (a) assessing the needs, strengths, progress, and performance of students; (b) developing and revising current and planned classroom instruction and activities, e.g., examine literacy scores and regroup based on progress; and (c) reflecting on and understanding their own professional strengths and weaknesses, e.g., teacher evaluations and observations (Dembosky et al., 2005; Gill et al., 2014; Means et al., 2011).

School administrators focused on types of data for: (a) assessing the needs, strengths, progress, and school-wide performance of staff and students, e.g., examine overall student performance and staff performance and progress; (b) developing and revising school plans, targets, and goals, e.g., use student outcomes and contributions of individual teachers to modify pacing guides; (c) setting and monitoring the implementation of school practices, programs, and policies, e.g., evaluate the success of an after school tutoring program (Dembosky et al., 2005; Gill et al., 2014; Heritage et al., 2005).

Data-use activities for district administrators consisted of: (a) assessing the needs, strengths, progress, and performance of schools, staff, and students, e.g., examine overall school performance and progress; (b) developing and revising district level curricula, standards, plans, targets, and goals, e.g., use student outcomes and contributions of individual teachers, coaches, and curriculum and instruction administrators to change grade level curricula to better align with academic standards; and (c) setting and monitoring the implementation and impact of district practices, programs, and policies, e.g., use overall writing scores to evaluate a recently instituted district-wide writing program (Dembosky et al., 2005; Gill et al., 2014; Heritage et al., 2005).

Lastly, state education agency officials used data for: (a) monitoring statewide achievement and attainment levels; (b) monitoring and reporting measures of school performance; (c) measuring and monitoring quality of teachers and principals; (d) evaluating program implementation and impacts; and (e) developing and revising state standards, curricula, and goals (Gill et al, 2014).

## Data-Driven Decision Making Organizational Components

Many studies have examined and identified particular organizational factors that influence the effectiveness of using data in educational settings (e.g., Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Hamilton et al., 2009; Heritage et al., 2005; Knapp et al., 2007; Lachat & Smith; 2005). From recent works, three organizational components have emerged that can either support or hinder data-driven decision making. They entail technological hardware/data systems, capacity for analysis, and leadership.

*Data System Infrastructure*

Data management ranges from low- to high-tech data practices, ranging from binders and cabinets of paper reports to sophisticated data warehouses (Halverson et al., 2007). Amongst those range of practices, Hamilton et al. (2009) identified common technical and accessibility challenges that districts and schools face when attempting to support instructional planning with data. They note such challenges begin even before trying to analyze and interpret data to draw any formative conclusions. These challenges can include data collection, storage, access, retrieval, and accuracy. Undependable data are problematic for analysis, and consequently decision making (Heritage et al., 2005).

In a study including low performing high schools seeking to utilize data for school reform, Lachat and Smith (2005) found these districts and schools were faced with discontinuous and inaccurate data when they attempted to use data more rigorously. Also there was a lack of data system capacity and cohesiveness pertaining to data requests which negatively affected timeliness and pertinence of data reports. Across the examination of two studies on the different ways in which educators use data to make decisions about teaching and learning, Ikemoto and Marsh (2007) found that the accessibility and timeliness of data and the perceived validity of data greatly influenced the extent of data-use by staff personnel. Kerr, Marsh, Schuyler Ikemoto, Darilek, and Barney (2006) reported similar factors affecting data-use when examining strategies for promoting data-use toward instructional improvement. Common complaints centering around the use of test data were that by the time data reports became available the information was out of date and not timely, thus becoming irrelevant. Moreover, staff that questioned the

accuracy and validity of the data consistently held doubts toward the meaningfulness of data-use, which in turn detracted buy-in and commitment.

In the current age of educational planning and accountability, having a high-quality data system infrastructure is a necessity for buffering these data issues and for carrying out data-driven decision making activities. Mandinach (2012) states on the need for technological tools and data infrastructure: "The amount of data with which educators are confronted continues to grow and increase in complexity. This growth is beyond the capacity of humans to handle, thereby necessitating technological solutions to support data-driven practices" (p. 76).

In a study examining how high-performing school systems use data to improve instruction, Datnow et al. (2007) found that these school systems had invested in a data information management system that could organize different types of data, allow for convenient access, and support data and analyses activities for data-driven decision making. Wayman and Stringfield (2006) reported schools with high quality data systems were able to use multiple sources of data points to obtain a better understanding of student progress and learning. In addition, the data systems allowed for the assembly of varied forms of student data which were advantageous for educators in disaggregating data and comparing different levels and subgroups of students. Ikemoto and Marsh (2007) noted that educators even benefited from simple technological tools such as data dashboards that could summarize data and allow for manipulation and display of basic data.

Data systems and tools provide a solution to the problem of disparate forms and locations of student data, alleviating the difficulties in organizing data in an efficient manner

(Heritage & Yeagley, 2005). Hamilton et al. (2009) state high-quality data systems will integrate various types of data for reporting and analysis empowering educators with comprehensive information. These data systems and tools often include data warehouses, student information systems, assessment and diagnostic systems, progress monitoring programs, and instructional management programs (Wayman, 2005). Gill et al. (2014) note that a data infrastructure will not only consist of data systems for maintaining student, academic, and behavioral information but the technological hardware can also entail computers, devices, internet connections, bandwidth capacities, and servers. In sum, these data systems and tools need to be of high quality and flexible enough to provide for data collection mechanisms (Mandinach et al., 2006), incorporate and organize multiple types of data, (Hamilton et al., 2009), produce data in an accurate and timely manner (Means et al., 2010), and allow for usability by personnel (Datnow et al., 2007).

*Analytic Capacity*

Beyond sufficiently storing data and having access to data, there is a necessity of being capable to make use of that data. Spillane (2012) notes the grave importance of how educators perceive and interpret data in the contexts of their daily practice. Educators must understand how to use data from various sources and transform that data into usable information and knowledge that can become actionable (Mandinach, 2012). Because data needs to be analyzed and converted into information, if it is not done properly, using data can create misleading information and decisions which result in unintended or negative consequences. As Mandinach et al. (2011) note, “without improving educators’ capacity to

use and understand data, the potential of those investments will not be maximized and educators will not use data effectively to advance educational practice" (p. 2).

Moreover, since student data are commonly supported through data systems and tools, one must be able to navigate and utilize those sources that house the assortment of data so one can analyze it and extract useful information from it. Data systems (like any tools) serve a less effective function without proper training and support (Wayman & Cho, 2008). Simply having an interest in and motivation to use data-driven decision making does not result in being able to navigate for, analyze and interpret data, and make meaning of it—the personnel needs the capacity to do so.

Unfortunately, it is commonplace to find districts and schools lacking the capacity to implement and execute what research suggests as effective data-driven decision making processes (Wayman et al., 2007). Dembosky et al. (2005) found, from their study of examining school districts' use of data to make decisions in support of improving student achievement, that even though educators valued data and sought to use data for improvement, many lacked data analysis skills and an understanding of processes for systematically using data. In a study involving a new data system implementation, Heritage et al. (2005) reported that less than 40% of respondents as feeling they had the capacity to use data independently without outside support. Ikemoto and Marsh (2007) found concurring results such that many teachers from their study districts felt less than moderately capable or unprepared to interpret data reports of student test results. They also noted that many principals provided a lack of assistance with these data tasks and provided limited professional development opportunities on the topic of data-use.

Mandinach (2012) notes from an implementation perspective that there is generally limited attention given toward providing support and resources for building human capacity around data analysis and data literacy. Moreover, there tends to be a lack of professional development and formal training offered for analyzing and interpreting data as well (Lachat & Smith, 2005), and even more so a lack of ongoing, sustained training throughout the school year (Protheroe, 2001). Because traditional administrative preparation does not formally cover aspects of analyzing student data, especially with the utilizations of data systems and tools, there is often an unaddressed gap in understanding how to provide the necessary support and professional development needed to build data-use capacity amongst personnel (Heritage & Yeagley, 2005).

Research and literature on data-driven decision making consistently address the need for analytic competency in order to maintain effective data-use practices (e.g., Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Mandinach, 2012). Datnow et al. (2007) reported that high-performing school systems that used data to inform instruction had invested in professional development, provided support for staff in how to use data, engaged in data discussions, provided collaboration time, and connected educators to share data and improvement strategies. Hamilton et al. (2009) found from numerous analyses reports that supporting staff in data-use is extremely important. Based on their findings they suggested facilitation of data discussions, dedicated staff collaboration time, and targeted professional development on a regular basis. Dembosky et al. (2005) also discovered similar findings such that teacher collaboration and quality training were major factors for enabling the needed analytic skills for carrying out data-driven decision making.

Beyond professional development and training, collaboration time, and data discussions, Gill et al. (2014) added that the support of strong analytic capacity can also come in the forms of additional personnel to support teachers, coaches, and school administrators with data-use for understanding and improving professional practice. This can help with the limited time constraints often burdening many educators; such that, a great impediment to implementing data-driven decision making is allocating sufficient time for not only building capacity but for analyzing and interpreting data (Dembosky et al., 2005).

*Data-Use Leadership*

With any type of implementation or reform, strong leadership is a necessary factor. Leadership establishes the expectations, sets the achievement and success goals, builds the foundation, and ultimately develops and executes the plans for action (Datnow et al., 2007). Leadership provides the initiative and persistence to carry out an idea (Ikemoto & Marsh, 2007; Supovitz & Klein, 2003). Moreover, leadership crafts the norms and values that support the mindset of the organization, creating the environment for desired practices (Andrerson, Leithwood, & Strauss, 2010; Katz, Sutherland, & Earl, 2002).

Thus, the third key component to the organizational support of data-driven decision making is leadership. One can note that leadership coincides with the previous two components as well, such that leadership controls the building and maintaining of the data system infrastructure and influences the level of analytic capacity within the organization. Nevertheless, the support of leadership is considerably vital for establishing the vision for data-use (Choppin, 2002; Feldman & Tung, 2001; Ikemoto & Marsh, 2007; Knapp et al.,

2007; Lachat & Smith, 2005; Wayman, Midgley, & Stringfield, 2006) and creating the culture around data-use (Hamilton et al., 2009; Ikemoto & Marsh, 2007).

Knapp and colleagues (2007) state leadership defines the focus and vision for data-use, shaping the strategic thinking and engagement of inquiry behind the process. Education leaders have influence over the meaning-making and the resulting actions of the data-use, thus leadership determines the core purpose and plan for data-driven decision making throughout the district and schools. Both Lachat & Smith (2005) and Mason (2002) found that schools experiencing effective data-use were exposed to leadership that championed data-use as integral for improvement and built a strong vision for what data-use will be in their schools. Wohlstetter et al. (2008) found the importance of education leaders setting the groundwork and direction for data-driven decision making through the aligning of goals, curriculum, and assessment. Wayman et al. (2006) noted the importance of having a strong consensus regarding the goals, standards, and definitions about schooling in order to prevent data-use from becoming fragmented and diffused. Hamilton et al. (2009) concurred with establishing defined concepts as well; in addition they followed up stating that a written data-use plan needs to be developed that is consistent with the goals of the district and schools.

Leadership has also been important for fostering a culture of data-use and continuous improvement (Datnow et al., 2007; Ikemoto & Marsh, 2007). Strong leadership coupled with accountability practices create a sound organizational culture of data-driven decision making that consists of a conducive environment for discussion and reflection on data results (Gill et al., 2014). Datnow et al. (2007) noted in their study the importance of

creating explicit expectations and norms throughout the district and schools as means of establishing a culture of data-use. In a study examining data-use in a set of public schools, Mason (2002) found schools that were most successful and effective in using data possessed a strong data culture built by strong leadership. They noted that the education leaders cultivated the desire to transform data into knowledge, focused on a process for planned data-use, committed to the acquisition and creation of data, organized data management, developed analytical capacity, and applied information and results strategically. Dembosky et al. (2005) found in their study that school leaders pushed for setting time aside for both reviewing data with teachers as well as providing substantial feedback. In addition, school leaders arranged and joined in on data discussions of results and instructional plans based on students' weaknesses. Wayman et al. (2006) also noted how education leaders consistently maintained a student-data focus and kept teachers engaged in data initiatives.

## Data-Driven Decision Making Framework and Processes

The most common form of the data-driven decision making process derives from the data-information-knowledge-wisdom relational hierarchy. This hierarchy allows for the contextualization of data, information, knowledge, and at times, wisdom (Rowley, 2007). Moreover, it describes how an entity at a lower level in the hierarchy (e.g. data) transforms into an entity at a higher level in the hierarchy (e.g. knowledge). Ackoff (1989) depicted a continuum where data goes through a transformation process so that the data can ultimately lead to a state of action based on knowledge, experience, understanding, common sense, and insight. He noted how data can be collected, changed into information,

and then changed into knowledge—where one with knowledge would be able to envision long-term consequences of actions and be able to evaluate and control further actions. This knowledge would eventuate in ideal decision making and provide the capability for constant evaluation and utilization of data-driven decision making. The data-driven decision making process highlights the use of data for evaluation and improvement; it allows for the idea of continuous development where structures are in place to constantly monitor processes such that problems can be identified and responsive solutions can be enacted (Bhuiyan & Baghel, 2005).

Based on the data-information-knowledge hierarchy, many frameworks were developed to capture a data-driven decision making system in an education context—most of which emphasize a continuous-improvement cycle (e.g., Datnow et al., 2007; Gill et al., 2014; Halverson et al., 2007; Mandinach et al., 2006). The framework presented in Figure 2, that is similar to others, is taken from Mandinach et al. (2006) which illustrates not only stages in data-driven decision making but also the processes that occur within each stage. Their presentation of the framework is concentrated on the district level, however Mandinach et al. (2006) note such decision making processes occur on all levels of the education system and can influence across levels. Nevertheless, principal to the framework is understanding the progression through the six data-driven decision making processes of collecting and organizing data, analyzing data and summarizing information, and synthesizing information and prioritizing knowledge to make decisions (Mandinach et al., 2006).

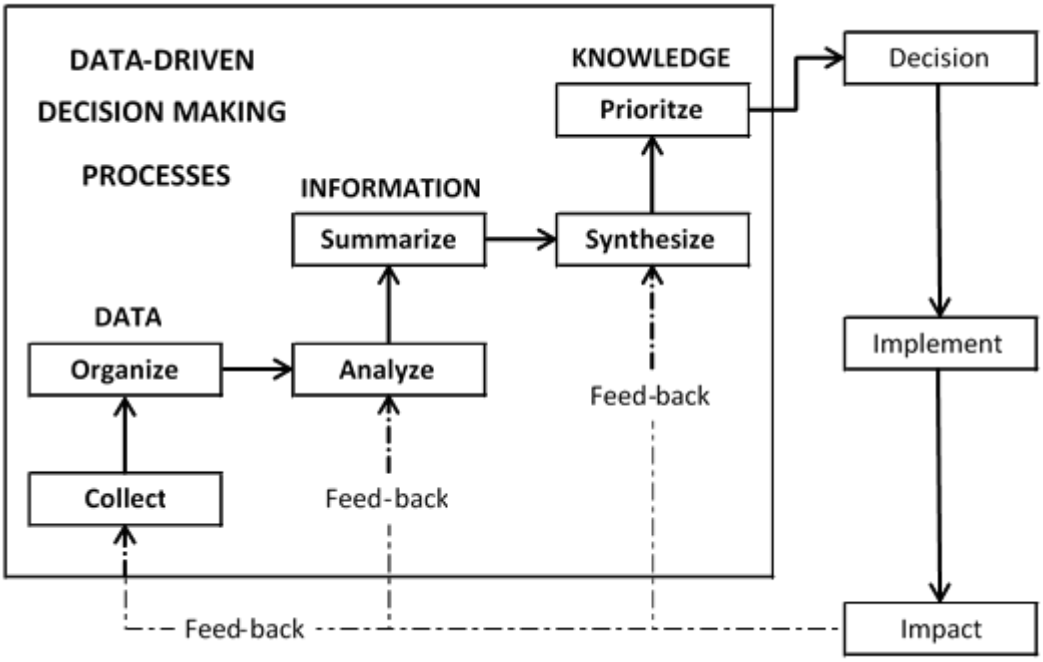


*Figure 2*. Data-Driven Decision Making Framework (Mandinach et al., 2006).

Light, Wexler, and Henize (2004) notes data exists in a meaningless, unusable raw state. Data are merely a collection of evidence, items of value garnered through observation (Zins, 2007). Gill et al. (2014) suggest education-related raw data can be collected through a multitude of sources such as formative, diagnostic, and summative assessments of students; standardized tests and college and career readiness exams; qualitative interviews, observations, or focus groups; surveys of staff, students, parents, and community members; financial, human resource, and administrative records; student records and transcripts; and/or labor, health, human service, education, and statistical agencies.

Whether or not information can be drawn from the raw data depends on how it is conveyed (Light et al., 2004). Information can be amenable to analysis and interpretation; it can shape or form an idea and depends on context (Zins, 2007). As such, information can be seen as connecting data to a context giving that data meaning. Light et al. (2004) state,

"[Information] is data used to comprehend and organize our environment, unveiling an understanding of relations between data and context" (p.3). Gill et al. (2014) note two stipulations: irrelevant data to the decision maker will not be used and non-diagnostic data of the issue at hand may be counterproductive.

Information itself does not implicate any actions. Collected information that is deemed useful develops into knowledge and that knowledge can initiate decision making actions. Knowledge embodies the capacity to understand, explain, and negotiate concepts, intentions, and actions (Zins, 2007). Moreover, instructional and operational decisions targeted to improve outcomes can only occur if results of relevant data and analyses are actually being used and applied (Gill et al., 2014).

In the framework presented by Mandinach et al. (2006), there are six processes that occur within the three stages of the data-to-knowledge continuum. The collection and organization of data are the first two processes within the data stage. Within the information stage, the data are analyzed and summarized into workable information. And in the knowledge stage, the information is synthesized and prioritized transforming it all into knowledge. After these processes, decisions are made based on the knowledge acquired, actions are implemented, and consequential impacts occur.

The decision making process begins with some problem and then data can be gathered to address that problem. These problems can be various in nature depending on the stakeholders or the persons making the decisions. For example, teachers, principals, and district administrators face different problems than one another so they will need to make different decisions than one another. Nevertheless, this problem will initiate the following

processes in the decision making continuum. The first step is to collect raw data that will be relevant toward the problem. Once collected, the raw data (e.g., student test score data) will be organized in some sensible manner. Because raw data does not reveal much meaning, the data have to be converted into information. Therefore after the raw data are organized, the data can be analyzed for informational purposes. The type of analysis will depend on the inquiry, the stakeholders, and any constraining parameters. Once the data are analyzed and converted into information, the accumulated information will need to be summarized—highlighted and interpreted for main points and key details. Regardless of depth and range, the summarized information needs to be concise and systematized so that it can be transformed into knowledge. This transformation occurs in the final stage of the decision making continuum as information is synthesized into knowledge. Lastly, the knowledge is prioritized depending on importance and possible subsequent actions. At this stage, the stakeholders or decision makers will determine, using their best judgment, what knowledge is most pertinent or is most rational for resolving the educational problem at hand.

At the end of the six-step process, a decision is formulated and implemented; barring external reasons such as lack of resources or impracticality, an outcome or impact will result from that implemented decision. The results of the impact will determine whether the stakeholders need to collect more data and revisit the decision making process again. This can include addressing further issues or issues that have come up as a result of recent decisions. However it may be, the stakeholders can also return to any part of the decision making framework and revisit a stage or process to develop a new or altered decision, thus

creating possible feedback loops. Mandinach et al. (2006) emphasize, "Because of the feedback loops, data-driven decision making is seen as an iterative process with data leading to a decision, implementation of that decision, determination of the impact, and perhaps the need to work through some or all of the six processes again" (p. 9). This iterative process allows for data-driven decision making to be continuously impactful for evaluative and improvement purposes.

## Organizational Supports and Data-Driven Decision Making Processes

With the growing capacity to store and handle data, data-driven decision making provides educators with a powerful resource to seek to evaluate and improve both instructional practices and student achievement. More specifically, the use of data-driven decision making enhances our ability as educators to help make decisions and plan courses of action. Because raw data itself lacks any particular meaning (Light et al., 2004), data-driven decision making allows data to be used for decision making. The data-driven decision making framework illustrates the process of how raw data are gathered, informational meaning is extracted, and actionable knowledge is transformed befitting for decision making (Mandinach et al., 2006).

The assumption behind data-driven decision making is procedural and straightforward; however, as we noticed in this review, data-driven decision making is not an isolated process and the incorporation of a data-driven decision making system is not as simplistic as we may have perceived. Numerous studies noted the difficulties and challenges in exercising data-driven decision making practices (e.g., Dembosky et al., 2005; Hamilton et al., 2009; Heritage et al., 2005; Wayman & Cho, 2008) and addressed the factors that would

influence the effectiveness and the processes involved (e.g., Gill et al., 2014; Hamilton et al., 2009; Ikemoto & Marsh, 2005). In addition, implementation of any type of improvement reform takes much thought, effort, and planning. New systems are never implemented into "clean slates" (Halverson et al., 2007). Systems are already in place with developed mechanisms that resist new efforts and insulate external interferences.

Organizational factors of data system infrastructure, analytic capacity, and leadership evidently play vital roles in supporting the effectiveness of a data-driven decision making system (e.g., Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Hamilton et al., 2009; Heritage et al., 2005; Knapp et al., 2007; Lachat & Smith; 2005). Educational systems that lack these supports would be hindered in carrying out their data-driven decision making processes (Heritage et al., 2005; Lachat & Smith, 2005). Gill et al. (2014) suggests that organizational supports are necessary in data-driven decision making and can directly affect processes within a data-driven decision making system.

Upon examinations, each of these organizational supports can be theorized as having an impact on particular processes within the stages in the data-driven decision making framework. The stage containing the processes of collecting and organizing data in a timely and accurate manner can be affected by the dependability of the data system infrastructure (see Datnow et al., 2007; Hamilton et al., 2009; Mandinach et al., 2006; Means et al., 2010). The stage containing the processes of analyzing data and summarizing the information for main useful points can be influenced by the level of analytic capacity for personnel (see Dembosky et al., 2005; Heritage et al., 2005; Ikemoto & Marsh, 2007; Wayman et al., 2007).

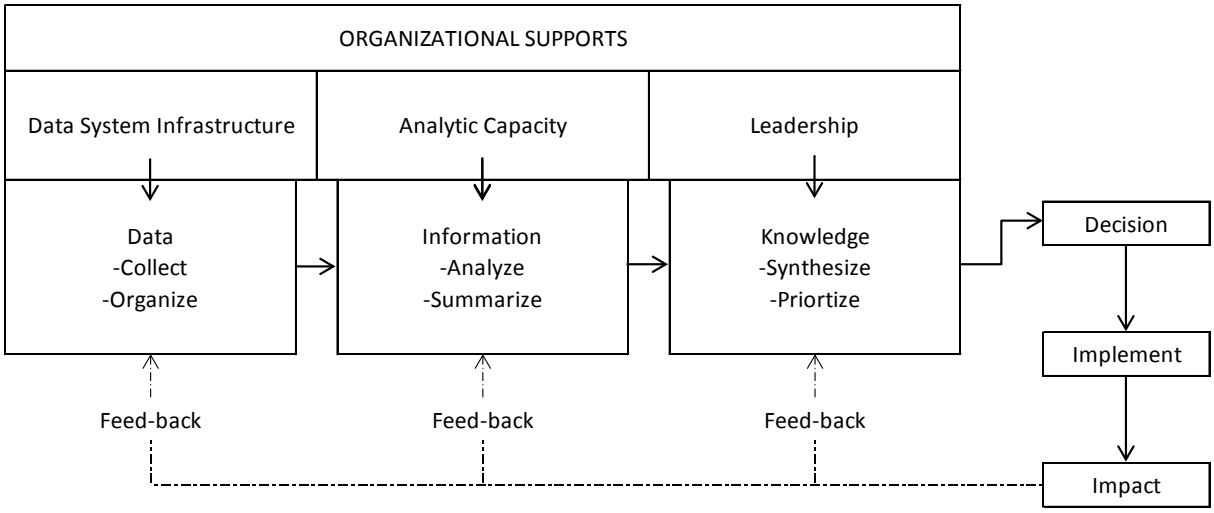


*Figure 3*. Adapted Data-Driven Decision Making Framework with Organizational Supports (see Gill et al., 2014 & Mandinach et al., 2006)

And the stage containing the processes of synthesizing information and prioritizing of knowledge to make decisions can be shaped by the vision and direction of leadership (Choppin, 2002; Feldman & Tung, 2001; Hamilton et al., 2009; Ikemoto & Marsh, 2007; Knapp et al., 2007; Lachat & Smith, 2005; Wayman et al., 2006).

## Conceptual Framework

The study utilized an adapted continuous-improvement data-driven decision making framework with organizational supports to guide the examination of the study's research questions. See Figure 3. The framework was primarily adapted from those posited by Mandinach et al. (2006) and Gill et al. (2014). The framework illustrates an in-depth perspective of how the processes of data-driven decision making function, lead to decisions, and how they are supported by the organization. The framework was set in the context of DPUSD. The continuous-improvement data-driven decision making framework is comprised of how data are collected, analyzed, and transformed into useful information to be used to

make decisions. Moreover, the proponents of a continuous-improvement framework include feed-back loops for continuity of an improvement system. The organizational factors of data system infrastructure, analytic capacity, and leadership make up the school district supports—where each of the supports has a direct impact on particular corresponding data-driven decision making processes.

## CHAPTER III
## METHODOLOGY

The study sought to examine how one large school district in Northern California, Dawn Peak Unified School District (DPUSD), currently supports the use of student data to drive decision making. The approach to this study was to focus on the district's data-driven decision making supports (i.e., data system infrastructure, analytic capacity, and data-use leadership) from the perspective of the district data administrators (DDAs) that oversee the provisions of data-driven decision making supports throughout the school district and from the perspective of school and district personnel (teachers, school and district administrators, school support staff, and district staff that actively use data-driven decision making toward their educational practices). The study first sought to examine how DDAs seek to ensure quality data-driven decision making supports throughout the school district and what DDAs perceived as the current strengths and weaknesses of the district's data-driven decision making supports. Secondly, the study sought to examine the quality of the data-driven decision making supports as perceived by school and district personnel and how the supports may relate to the processes of data-driven decision making carried out by school and district personnel (i.e., collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing information). Lastly, by examining the data-driven decision making supports from the perspectives of the administration providing the supports and the personnel receiving the supports to utilize data-driven decision making, the study sought to capture the general state of the data-driven decision making supports within the district. The remainder of this chapter revisits

the study's research questions, and then addresses the research design, setting, sampling and participants, data collection methods, instrumentation, and data analysis methods.

## Research Questions

Focusing on the perspectives of the district data administrators (DDAs) and school and district personnel, the basis of the study was to examine the data-driven decision making supports at DPUSD. The research questions addressed in the study were as follows:

Qualitative Research Questions

(1) How do district data administrators describe their efforts to ensure data-driven decision making supports are being provided throughout the school district?
(2) What are district data administrators' perceptions of the weaknesses and strengths of the data-driven decision making supports?

Quantitative Research Questions

(3) What are the general perceptions of the data-driven decision making supports by school and district personnel?
    a. Are there any significant differences in the general perceptions of the data-driven decision making supports by school and district personnel?
(4) What are the general perceptions of school and district personnel of how the data-driven decision making supports relate to their use of data-driven decision making?
    a. Are school and district personnel's general perceptions of the data-driven decision making supports significant predictors of the data-driven decision making processes carried out by school and district personnel?

Combined Research Question

(5) What is the general state of the data-driven decision making supports within the district?

## Research Design

The research design refers to the overall strategy and specific plans for addressing the area of inquiry; in essence, it is the blueprints for how data will be collected, measured, and analyzed, and for how findings will be reported (Creswell, 2013). The study employed a mixed methods research design to conduct this examination. Mixed methods consists of

research in which data collection, analyses, and findings are integrated at some level, and inferences are drawn using both qualitative and quantitative approaches in a single study (Creswell, 2013; Leech & Onwuebbuzie, 2007). Mixed methods research creates a middle-ground between quantitative and qualitative research, allowing for methods and techniques best suited for what researchers actually use in practice (Johnson & Onwuegbuzie, 2004).

The need for pragmatism has led to the growth of mixed methods research, revealing the necessity to mix approaches together meaningfully and that offer the best opportunities for answering research questions imbedded in practical situations. Qualitative and quantitative research paradigms have their differing practices and each have their benefits, but also many costs. Mixed methods provides researchers the opportunities to combine insights and procedures to produce a "workable solution," one that has practical implications (Johnson, Onwuegbuzie, & Turner, 2007). Because the aim was to investigate some of the struggles DPUSD experiences with incorporating data-use for decision making in their day-to-day activities and overarching actions, a research design that can best address pragmatic concepts was most useful for application purposes.

Beyond pragmatic reasons for applying a mixed methods approach, there were also methodological and results-related reasons the exploratory study benefited from a mixed methods research design. Greene et al. (1989) identified five primary purposes for conducting mixed methods research which included triangulation, complementarity, development, initiation, and expansion. Bryman (2006) elaborated on these purposes and compiled a schema of rationales for conducting mixed methods studies. Drawing from

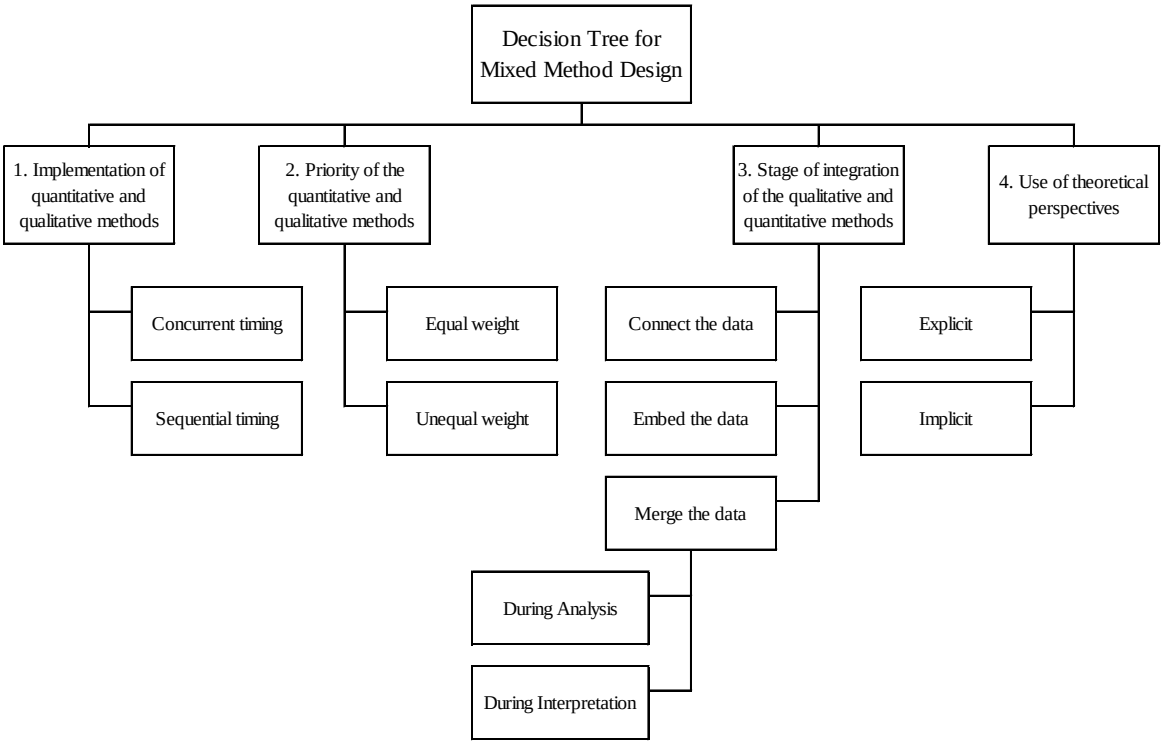


*Figure 4*. Decision Tree for Determining a Mixed Methods Design (Creswell et al., 2003; Creswell and Plano Clark, 2007).

those rationales, the study utilized a mixed methods research design to capitalize on the following: greater validity through the corroboration of quantitative and qualitative data; completeness for a more comprehensive view of the area of inquiry; contextual understanding of the structures of the school district organization; and enhancement of the quantitative and qualitative findings (see Bryman, 2006).

Mixed methods contains multiple approaches to research and blends them together. Consequently, decisions pertaining to implementation, priority, integration, and theoretical perspective have to be made prior to selecting a type of mixed methods research design (Creswell et al., 2003). See Figure 4 that displays a decision tree for identifying the main design considerations for the variant possibilities of mixed methods research.

As for implementation, qualitative and quantitative data were gathered concurrently (Spring 2017) as opposed to attending to one before the other. Because the qualitative and quantitative methods would not converge together until each of their results are interpreted, the order of the data collection was irrelevant and data could be collected concurrently. Addressing priority, there was equal weight and priority given to both approaches. This better reflected the purpose of the study and answered the research questions more thoroughly. Each approach focused on particular qualitative and quantitative research questions, one providing context and the other providing relations, and together they developed a holistic view of the area of inquiry. Regarding the integration of qualitative and quantitative methods, the methods were mixed after the results were interpreted. This allowed for an examination of the convergence of the qualitative and quantitative results to bring about congruent or discrepant findings. Lastly, the explicit theoretical perspective guiding the study was the organizational supports/data-driven decision making framework presented in the last chapter (see Figure 3). Generally, a theoretical perspective reflects a particular stance or point of view on a matter; it can be shaped by a multitude of influences such as personal, experience, history, culture, sociology, psychology, human behavior, class, and organization perspectives (Creswell, 2013).

Because of the flexibility of mixed methods, the researcher has the freedom to manipulate and innovate amongst the general design types to employ a design that will best fit the research situation. Based on the aforementioned decisions pertaining to implementation, priority, integration, and theoretical perspective, of the six primary types

Table 1

*Types of Research Designs*

| Design Type | Implementation | Priority | Stage of Integration | Theoretical Perspective |
|---|---|---|---|---|
| Sequential Explanatory | Quantitative followed by qualitative | Usually quantitative; can be qualitative or equal | Interpretation phase | May be present |
| Sequential Exploratory | Qualitative followed by quantitative | Usually qualitative; can be quantitative or equal | Interpretation phase | May be present |
| Sequential Transformative | Either quantitative followed by qualitative or vice versa | Quantitative, qualitative or equal | Interpretation phase | Definitely present |
| Concurrent Triangulation | Concurrent collection of quantitative and qualitative data | Preferably equal; can be quantitative or qualitative | Interpretation phase or analysis phase | May be present |
| Concurrent Nested | Concurrent collection of quantitative and qualitative data | Quantitative or qualitative | Analysis phase | May be present |
| Concurrent Transformative | Concurrent collection of quantitative and qualitative data | Quantitative, qualitative or equal | Usually analysis phase; can be during interpretation phase | Definitely present |

Source: Plano & Creswell (2008)

of mixed methods designs (see Creswell et al., 2003), the study employed a concurrent triangulation design. See overview of the types of mixed methods designs based on decisions criteria in Table 1. The fourth approach, concurrent triangulation, best addressed the purpose of the study and the research questions. Moreover, this design allowed for converging and/or discrepant findings to emerge using multiple viewpoints, thus creating a better understanding of the area of inquiry (Creswell et al., 2003).

Thus, the study employed a concurrent triangulation mixed methods design; quantitative and qualitative data were collected at the same time, measured and analyzed

separately, and integrated when the results were synthesized and discussed. Specifically, a qualitative research approach was concerned with the first and second research question, delving into the perceptions of how the school district provides and maintains data-driven decision making supports throughout the district and across schools, and of the strengths and weaknesses of the district data-driven decision making supports. A quantitative research approach was utilized for question three and four and each of their subparts, highlighting the perceptions that school and district personnel have on the data-driven decision making supports and the relationship that the data-driven decision making supports have with the data-driven decision making processes carried out by school and district personnel. Lastly, the results were examined together to address the last research question, depicting the general state of the data-driven decision making supports within the school district.

## Research Setting

The setting for the study was Dawn Peak Unified School District (DPUSD) in Northern California. DPUSD is a large school district in California. The school district is comprised of 30 elementary schools, 9 middle schools, 5 high schools, 2 adult education centers, and 18 alternative schools and programs. DPUSD has approximately 3,600 employees of which 1,600 are teachers, 100 are school administrators, 900 are school support staff, 40 are district administrators, and 960 are district staff. DPUSD serves approximately 32,000 students and has a racial/ethnic composition made of about 41.6% Hispanic, 33.9% White, 7.3% Asian, 4.8% Multiracial, 4.6% Filipino, 3.9 % African American, 0.8% Pacific Islander,

0.3% American Indian, and 2.8% not reporting their racial/ethnic identity. Students eligible to receive free/reduced lunch constitute about 41.7% of the district's student population.

## Population and Sample

Because the study was an examination of how one school district supports data-driven decision making, the population for the study included administrators and personnel relevant to the area of inquiry. Thus, the population included all the teachers and only relevant school and district administrators, school support staff, and district staff at DPUSD. All teachers were included as participants and purposeful sampling was used to select particular school and district administrators, school support staff, and district staff. Purposeful sampling allows for participants to be intentionally selected based on their pertinence to the concept being studied (Creswell & Plano Clark, 2007). School administrators included school principals and vice/assistant principals. Relevant school support staff included school counselors, instructional coaches, school therapists/pathologists, school psychologists, and librarians. Relevant district administrators included assistant superintendents, directors, coordinators, and managerial administrators from the following departments: (a) Assessment, Research & Evaluation, (b) English Learner Services, (c) Equity & Disproportionality, (d) Instructional Support, (e) School Support, (f) Special Education, (g) Student Services, and (h) Technology. And relevant district staff included program specialists, district instructional coaches, district teachers on special assignment, and other staff personnel from the same departments.

The rationale for selecting all teachers and these particular administrators and staff was that they actively utilize data-driven decision making toward educational practices.

Moreover, district data administrators (DDAs) were selected because they have particular knowledge and control over the provisions of data-driven decision making supports throughout the school district. Selected participants were identified through a review of site and district positions. To ensure proper coverage, the list of selected participants was discussed with primary district contacts.

## Data Collection

Both qualitative and quantitative data were collected to be analyzed for the study. As mentioned earlier, a concurrent triangulation mixed methods research design was employed (see Table 1). Thus, qualitative and quantitative data were collected concurrently and separately. Qualitative data were collected through individual semi-structured interviews with DDAs—district data administrators that oversee the organizational data-driven decision making supports that pertain to the district's data system infrastructure, capacity for data analysis, and data-use leadership. Quantitative data were collected through a district-wide online survey of school and district personnel—teachers, site administrators, other district administrators, school support staff, and district staff. Descriptions of the respondents are elaborated in further detail in Chapter 4.

The exploratory study was submitted for permission through two governing bodies prior to data collection: DPUSD's institutional review board for research studies and University of California, Santa Barbara Office of Research. Informed consent, confidentiality, and ethical considerations were dealt with the utmost care. Participants were provided information about the nature of the study, participation involvement, a risk statement, a guarantee of confidentiality and anonymity to participants, the right to cease participation at any time, a

copy of the consent form prior to participating in the study, and contact information if questions arise. This disclosure of information instilled trust, ensured integrity of the research, and avoided any misconduct and impropriety that could potentially impact the researcher, participants, and the school district (see Creswell, 2007). Moreover, all written participant information was stored in a locked file cabinet and electronic files were password protected and secured by the researcher.

## Instrumentation

### *Individual Interviews*

Qualitative data were collected through individual interviews with five DDAs in Spring 2017. These district data administrators were selected because of their knowledge and control over data-driven decision making supports throughout the school district. The researcher served as the interviewer for all five interviews.

The goal of the interviewing approach was to strike a balance between soliciting responses that address the desired content requirements, yet open-ended enough to bring out full, meaningful perspectives and thoughts of the individuals (see Brenner, 2006; Charmaz, 2002). Thus, a semi-structured interviewing protocol that centered on DPUSD's data-driven decision making supports was devised and used to conduct the interviews. More specifically, the protocol focused interview discussions on the district's provisions over data system infrastructure, analytic capacity, and data-use leadership. See Appendix B for the interview protocol. Semi-structured interviewing protocols enable the researcher to delve into a topic and probe for more information as to ensure the answers provided were thorough and complete enough to cover the correct material (Patton, 2002). Semi-

structured interviews also allow for detailed information to be collected in a conversational manner without varying in too many directions and being too restrictive (Harrell & Bradley, 2009).

The district's provisions over data system infrastructure, analytic capacity, and data-use leadership were the guiding concepts behind the development and the purpose of the interview questions. The interview questions were given to a doctoral committee for assessment and feedback regarding their suitability to the goals of the exploratory study. Changes were made based on recommendations from this committee.

In formulating the interview questions, the researcher acknowledged what Mishler (1986) described as the implications of how an interviewer states questions and how those questions will be reformulated by respondents and answered in accordance to the informants' reciprocal understanding of those questions. As a result, the researcher took careful consideration in crafting the interview questions and supported them with probing questions to ensure the topics of inquiry would be addressed. Questions were grouped by type of district support. The first questions of each group addressed the types of data-driven decision making supports that are provided throughout the district. These were fairly straightforward topics that are process-oriented questions. Thus, they served as an easy transition into the conversation over that topic area. Patton (2002) suggests beginning interview conversations with non-controversial questions and keeping them descriptive. In delving deeper, the succeeding questions in each group and the final questions in the protocol addressed the weaknesses and strengths of the district supports and inquired into

what can be improved. These questions were more opinion and values oriented, aiming to understand the cognitive and interpretative processes of the informants (Patton, 2002).

*Surveys*

Quantitative data were collected through a district-wide online survey of school and district personnel in Spring 2017. A survey design allows the researcher to study the numeric descriptions of trends, attitudes, behaviors, opinions, and other quantified variables of a sample that represents the population (Creswell, 2013). The survey used for the study targeted the population of teachers, district and site administrators, school support staff, and district staff that utilize data-driven decision making toward educational practices. The online survey was distributed through Google Forms, a free online survey software and questionnaire tool. See Appendix D for the online survey.

The survey items used for this investigation were derived and adapted from literature and research on the three organizational components supporting the use of data-driven decision making and the processes that represent the use of data-driven decision making (see Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Hamilton et al., 2009; Mandinach, 2012; Means et al., 2010; Wayman et al., 2007). See Appendix E for survey item sources. The first section of the survey consisted of items addressing the following three data-driven decision making supports:

(a) quality of the data system infrastructure (*e.g., The accessible computer systems provide me access to lots of data. The accessible computer systems allow me to retrieve data in a timely manner.*);

(b) extent of analytic capacity (*e.g., The district has adequately prepared me to use data*

*systems and data tools. The district has adequately prepared me to examine and analyze data.*); and

(c) data-use leadership—where vision and culture of data-use represented the establishment of data-use leadership (*e.g., There are clear goals in my school/department for using data to inform decision making and improve education practices. There are policies in place allowing for efficient usages of data systems and data information.*)

Items pertaining to the six data-driven decision making processes of collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing knowledge constituted the second section of the survey. See Appendix D and E.

The survey items focused on the perceptions of the three data-driven decision making supports provided by the district and of the six data-driven decision making processes carried out by the participants (school and district personnel). Items were assessed on a 6-point Likert scale with response categories of (1) *strongly disagree,* (2) *disagree,* (3) *somewhat disagree,* (4) *somewhat agree,* (5) *agree,* and (6) *strongly agree*. Participants were asked to identify their general position and school/department level, but that was all as to protect anonymity. Participants were not allowed to leave any items blank.

The researcher derived a bank of items from other works that were on the general area of inquiry (see Datnow et al., 2007; Dembosky et al., 2005; Gill et al., 2014; Hamilton et al., 2009; Mandinach, 2012; Means et al., 2010; Wayman et al., 2007) and adapted them for the purposes of the study. See Appendix E for survey item sources. The items adapted from other studies address data-use in schools, school districts, LEAs, and other school systems.

The survey items were reviewed by a doctoral committee and were solicited for feedback and input relative to the survey components, wording, and layout. Appropriate changes were made to the survey based on recommendations.

## Data Analysis

Although a mixed methods design was utilized for this exploratory study, qualitative and quantitative data were analyzed separately. The separate analyses addressed the first four research questions, and then the findings were used together to answer the last research question—providing a depiction of the general state of the data-driven decision making supports at DPUSD. Because the objective of the exploratory study was to examine the data-driven decision making supports provided by the district, the three areas of inquiry were concentrated on the following: (a) data system infrastructure, (b) data analysis support, and (c) leadership for data-use.

### *Qualitative Analysis*

Interview data were analyzed to determine the provisions of the district supports for data-driven decision making and their weaknesses and strengths. Interviews were transcribed verbatim with the main focus on the content of the verbal speeches. Informants' responses were color coded for identification purposes. A major challenge in reviewing the interview data was determining how to represent the informants' responses to accurately depict his/her views and perceptions about the topics of inquiry. As means of managing the data, transcripts were converted into charts with two parallel columns, one being the transcript itself and the other containing code summaries.

The "Code Summary" column served as an indexing tool and brief summaries were noted from the informants' comments. The code summaries captured the meaning and essence of the informants' comments and allowed the researcher to review the types of comments that were made. Cautionary measures were taken in paraphrasing the informants' comments and considerations were made in interpreting the meaning of the informants' comments as well. Code summaries were then categorized into corresponding themes. A data-driven approach was used to code summaries into themes. Data-driven coding uses codes or themes that emerge from the interviews (Kvale, 2009). Even though the development of the themes was guided by the main objectives of the study, the specificity of the themes emerged from the data. The categorization of summaries into themes was a vital part of the analysis, particularly for examining each of the informants' perceptions for each of the data-driven decision making supports. This analysis process enabled the researcher to organize the descriptions and perceptions of the informants and fashion it all together as meaningful discussions of the desired objectives of the study.

*Quantitative Analysis*

Quantitative data from the surveys were used to measure school and district personnel's perceptions of the data-driven decision making supports provided by the district and identify their relationship with how data-driven decision making processes are carried out. The perceptions of the data-driven decision making supports served as the predictor variables and the perceptions of the data-driven decision making processes were the outcome variables. The data-driven decision making supports include: Data System Infrastructure (DSI); Analytic Capacity (AC); and Data-Use Leadership (DL). The data-driven

decision making processes include: Collecting Data (CD); Organizing Data (OD); Analyzing Data (AD); Summarizing Information (SI); Synthesizing Information (SYI); and Prioritizing Knowledge (PK). Three types of analyses were used. All statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) software.

Prior to the main analyses, factor analyses were conducted on the survey items as to confirm and generate the variable groupings (e.g., analytic capacity, summarizing information) and to form the three variable scales to represent the different data-driven decision making supports and the six variable scales to represent the different data-driven decision making processes (a total of nine variables). Items related to the data-driven decision making supports and processes were analyzed for factor loadings. The factors deemed as representative of operationalizing the model concepts were based on eigenvalues exceeding 1.0. Scale reliabilities using Cronbach's alpha were conducted. All were .80 and above. Lists of variable scales, reliabilities, and scale items with rotated factor loadings are displayed in Appendix E. Each variable scale was constructed by taking the mean of all the item responses in the scale to measure each of the data-driven decision making supports and processes.

First, descriptive statistics were conducted to summarize information on the perceptions data of the personnel utilizing data-driven decision making. Means and variability were measured and displayed (see Chapter 4). These statistics were used to address the general perceptions that school and district personnel have on the data-driven decision making supports being provided by the district. Moreover, they also contributed to

the preliminary data screening that was conducted to identify and remedy any potential problems prior to the running of the next two analyses.

Second, an analysis of variance (ANOVA) was conducted to compare the mean scores of the data-driven decision making supports and of the data-driven decision making processes. These statistics determine whether there are any significant differences in mean scores across the three data-driven decision making supports and across the six data-driven decision making processes. The Tukey HSD test (using $\alpha = .05$) was also conducted to determine significant pairwise comparisons of group means. In addition to the preliminary data screening, a Levene test for homogeneity of variance was used to examine whether there were serious violations of the assumption of homogeneity of variance across groups.

Third, bivariate regression analyses were conducted on the survey data to determine how well the perceptions of data-driven decision making processes are predicted by the perceptions of the data-driven decision making supports. A bivariate regression analysis evaluates the strength of linear association between scores on two quantitative variables and provides an equation that predicts raw scores on one quantitative variable from raw scores on another quantitative variable (Warner, 2008). See Equation 1 for a general form where *Y* represents the outcome variable, *X* represents the predictor variable, *b* is the slope between the two variables, $b_0$ is the intercept when *Y* equals 0.

$$Y' = b_0 + bX \quad (1)$$

Assumptions for the regression analyses were assessed such that: (1) each score should be independent of other scores on each variable; (2) scores on both variables should be quantitative and normally distributed; (3) the two variables should be linearly related; (4)

the scores on both variables should have a bivariate normal distribution; and (5) the variance of scores on one variable should be the same at each level of the other variable (the homogeneity or homoscedasticity of variance assumption).

Because this part of the study sought to examine the relationship of data-driven decision making supports with corresponding data-driven decision making processes, six separate significance tests were performed to seek the relationship and predictability between each of the data-driven decision making processes (outcome variables) and their corresponding data-driven decision making support (predictor variables). More specifically, the tests assessed whether, separately, the collection of data and organization of data are significantly related to the data system infrastructure, the analysis of data and summarization of information are significantly related to the analytic capacity, and the synthesis of information and prioritization of knowledge are significantly related to the data-use leadership provided by the district. For the significant linear relationships discovered, an equation (see Equation 1) was reported to predict a scale mean score on the outcome variable from a scale mean score on the predictor variable. Furthermore, the bivariate correlation (*r*) measuring the linear relationship between the variables was reported, as well as the following: an assessment of the strength of relationship ($r^2$)—the percentage of variance in *Y* that was predictable from *X*; and a confidence interval (*CI*)—a range estimate of the slope prediction for the population.

# CHAPTER IV
# FINDINGS

The purpose of this exploratory study was to examine how one school district supports data-driven decision making within its central offices and throughout its schools. The approach to this study was to focus on the district's data-driven decision making supports (i.e., data system infrastructure, analytic capacity, and data-use leadership) from the perspective of the DDAs (district data administrators that oversee the provisions of data-driven decision making supports throughout the school district) and from the perspective of school and district personnel (teachers, school and district administrators, school support staff, and district staff that actively use data-driven decision making toward their educational practices). The study examined how DDAs seek to ensure quality data-driven decision making supports throughout the school district and what DDAs perceived as the current weaknesses and strengths of the district's data-driven decision making supports. The study also examined the quality of the data-driven decision making supports as perceived by school and district personnel and how the supports may relate to the processes of data-driven decision making carried out by school and district personnel (i.e., collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing information). By examining the data-driven decision making supports from the perspectives of the administration providing the supports and the personnel receiving the supports to utilize data-driven decision making, the study sought to capture the general state of the data-driven decision making supports within the district.

The study aimed to shed some light on the matters of improving provisions for using data to drive decision making so better educational decisions can be made.

An adapted continuous-improvement data-driven decision making framework with organizational supports was used to guide the study. See Figure 3 in Chapter 2. The study employed a concurrent mixed-methods research design. Focusing on the perspectives of the DDAs and school and district personnel, the researcher collected qualitative data from DDA participants in a semi-structured interview format and quantitative data from school and district personnel in a survey format. Qualitative and quantitative data were collected at the same time, measured and analyzed separately, and examined together when the results were synthesized and discussed.

This chapter describes the findings from the mixed methods research design used to examine the school district's data-driven decision making supports. The findings are presented in the following sections: qualitative findings, quantitative findings, and combined qualitative and quantitative findings. The research questions guiding the study are as follows:

<u>Qualitative Research Questions</u>

(1) How do district data administrators describe their efforts to ensure data-driven decision making supports are being provided throughout the school district?
(2) What are district data administrators' perceptions of the weaknesses and strengths of the data-driven decision making supports?

<u>Quantitative Research Questions</u>

(3) What are the general perceptions of the data-driven decision making supports by school and district personnel?
    a. Are there any significant differences in the general perceptions of the data-driven decision making supports by school and district personnel?
(4) What are the general perceptions of school and district personnel of how the data-driven decision making supports relate to their use of data-driven decision making?

a. Are school and district personnel's general perceptions of the data-driven decision making supports significant predictors of the data-driven decision making processes carried out by school and district personnel?

Combined Research Question

(5) What is the general state of the data-driven decision making supports within the district?

The first section is concerned with the first and second research questions, delving into how DDAs seek to ensure quality data-driven decision making supports throughout the school district and what DDAs perceived as the current weaknesses and strengths of the district's data-driven decision making supports. The next section addresses research questions three and four and each of their subparts, seeking to highlight the quality of the data-driven decision making supports as perceived by school and district personnel and how the supports may relate to the processes of data-driven decision making carried out by school and district personnel (i.e., collecting data, organizing data, analyzing data, summarizing information, synthesizing information, and prioritizing information). The third section examines the qualitative and quantitative findings together to depict the general state of the data-driven decision making supports within the district.

## Qualitative Findings

Qualitative data from interviews with five district data administrators (DDAs) were used to provide description and identify weaknesses and strengths characterizing the school district's implementation and maintenance of data-driven decision making supports within the district office and throughout its schools. Separate individual interviews were conducted with five DDAs who were deemed knowledgeable of and have control over the provisions of data-driven decision making supports in the school district. All interviews

Table 2

*District Data Administrator (DDA) Pseudonyms*

| *DDA* | *Gender* | *DDA Pseudonym Names* |
|---|---|---|
| DDA #1 | Female | DDA Carol |
| DDA #2 | Male | DDA George |
| DDA #3 | Female | DDA Anna |
| DDA #4 | Male | DDA Robert |
| DDA #5 | Male | DDA Mark |

were conducted using the protocol in Appendix B. The data-driven decision making supports that guided the interview discussions were Data System Infrastructure, Analytic Capacity, and Data-Use Leadership. DDAs were asked about the presence and provisions of each of the supports in their district and what they see as weaknesses and strengths about them. Extracted summaries from the interview transcripts were categorized into emerging themes and organized together to address the main points of inquiry. Table 2 displays the gender and pseudonyms for each of the DDAs interviewed.

*Data System Infrastructure*

In the discussions about data system infrastructure, the DDAs collectively identified very similar types of data systems that store and maintain the district's student data. They noted that the data systems are accessible via internet platforms on any desktops, laptops, or smart devices, and the main data systems the district provides are the following. DDA Mark described the main data systems in detail:

> *AERIES* serves as the district's student information system (SIS), where all types of student data are stored including demographics, enrollment, discipline, attendance, program, and test score data. *IO Education* serves as the district's student assessment system. This system allows for the creation, administration, scoring and reporting of intra-district assessments. *i-Ready* serves as a diagnostic and instruction system for Kindergarten through Grade 8 students and other students below grade level in mathematics and reading. *SEIS* serves as the district's information system for the storage of IEPs (individual education plans) and special education student records.

Other data systems providing resources and supplementing instruction and assessments are provided throughout the district as well, however they are not as widespread. DDA Robert noted, "These may only be used in certain schools or only target specific subjects or activities. For example, *Naviance* is our college and career readiness system just for high schools and *ALEKS* is a system just for our algebra students."

The data systems are housed and managed within different departments in the district. That is, the Technology and Information Systems department (TIS) manages most of the *AERIES* system; the Special Education department (SPED) handles *SEIS*; and the Assessment, Research and Evaluation department (ARE) manages the *IO Education* and *i-Ready* systems. TIS and ARE are mostly responsible for managing the other data systems provided by the district as well. The data systems are synced with one another to certain extents providing demographic and program information, rostering and enrollment information, and other data depending on the systems' features. DDA Anna described an example of the syncing between systems, "*IO Education* and *i-Ready* are integrated with *AERIES* such that students' demographic information, teacher rostering, and school enrollment are synced from *AERIES* into *IO Education* and *i-Ready*." DDA Mark noted, "Some of the syncing is automated and some have to be manually done by personnel."

Students, teachers, administrators, and staff have differing access to each of the systems depending on the needs of usage and access rights. This access is determined by the department managing the system. Thus, data are collected from a variety of sources while much of the organization and manipulation of the data are done through the data systems and their features. DDA Carol described the data collection process:

> Staff and administrators enter in much of the demographic, behavioral, attendance, program, and enrollment data in *AERIES*. Teachers also enter in behavioral, attendance, and program data into *AERIES* as well. They also enter in achievement and assessment data into both *IO Education* and *AERIES*. Students, through taking assessments, enter in data into *IO Education* and *i-Ready*. Achievement data such as state test data are downloaded and uploaded into *AERIES* and *IO Education.*

The most prevalent limitation that each DDA mentioned was the *challenges of working with multiple systems where multiple departments are involved*. DDA George noted, "[I]t can be really difficult at times, particularly when the communication between multiple departments is not clear." DDA Anna explained, "One department works on the front end and the other department works on the backend and making sure they're all very much aligned can be challenging." DDA Carol elaborated on how one department can impact another:

> [S]o there are a lot of setbacks when you're working with directors and personnel in other departments to make changes and the changes are talked about but never really changed…when you are trying to merge two systems together where one department oversees one system and you oversee another but you can't make the changes you need to have your system run the way you want…and your hands are tied behind your back because you are so dependent on the other system providing the right information.

Another weakness that emerged from the discussions was the *accuracy and consistency of the data*. Some DDAs mentioned that the data are not always accurate and there

requires monitoring to ensure the data are entered and collected correctly. DDA George explained:

> Because data [are] collected from numerous people from numerous sites, I think it takes a lot of reviewing and checking into making sure that it's done accurately and information from the school sites are often not as accurate as we would've hope so.

Since systems are integrated, the accuracy of the data in one system can affect the usage of the other. "The accuracy is all dependent on the data that [are] entered and in our case, our SIS needs to be accurate since many of our systems sync with it…and often that is where errors occur, " DDA Robert explained. Moreover, this can affect efficiency in regards of usage of systems and being able to work with the data effectively. DDA Anna noted, "[U]ltimately the inaccuracy of the data provides challenges in pulling and extracting data and making other softwares work." DDA Mark commented that it was not necessarily "inaccurate data" being entered but the "data just needed to be up-to-date."

The main strength the DDAs agreed upon was the progress they, as a district, have made in the last few years and the "*tremendous upward trajectory*" they foresee. They mentioned that existing data systems were updated, new data systems were introduced, and district-wide data, spanning all schools, are now being collected, organized, and reported regularly. DDA Mark commented, "We've come a long way in three years…there was an outdated and unused assessment system, there were sparse instructional systems, and there was barely any collection of district-wide test data at the central office."

Some DDAs addressed the strength of *having an Assessment, Research and Evaluation department (ARE)*. Recent organizational restructuring of ARE designated the department to be a primary source for data system support and overall data support for the district and

across schools. DDA Carol commented on ARE, "That's part of the infrastructure that I think it's new and it's very helpful." For the last three years, ARE has been allocated the responsibilities of managing a majority of the data systems in the district as well as providing certain support in other systems such as *AERIES*. DDA Robert elaborated on the support of ARE:

> I think the work they do in overseeing our data systems has been huge. They not only help with internal issues with the system, but they provide training and navigation support on how to use the systems…They also assist with running reports and organize data reports for schools to easily view and start utilizing the information.

*Analytic Capacity*

In the discussions about analytic capacity, all the DDAs initially referenced training and professional development as key activities in supporting personnel with analyzing, interpreting and summarizing data. They also added how important the training and professional development was for simply using the data systems and navigating through their features. This was especially the case for the newer data systems. "Since our implementation of *IO Education* and *i-Ready*, we have done a lot of training for teachers because it is a critical piece," DDA Anna noted. She continued, "We're still doing that training as we speak and we'll need to continue actually doing even more." DDA George explained the importance of getting users onto the data systems particularly when the data systems are new or they are new to them:

> Getting in front of the different groups that you need to speak to is vital. Basically, any platform to get in and do training will help. We want to get them on the systems as frequently as possible so they gain a level of comfort and familiarity. Once that happens, then we can take the next steps of utilizing the features to collect data, organize the data, pull up reports, analyze the data, and then get some useful information.

The DDAs collectively addressed training sessions and professional development days that the district offers during the school year. Training sessions on specific topics and features within a data system are provided by the corresponding department that mainly manages the overall system. These sessions are scheduled at the discretion of the department directors, but principals and administrators also request training sessions for their entire staff or for specific groups of users. The number of training sessions offered varies during the course of the school year; they can be frequently offered, only at the beginning of the school year, or on a needs basis. Nevertheless, training on professional development days is a frequent occurrence. Certain topics or classes are offered during breakout sessions on those professional development days. Different training sessions are offered for beginning or intermediate users. These training sessions range from basic navigation of data systems to creating reports and analyzing the results and information.

Another arena in which analytical support is provided occurs during principal and co-administrator meetings. Four objectives are served during these meetings: train and work with the administrators in utilizing data; have discussions over the use and results of data; maintain a consistency of working with data; and have the administrators bring their work with data back to their sites. DDA Carol explained, "[P]rincipal and co-admin meetings were great places to provide a way of analyzing and interpreting student data because we know the administrators have to understand how to do this." DDA George added about principal and co-administrator meetings, "[Data] discussions will now be on the agenda, we're going to look at data, we're going to look at data specifically, and we're going to dive down deep regularly." Furthermore, DDA Mark noted, "[T]he importance of having administrators

understand the data they're looking at is so they can take it back to their sites and work with their staff in this process."

The most common weakness that emerged from the DDAs was *time*. Frequently they commented on the scarcity of time—time to provide training and professional development, time to address necessary data topics with administrators, and time to analyze and interpret data so that important information can be drawn from the data. "Time is always very short so you have to get in front of the different groups you need to when you can and you have to do it in baby steps," described DDA Carol. Moreover, even with training, professional development, and scheduled meetings, time is still a factor. DDA Anna explains how time can be a major restriction:

> [W]e've trained as many individuals as we can and we get them to be able to collect, assess, organize and be able to analyze data but we don't get everybody so there's always this learning curve and time that we run up against…That is the nature of the beast and we can't always carve out the necessary time in order to do what we truly want to do and as effectively as possible.

Another limitation most of the DDAs discussed was the *lack of common data points and protocols*. Three years ago there were "zero common data" being collected at the central office or across schools, and there was no reference point to make any data comparisons. "Since, I've gotten here three years ago, that has been my job to establish a set of common data points that you can use to analyze and interpret student data," noted DDA Anna. She continued, "[I]t has taken us a while to put these in place and we're still far from having common assessments in terms of common standards taught and assessed, common indicators of performance, and common indicators of progress." Moreover, common data protocols such as guidelines and instructions have not been well established throughout the

district. DDA Robert explained that in addition to or as a result of having a lack of common data points, there have not been sufficient protocols available for analyzing data:

> We've been working on utilizing actual analysis protocols because people don't always know how to look at data and interpret it and so forth. When you train them, you got to be able to give them some, I call, takeaways…here's a rubric, your cheat sheet, whatever it is of how to really look at this data and do something with it.

The strengths the DDAs saw in the district's support of analytic capacity were similar to that of the strengths they saw in the district's support of data system infrastructure. However, they addressed different aspects of those strengths in relation to analytic capacity as opposed to data system infrastructure. The DDAs all remarked on growth they are making and the organizational restructuring of ARE as main strengths of the district's support of analytic capacity.

One of the strengths the DDAs discussed was the *current work and progress* they have made in the last three years. They noted that even though there was a lack of common data-use throughout the school district (more so three years ago compared to now), they have begun to build a foundation for data-use and establish the beginnings of a cycle of improvement—driven by data. Thus, in addition to the new data systems having been implemented, central data points, common assessments and standards, common indicators, and protocols are being instituted. Moreover, applicable trainings, professional development, and data discussions are becoming more commonplace as means of analytic support. DDA Mark commented on the continuous building of analytic capacity throughout the district. "[I]t is like a tree that the branches just keep spreading out and I think it's the only way we're going to get where it is universally adopted and people's capacity is where they can actually do it."

The other strength the DDAs discussed was the *establishment of ARE*. The department has not only become a source of managing and supporting the data systems, but a main source for training, data expertise, and data support. DDA Robert described the presence of ARE, "[H]aving a department now that is like this is what we do, we have the personnel to do it, we'll do the training, and we'll be who people call when they need help. It's great." The reorganization of ARE has provided the human resource of data support. The department has been building human capital that specializes in data-use and has begun to produce data reports and analytics for the district and schools. DDA Carol elaborated on the data support of ARE:

> I think we've taken a huge step by having a department like ARE help to be the one stop shop when it comes to data and then having that be the department that support school sites in trying to find it, trying to analyze it, and all of that, so I think that's a huge step.

*Data-Use Leadership*

In the discussions on data-use leadership, two primary areas about data-use were addressed: data vision and data culture. In discussing the vision for using data in the district, the DDAs also included the district's focus and priorities for using data. And in discussing the culture around using data, the DDAs included their thoughts on the environment surrounding using data as well.

Each of the DDAs described his/her perceptions of the vision for data-use in the district slightly different but they were all related to one another. They all collectively in one way or another referenced a vision of utilizing data to make decisions or basing their actions on data. Some DDAs also suggested making improvements depending on the outcomes of their decisions/actions, creating a "cycle of improvement." DDA Mark directly stated, "We

want our decisions at the district, school, and classroom level to be based on data." DDA Anna elaborated on a similar perception, "We want people to look at data on a regular basis and follow through with their actions rooted in what they find." DDA Carol perceived "of getting the district into a cycle of improvement and plan particular programs or identify certain strategies based on data, research, and information."

The DDAs described the focus and priorities of the district in using data to inform decision-making and educational practice as twofold. They noted that the district seeks to utilize data to decrease the opportunity gaps and to address students' needs. DDA Robert elaborated that "the district very specifically uses data to focus on our subgroups so that we really target those kids that are getting marginalized." And DDA Carol explained directly "that our priority in using data is to identify students' weaknesses and determine how to provide the support they need."

As for establishing a culture or even creating an environment that encourages data-use, the DDAs varied quite a bit in their responses. Some alluded to previous discussions about making data a regular and commonplace activity. "We consistently include in our meetings looking at data, talking about data, reporting on data, and drawing conclusions from it," described DDA George. Another response centered on setting expectations. DDA Robert noted, "[W]e will invest money and time into support and training, and we're going to [use data], you're going to [use data]." He continued, "[I]n a manner of respect, this is not an option because this is how we are going to do business and improve our practice." Lastly, some DDAs mentioned the relationship between accountability and data-use. The newer-age of accountability is rooted in the measures of multiple indicators and the DDAs stated

the importance of developing a mindset that these data-based indicators will be how they measure progress and improvement.

An agreed upon weakness of being able to promote a data-use focus and establish a culture around data-use was the *size and breadth of the district*. Because of the size of the district, "it takes time to get to everyone, it takes time to get everyone trained, and it takes time to simply get the opportunity to convey the objective of utilizing data." DDA Anna continued, "[W]e would get everyone moving in the direction we want but then if the ball's dropped, with such a big group, we have to slowly get the ball rolling again." Moreover, the level of expertise and skills are very broad throughout the district. And even though "the district's job is to accommodate for such a range of abilities, the vastness makes the work difficult," stated DDA George.

Another limitation has been the *negative mindset and pushback of personnel*. These are very common behaviors when reform occurs within an organization already set in its structures and routines. DDA Carol described how the changes in the last 3 years have been an adjustment. She stated, "There was definitely a negative mantra around pushing out these new data-use components." DDA Mark added, "This is all new and when anything is new to a certain extent, you will get some resistance."

Similar to the strengths of the previous two supports, many of the DDAs again addressed *how far they have come* as a district in implementing a data-use system. They commented on how in the last three years they have developed viable priorities for data-use and begun to establish a culture exuding a presence that the use of data will be ubiquitous. DDA George noted, "I do think slowly but surely most people are realizing the

benefits of using data and that it is an additional source of information for us to make decisions."

The other strength the DDAs discussed was the *reorganization of ARE*. The DDAs noted two benefits of having a department that can take the initiative of establishing a data-use system for driving decision making throughout the district. One is "by having ARE and what they do, we as a district, are conveying the message that this data-piece is important," quoted DDA Carol. The second is, as DDA Anna explained, "ARE has taken the initiative to model the data utilizing behaviors so it can resonate with our key people and then they can model it to their folks."

## Quantitative Findings

Quantitative data from the online survey provided average responses of how school and district personnel view the data-driven decision making supports and how those supports relate to the data-driven decision making processes being carried out. Prior to the main analyses for addressing these areas of inquiries, factor analyses were performed to confirm the variable groupings and to form the three variable scales to represent the different data-driven decision making supports, as well as six variable scales to represent the different data-driven decision making processes. Descriptive statistics were used to describe the average perceptions that school and district personnel have on the data-driven decision making supports and their use of the data-driven decision making processes as measured on the survey. ANOVA analyses were used to compare the mean scores of those average perceptions and determine if there were any significant differences between the reported perceptions of the data-driven decision making supports and between the reported

perceptions of the data-driven decision making processes. Correlation (as part of the regression) analyses were first used to examine the relationship between school and district personnel's general perceptions of the data-driven decision making supports and their general perceptions of the data-driven decision making processes that they carry out. Regression analyses were then used to determine if school and district personnel's general perceptions of the data-driven decision making supports are significant predictors of school and district personnel's general perceptions of the data-driven decision making processes they carry out.

The perceptions of the data-driven decision making supports served as the predictor variables and the perceptions of the data-driven decision making processes were the outcome variables. The data-driven decision making supports include: Data System Infrastructure (DSI); Analytic Capacity (AC); and Data-Use Leadership (DL). The data-driven decision making processes include: Collecting Data (CD); Organizing Data (OD); Analyzing Data (AD); Summarizing Information (SI); Synthesizing Information (SYI); and Prioritizing Knowledge (PK).

Of the approximately 2,000 school and district personnel that received the survey, 218 respondents completed the online survey (an 11% return). The response rate, while fairly low, is not surprising considering that the survey was distributed at the end of the academic year when there were other demands on participants' time. Of those 218 respondents, 151 (69%) were female and 67 (31%) were male. Five (2%) were from the district office, 101 (46%) were from the elementary school level, 67 (31%) were from the middle school level, and 45 (21%) were from the high school level. Twelve respondents (6%) identified their role

as being part of the district staff, 35 (16%) were school support staff; 32 (15%) were principals/vice principals; and 139 (64%) were teachers.

*Data-Driven Decision Making Variable Scales*

Nine variable scales measuring different areas of the data were formed from the survey items, three of which represent the data-driven decision making supports and six represent the data-driven decision making processes. As noted, Appendix E displays the variable scales, reliabilities, and scale items with rotated factor loadings. Based on the factor loadings and reliability scores (if the item was deleted), no items were removed from their corresponding scale. The mean score was taken from the items in each of the variable groupings to create the variable scales for analyses. The online survey items were set on a 6-point Likert scale with response categories scaled as follows: *1-strongly disagree; 2-disagree; 3-somewhat disagree; 4-somewhat agree; 5-agree; and 6-strongly agree*.

*Data-Driven Decision Making Supports*

Descriptive statistics were calculated to identify, first, school and district personnel's general perceptions of the data-driven decision making supports provided by the school district. Mean scores, standard deviations, and standard errors of the mean were included in the statistics and presented in Table 3. A means plot was provided for visual representation of the mean scores of the data-driven decision making supports in Figure 5.

School and district personnel reported general perceptions ($M$ = 4.24) that somewhat agree to agree with being provided quality data system infrastructure support from the district. Whereas, school and district personnel reported general perceptions ($M$ = 3.67)

Table 3

*Data-Driven Decision Making Support Variables' Means, Standard Deviations and Standard Errors of the Mean*

| Variable (N =218) | *Mean* | *SD* | *SEM* |
|---|---|---|---|
| Data System Infrastructure | 4.24 | 0.93 | 0.06 |
| Analytic Capacity | 3.67 | 1.06 | 0.07 |
| Data-Use Leadership | 3.79 | 1.12 | 0.08 |

that somewhat disagree to somewhat agree with being provided quality analytic capacity support from the district. Similarly, school and district personnel also reported general perceptions ($M$ = 3.79) that somewhat disagree to somewhat agree with being provided quality data-use leadership from the district.

ANOVA analyses were then used to determine if there were any significant differences in the reported mean scores between the data-driven decision making supports. Pairwise comparisons were used to localize the significant differences, where differences were considered statistically significant at a threshold of $p < .05$. Preliminary examination of histograms of the scores for the data-driven decision making supports indicated that the scores were approximately normally distributed with no extreme outliers. The Levene test for homogeneity of variance was used to examine whether there were serious violations of the assumption of homogeneity of variance across groups, but no significant violation was found: $F(2, 651) = 1.492$, $p = .256$.

The overall $F$ for the one-way ANOVA was statistically significant, $F(2, 651) = 17.78$, $p < .001$. This corresponded to an effect size of $\eta^2 = .05$; that is, only about 5% of the variance in reported scores was predictable from the differing data-driven decision making support.

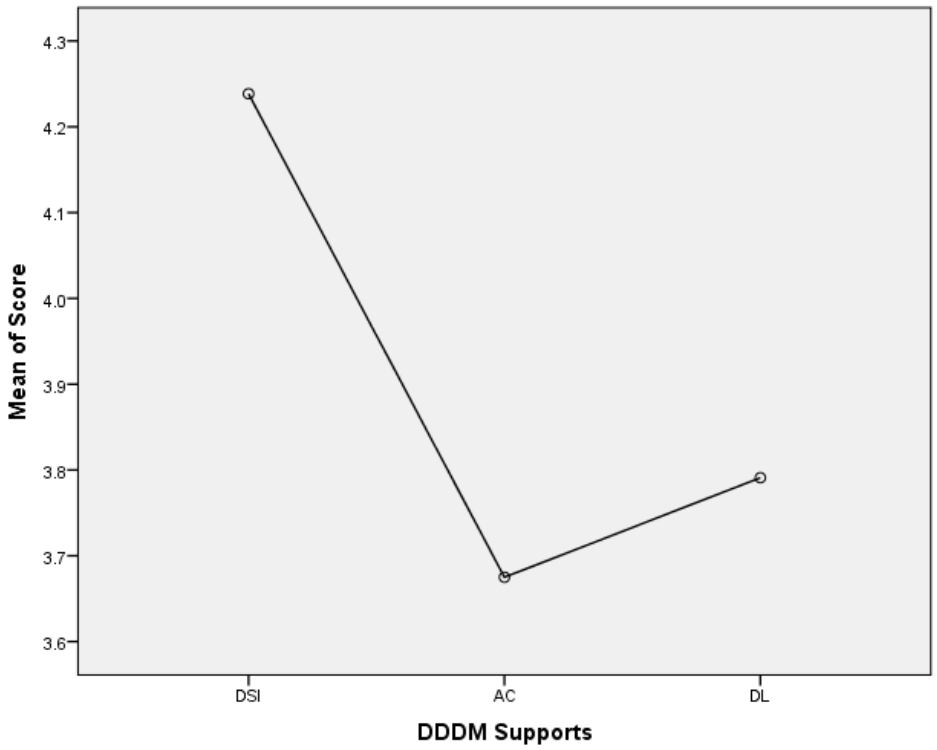


*Figure 5*. Means Plot by Data-Driven Decision Making (DDDM) Support.

This is not a large effect and not unexpected. Pairwise comparisons using the Tukey HSD test (at α = .05) revealed that scores for Data System Infrastructure (*M* = 4.24) were *significantly higher* than scores for Analytic Capacity (*M* = .367) and for Data-Use Leadership (*M* =3.79). No significant difference, by contrast, was found between scores for Analytic Capacity and Data-Use Leadership. This difference is reflected in the means plot in Figure 5 where there is a drop in mean scores between Data System Infrastructure compared to either Analytic Capacity or Data-Use Leadership.

These findings indicate that school and district personnel, on average, felt they were somewhat being provided the support of a quality data system infrastructure whereas they felt, to a lesser extent, that they were somewhat not being provided quality analytic support and data-use leadership. School and district personnel also reported a significantly

greater level of data system infrastructure support compared to the other data-driven decision making supports. These findings suggest that school and district personnel perceive the district office as more adequately providing such supports as computer and data systems and technology for collecting and organizing data as opposed to such supports that provide necessary data analysis and interpretation including opportunities to improve analysis skills, time to examine and use data, and opportunities for collaboration and discussion. Furthermore, personnel also perceive there to be less supports stemming from the establishment of goals and policies for data-use as well as the presence of structures and plans in place that provide direction and open lines of communication for sharing data information—compared to computer and data systems and technology for collecting and organizing data.

*Data-Driven Decision Making Processes*

Descriptive statistics were used to reveal school and district personnel's general perceptions of their use of data-driven decision making and its processes. Mean scores, standard deviations, and standard errors of the mean were included in the statistics and presented in Table 4. A means plot was provided for visual representation of the mean scores of the data-driven decision making processes in Figure 6. School and district personnel reported general perceptions (mean scores between 4 and 5) that somewhat agree to agree with using each of the data-driven decision making processes.

ANOVA analyses were used to determine if there were any significant differences in the reported mean scores between the data-driven decision making processes. Pairwise comparisons were used to localize the significant differences, where differences were

Table 4

*Data-Driven Decision Making Processes Variables' Means, Standard Deviations and Standard Errors of the Mean*

| Variable (N =218) | *Mean* | *SD* | *SEM* |
|---|---|---|---|
| Collecting Data | 4.67 | 0.92 | 0.06 |
| Organizing Data | 4.41 | 1.04 | 0.07 |
| Analyzing Data | 4.31 | 0.87 | 0.05 |
| Summarizing Information | 4.26 | 0.92 | 0.06 |
| Synthesizing Information | 4.24 | 0.96 | 0.06 |
| Prioritizing Knowledge | 4.42 | 0.91 | 0.03 |

considered statistically significant at a threshold of $p < .05$. Preliminary examination of histograms of the scores for the data-driven decision making processes indicated that the scores were approximately normally distributed with no extreme outliers. The Levene test for homogeneity of variance was used to examine whether there were serious violations of the assumption of homogeneity of variance across groups, but no significant violation was found: $F(2, 1302) = 1.348$, $p = .241$.

The overall $F$ for the one-way ANOVA was statistically significant, $F(2, 1302) = 6.08$, $p < .001$. This corresponded to an effect size of $\eta^2 = .02$; that is, only about 2% of the variance in reported scores was predictable from the differing data-driven decision making processes. This is not a large effect and not unexpected. Pairwise comparisons using the Tukey HSD test (at $\alpha = .05$) revealed that only scores for Collecting Data were significantly higher than scores for three other data-driven decision making processes—Analyzing Data,

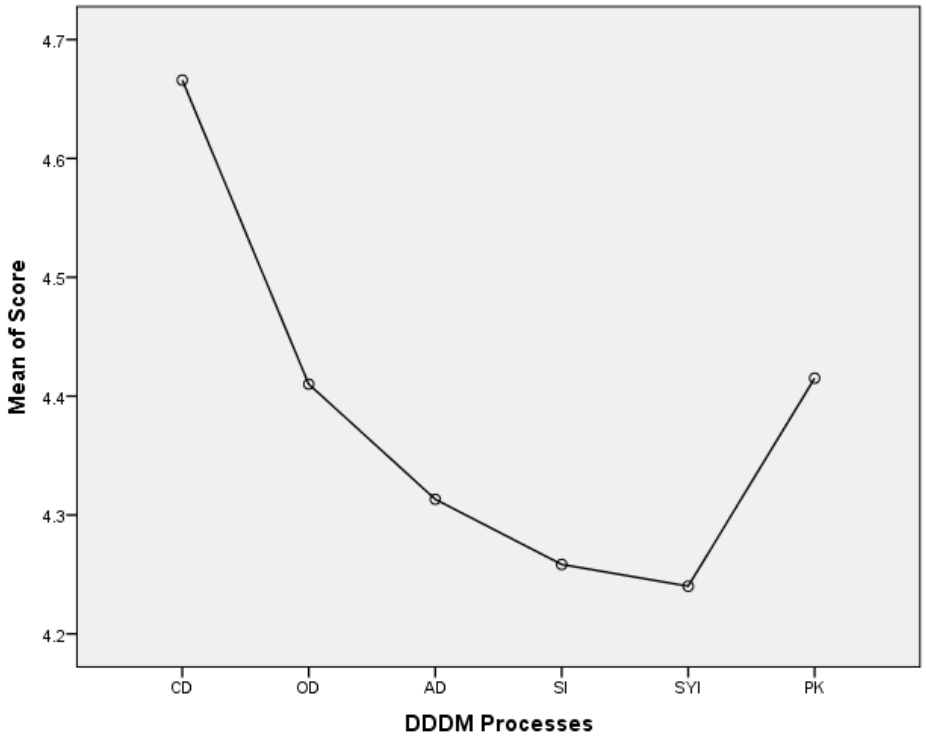


*Figure 6*. Means Plot by Data-Driven Decision Making (DDDM) Processes.

Summarizing Information, and Synthesizing Information. No significant differences were found between other scores for the data-driven decision making processes. This difference is reflected in the means plot in Figure 6 where there is a drop in mean scores of the succeeding data-driven decision making processes after the data-driven decision making processes of Collecting Data.

These findings indicate that school and district personnel utilize data-driven decision making, overall, to a moderate degree. Nevertheless, the findings do show that school and district personnel are generally perceived as carrying out each succeeding data-driven decision making processes to a lesser degree than the previous one, except for the data-driven decision making processes of Prioritizing Knowledge. Further, school and district personnel carried out the data-driven decision making processes of Collecting Data to the

greatest degree, more specifically to a significantly greater degree than data-driven decision making processes of Analyzing Data, Summarizing Information, and Synthesizing Information.

*Data-Driven Decision Making Supports and Processes Relationship*

Regression analyses were used to examine how the data-driven decision making supports relate to the data-driven decision making processes being carried out by school and district personnel. Six separate significance tests were performed to seek the relationship and predictability between each of the data-driven decision making processes (outcome variables) and their corresponding data-driven decision making support (predictor variables). Preliminary data screening and examination of the descriptive statistics indicated that the scores on all variables were reasonably normally distributed. A scatter plot indicated that the relations between all outcome and predicator variable combinations were positive and reasonably linear and there were no bivariate outliers.

*Data System Infrastructure and Collecting Data*. The correlation between Data System Infrastructure scores and Collecting Data scores was statistically significant, $r(216) = .37$, $p < .001$. The regression equation for predicting Collecting Data scores from Data System Infrastructure scores was found to be $Y' = 3.11 + 0.37 \times X$. The $r^2$ for this equation was .13; that is, 13% of the variance in scores for Collecting Data was predictable from the scores for Data System Infrastructure. This is a moderate relationship. The 95% CI for the slope to predict Collecting Data scores from Data System Infrastructure scores ranged from 0.24 to 0.49; thus, for each 1 point increase in Data System Infrastructure score, the predicted Collecting Data score increased by about a quarter of a point to half a point. The findings

indicate that the data-driven decision making support of Data System Infrastructure has a moderate predictive relationship with the data-driven decision making processes of Collecting Data.

*Data System Infrastructure and Organizing* Data. The correlation between Data System Infrastructure scores and Organizing Data scores was statistically significant, $r(216) = .33$, $p < .001$. The regression equation for predicting Organizing Data scores from Data System Infrastructure scores was found to be $Y' = 2.86 + 0.37 \times X$. The $r^2$ for this equation was .11; that is, 11% of the variance in scores for Organizing Data was predictable from the scores for Data System Infrastructure. This is a moderate relationship. The 95% CI for the slope to predict Organizing Data scores from Data System Infrastructure scores ranged from 0.22 to 0.51; thus, for each 1 point increase in Data System Infrastructure score, the predicted Organizing Data score increased by about a quarter of a point to half a point. The findings indicate that the data-driven decision making support of Data System Infrastructure has a moderate predictive relationship with the data-driven decision making processes of Organizing Data.

*Analytic Capacity and Analyzing Data*. The correlation between Analytic Capacity scores and Analyzing Data scores was statistically significant, $r(216) = .58$, $p < .001$. The regression equation for predicting Analyzing Data scores from Analytic Capacity scores was found to be $Y' = 2.56 + 0.48 \times X$. The $r^2$ for this equation was .34; that is, 34% of the variance in scores for Analyzing Data was predictable from the scores for Analytic Capacity. This is a fairly strong relationship. The 95% CI for the slope to predict Analyzing Data scores from Analytic Capacity scores ranged from 0.39 to 0.57; thus, for each 1 point increase in Analytic

Capacity score, the predicted Analyzing Data score increased by about half a point. The findings indicate that the data-driven decision making support of Analytic Capacity has a fairly strong predictive relationship with the data-driven decision making processes of Analyzing Data.

*Analytic Capacity and Summarizing* Information. The correlation between Analytic Capacity scores and Summarizing Information scores was statistically significant, $r(216) = .57$, $p < .001$. The regression equation for predicting Summarizing Information scores from Analytic Capacity scores was found to be $Y' = 2.43 + 0.50 \times X$. The $r^2$ for this equation was .33; that is, 33% of the variance in scores for Summarizing Information was predictable from the scores for Analytic Capacity. This is a fairly strong relationship. The 95% CI for the slope to predict Summarizing Information scores from Analytic Capacity scores ranged from 0.40 to 0.59; thus, for each 1 point increase in Analytic Capacity score, the predicted Summarizing Information score increased by about half a point. The findings indicate that the data-driven decision making support of Analytic Capacity has a fairly strong predictive relationship with the data-driven decision making processes of Summarizing Information.

*Data-Use Leadership and Synthesizing Information*. The correlation between Data-Use Leadership scores and Synthesizing Information scores was statistically significant, $r(216) = .61$, $p < .001$. The regression equation for predicting Synthesizing Information scores from Data-Use Leadership scores was found to be $Y' = 2.23 + 0.52 \times X$. The $r^2$ for this equation was .38; that is, 38% of the variance in scores for Synthesizing Information was predictable from the scores for Data-Use Leadership. This is a fairly strong relationship. The 95% CI for the slope to predict Synthesizing Information scores from Data-Use Leadership scores

ranged from 0.43 to 0.61; thus, for each 1 point increase in Data-Use Leadership score, the predicted Synthesizing Information score increased by about half a point. The findings indicate that the data-driven decision making support of Data-Use Leadership has a fairly strong predictive relationship with the data-driven decision making processes of Synthesizing Information.

*Data-Use Leadership and Prioritizing* Knowledge. The correlation between Data-Use Leadership scores and Prioritizing Knowledge scores was statistically significant, $r(216) = .59$, $p < .001$. The regression equation for predicting Prioritizing Information scores from Data-Use Leadership scores was found to be $Y' = 2.60 + 0.48 \times X$. The $r^2$ for this equation was .35; that is, 35% of the variance in scores for Prioritizing Information was predictable from the scores for Data-Use Leadership. This is a fairly strong relationship. The 95% CI for the slope to predict Prioritizing Knowledge scores from Data-Use Leadership scores ranged from 0.39 to 0.57; thus, for each 1 point increase in Data-Use Leadership score, the predicted Prioritizing Knowledge score increased by about half a point. The findings indicate that the data-driven decision making support of Data-Use Leadership has a fairly strong predictive relationship with the data-driven decision making processes of Prioritizing Knowledge.

## Combination of Qualitative and Quantitative Findings

The findings from both the qualitative and quantitative data were used together to depict the general state of the data-driven decision making supports in the school district. This examination sought to corroborate how the DDAs described the data-driven decision making supports and to what extent were those data-driven decision making supports

available to school and district personnel for using the data-driven decision making processes. Interestingly the qualitative and quantitative findings mostly complemented one another and appeared to fit together in portraying the general state of the data-driven decision making supports in the school district.

*Data System Infrastructure*

The results from the interviews with DDAs provided an in-depth description of the district's available data systems and how they are managed and supported through specific departments. Explanation was also provided of ARE restructuring efforts over a three year period in becoming a primary source for data system support and overall data-use support. Moreover, existing data systems have been updated, new data systems have been introduced, and district-wide data, spanning all schools, are being collected, organized and reported regularly.

The general perceptions of school and district personnel from the survey reflected these descriptions of the state of the district's provisions over data system infrastructure. School and district personnel perceived these provisions to be moderately adequate for supporting the use of data-driven decision making. They also reported the support of data system infrastructure to be at a significantly greater level than the other two data-driven decision making supports.

Nevertheless, even though data system infrastructure was regarded as somewhat sufficient, the overall responses toward the district presence of a high quality data system infrastructure were not definitive. Possibly, circumstances the DDAs brought up that may have been affecting the quality of the data system infrastructure support are the challenges

in working with multiple departments involved with the use of any of the data systems, and concurrently the accuracy and consistency of data being entered into the systems. Furthermore, the DDAs notably referenced that enhancing or implementing new infrastructure for a data-driven decision making system takes time to establish.

*Analytic Capacity*

The DDAs referenced training and professional development as key components of supporting analytic capacity. They also noted having discussions over the use and the results of data, and maintaining a consistency of working with data builds analytic capacity. The arenas that the district offers training and professional development are through scheduled training sessions, on designated professional development days, and in principal and co-administrator meetings. In describing the training and professional development, the DDAs discussed much of the prerequisite skills of getting familiar with the systems, navigating the features, and pulling reports. They alluded to intermediary skills of analyzing data, interpreting results, and summarizing important information, but more so implied that these were the next steps in training and professional development and they were only beginning to occur.

Thus, the responses of school and district personnel reflected these descriptions the DDAs gave on the state of the district's provisions over analytic capacity. Since analytic capacity was to support analysis, interpretation, and summarization of data, school and district personnel perceived these provisions to be moderately inadequate for supporting the use of data-driven decision making. They also reported the support of analytic capacity to be the least supported amongst the data-driven decision making supports.

This lack of sufficiency in analytic capacity support, however, can be attributed to the novelty of data-use and data systems in the district and the major factor that DDAs discussed—time. The DDAs noted that time is always scarce and given the need to acquire beginning skills before intermediary skills, such as analysis and interpretation, there is limited time for the required training. The DDAs also noted the lack of time to meet with different groups to have data discussions and make data analysis commonplace. In all, the DDAs explained that establishing adequate data-driven decision making supports is a work in progress. Furthermore, as noted, the DDAs mentioned the lack of common data points and indicators to make data comparisons for progress and performance, and common data protocols to guide users in looking at data, analyzing and interpreting data, and using the results properly. These factors may also contribute to the current state of the district's provisions over analytic capacity.

*Data-Use Leadership*

The DDAs discussed the overall vision for data-use in the district as making decisions based on data and creating a cycle of improvement. They also noted the two primary priorities for using data are to decrease the opportunity gaps and to address students' needs. As for establishing a culture and creating an environment that encourages the district's vision and priorities, the DDAs discussed a variety of means to do so. Some of these included emphasizing the importance of using data, having expectations for it, and keeping the topic on the agenda. Nevertheless, promoting a district-wide vision and establishing a culture around that vision has taken time, resources, and continuous work.

Furthermore, the DDAs consistently stated that they are far from where they want to be in regards to having a viable data-driven decision making system in place.

The survey responses of school and district personnel reflected these descriptions the DDAs provided on the state of the district's provisions over data-use leadership. School and district personnel reported these provisions to be moderately inadequate for supporting the use of data-driven decision making. They also reported the support of data-use leadership to be on a slightly greater (albeit not statistically significant) level than that of the data-driven decision making support of analytic capacity and not nearly on the level of data system infrastructure.

This lack of sufficiency in data-use leadership support may have been due to the size and breadth of the district. The DDAs described the mere size of the school district and the broad range of data expertise and skills can limit what the district leadership is attempting to do with data-use. Furthermore, because the implementation of data-driven decision making supports and a data-driven decision making system is practically new and still developing, the priorities of the personnel are not yet in line with the district leadership.

# CHAPTER V
# DISCUSSION

This chapter begins with a synthesis and discussion of the findings in light of the study's research questions, literature review and conceptual framework. The second section addresses some implications for action and areas for future research. The last section provides some concluding remarks.

## Main Conclusions of the Research

Overall the findings from the study are fairly consistent with the research and literature on data-use and data-driven decision making in school districts. The section will discuss these matters further including the emergent patterns from the findings, interpretation of the findings, and correspondence with the research and literature. The section will also provide explanations for any developments in the findings. The section is presented in the following parts: Data System Infrastructure, Analytic Capacity, Data-Use Leadership and Data-Driven Decision Making Processes.

### *Data System Infrastructure*

In the discussions on data system infrastructure, the DDAs referenced numerous data systems that the district provides for personnel to use. The primary data systems mentioned include the following: a student information system containing demographics, enrollment, discipline, attendance, program, and test score data; a special education information system containing IEPs (individual education plans) and special education data; an achievement and assessment system allowing for the creation, administration, scoring

and reporting of intra-district assessments; and a diagnostic and instruction system for Kindergarten through Grade 8 students and other students below grade level in mathematics and reading. These systems are designed for everyday personnel to use, are capable of collecting and maintaining all types of student data, have the capacity to organize multiple types of data into reports for retrieval, and are synced with one another to provide more integration of data. These findings are consistent with the literature suggesting that data systems and tools (to be beneficial toward data-use) need to be of high quality and flexible enough to provide for data collection mechanisms (Mandinach et al., 2006), incorporate and organize multiple types of data, (Hamilton et al., 2009) and allow for usability by personnel (Datnow et al., 2007).

Because school and district personnel perceived the data system infrastructure to be only moderately adequate, there still appears to be reservations about the support they are receiving and some insufficiencies in terms of data system infrastructure. Confirming this insufficiency, the DDAs noted that DPUSD is lacking some consistency and accuracy of data in their systems. The research and literature state that quality data systems need to be able to produce data in an accurate and timely manner (Means et al., 2010). Contributed by the challenges of working with multiple systems where multiple departments are involved and that data are collected from numerous personnel from numerous school sites, the chances for inaccurate or out-of-date data to be collected can be a frequent occurrence. Therefore, this data inconsistency can impact the quality of the data system infrastructure and the perceptions of school and district personnel.

*Analytic Capacity*

In the discussions on analytic capacity, the DDAs noted training and professional development as keys to building personnel's analytic abilities and skills. The district offers many arenas for training and professional development including scheduled sessions, sessions at the behest of principals and administrators, planned professional development days, and allocated time during meetings. The DDAs also mentioned the facilitations of data discussions and collaboration time. This practice is supported in the research and literature such that high-performing school systems that used data effectively had invested in professional development, provided support for staff in how to use data, engaged in data discussions, provided collaboration time, and connected educators to share data and improvement strategies (Datnow et al., 2007; Dembosky et al., 2005; Hamilton et al., 2009).

Nevertheless, although the district provides opportunities for training, professional development, and meetings—which was stressed in the research and literature for supporting analytic capacity—personnel perceived rather inadequate levels of this particular support. This might be attributed to three factors: (1) the current phase of DPUSD's implementation process; (2) the type of training received and professional development provided; and (3) time. The DDAs all noted that nothing data-related was in place three years ago. There were limited available data systems, few training and discussion opportunities, and no common data points for comparisons or data protocols for analysis and interpretation. The process for creating a data-driven decision making system throughout the district has only been in the works for less than three years. Because of this, much of the initial training and professional development have not focused on analyzing

and interpreting data, but rather on data system basics such as navigation of the data systems, collection of data, and organization and retrieval of data reports. The DDAs noted the mere importance of just getting users onto the systems and familiar with the features. Furthermore, because time is such a factor, the DDAs mentioned how difficult it is to provide the analytic support they desire. As one DDA stated, "Basically, any platform to get in and do training will help." The DDAs all addressed how scarce time is for providing training and professional development, and for working with personnel in analyzing and interpreting data. This is also noted in prior research and literature, such that a large impediment to implementing data-driven decision making is allocating sufficient time for not only building capacity, but for analyzing and interpreting data (Dembosky et al., 2005).

*Data-Use Leadership*

In the discussions on data-use leadership, the DDAs expressed the district's vision for data-use was to make decisions based on data and create a cycle of improvement. They also stated that the district's focus and priorities in using data are to decrease the opportunity gaps and to address students' needs. The leadership at DPUSD, as Wohlstetter and colleagues (2008) would describe, is setting the groundwork and direction for data-driven decision making. The leadership shapes the strategic thinking and engagement of inquiry behind the process (Knapp et al., 2007).

To foster a culture of data-use and create an environment encouraging personnel to use data, the DDAs mentioned setting expectations and accountability for utilizing data. They discussed making data-use a regular and commonplace activity where looking at data, reporting on data, talking about data, and making meaning of it would be a regular

occurrence in meetings and collaboration time. They also noted that accountability is to be tied into data-based indicators of progress and improvement. Supported by research and literature, these are useful strategies that DPUSD are implementing. Datnow et al. (2007) noted the importance of creating explicit expectations and norms to establish a culture comfortable with data-use. Moreover, Mason (2002) referenced cultivating a mindset and desire to use data would result in commitment to the process.

Similar to analytic capacity (but not quite as low), school and district personnel perceived moderately inadequate levels of data-use leadership. Much of this can be attributed to two major factors. Similar to analytic capacity (again), the current state of implementation that DPUSD is in can impact the mindset and behaviors of the district's personnel. Secondly, the size and breadth of the district can make leadership more challenging. As stated previously DPUSD is still in the process of building a viable data-driven decision making system, and being able to get all members to buy-in to a system can be restricted when the district is large, personnel vary in skills of expertise, and priorities are not aligned.

The district is obviously in the early stages of having a working data-driven decision making system. The DDAs all expressed the progress they made in three years and foresee the growth to continue. In this short time, the district has implemented new data systems, arranged scheduled trainings, professional development and data discussions, and begun to establish a culture and environment promoting the district's vision and priorities. The district has also re-structured the Assessment, Research, and Evaluation department (ARE) as noted by several interviewees; ARE was identified as one of the primary sources for

overall data support—whether it be support for data system use, collecting and organizing data charts, running reports, providing trainings, or analyzing and interpreting data. ARE has become the human resource for data-related needs and the model for utilizing data. Furthermore, by having the organizational component of ARE, the message that data-use is important is being conveyed throughout the district.

*Data-Driven Decision Making Processes*

In examining the data-driven decision making supports and the corresponding data-driven decision making processes, all six relationships were found to be positively significant, with most having fairly strong effect sizes. Even the pattern of the means of the data-driven decision making supports were similar to the pattern of the means of the data-driven decision making processes, displaying personnel's perceptions of the data-driven decision making supports to be reflective of the data-driven decision making processes that they mostly carry out. This supports what Gill et al. (2014) suggested that organizational supports are necessary in data-driven decision making and can directly affect processes within a data-driven decision making system. In having all relationships between data-driven decision making supports and corresponding data-driven decision making processes be significant, this highlights the importance of having quality data-driven decision making supports in place so personnel can carry out data-driven decision making processes more effectively.

## Implications for Practice

An emerging body of research and literature discussed in this study's review suggested the need for quality organizational supports in order for data-driven decision making to be used properly. A growing number of studies in the last 15 years demonstrated the increasing attention around data-use in school districts. The limited number of studies investigating outcomes of implementation strategies for a data-driven decision making system exemplify the need for greater understanding of how particular data-driven decision making supports (i.e., data system infrastructure, analytic capacity, and data-use leadership) are implemented by an organization and received by personnel, and how those supports relate to the data-driven decision making processes carried out by that personnel (i.e., the use of data-driven decision making to transform data into actionable decisions). Though still in the early phases, the district in this study has been on a steady upward trajectory of implementing a viable data-driven decision making system. The findings indicated the district in this study has begun to strategically implement data-driven decision making supports that personnel need to be able to use data-driven decision making, and the extent of those data-driven decision making supports are reflective of the use of data-driven decision making by personnel.

The findings identified several predictive relationships between data-driven decision making supports and data-driven decision making processes. This finding suggests that the quality of data-driven decision making supports districts provide enhance the extent to which personnel will be able to use data-driven decision making in their everyday practice and overall work. Therefore, districts looking to implement a data-driven decision making

system might take into account the necessity of quality data-driven decision making supports, that is, data system infrastructure, analytic capacity, and data-use leadership.

As a result of the findings and reaffirming research and literature, districts seeking to implement or improve their data-driven decision making supports may want to take into consideration the following. The support of data system infrastructure should consist of data systems and tools that are of high quality and flexible enough to collect data efficiently, incorporate and organize multiple types of data, and produce data in an accurate and timely manner. The support of analytic capacity should consist of quality training and professional development, as well as the facilitation of data discussions and collaboration time. Lastly, the support of data-use leadership should consist of instilling a purposeful vision and priorities for data-use that align with personnel. Moreover, districts need to set explicit expectations and norms on using data, and they need to motivate the desire and commitment to use data regularly.

The findings of the study also highlight notable considerations toward implementation phase, district size and breadth, organizational structures, and time. Depending on the stage of implementation, districts' data-driven decision making supports will be affected accordingly. DPUSD was a prime example of a district that was still a work in progress of implementing a data-driven decision making system. Prior to being able to support analysis and interpretation of data, DPUSD had to support basic skills and navigation first. The size of the district and breadth of the skills and abilities will require more time and versatility in providing support as well. Organizational structures such as the involvement of multiple departments can result in more challenges and impediments. However, organizational

structures designed to provide direct data support can be highly beneficial. Lastly, time is scarce and implementing any type of system will take time.

## Limitations of the Study

The study was conducted in a single school district and was restricted to data collection from the administrators and personnel within the central district office and schools. This restriction limits the extent and generalizability of the findings that may be applicable to other school districts. Additionally, because the results of the study reflect only the perceptions of the participants in the study, the results do not reflect the sum of all the agents, thus limiting generalizations to be applied to all staff throughout the district and across schools.

Further, the study presents only a snapshot in time of the status of data-driven decision making in the district under study. Because data-driven decision making in school districts is still a growing field of study, it may experience potential rapid changes upon new findings. Therefore, the conclusions reached may only be applicable for an incremental period and become less accurate as districts' experience with the data-driven decision making system grows and evolves. In addition, the district under study was in a particular phase in the implementation of a data-driven decision making system. Thus, the conclusions may be less pertinent to districts in different phases of the implementation process.

Another limitation (and strength in some circumstances) was that the researcher does possess a working and professional relationship with the staff at the district under study. This status was helpful in achieving access to the district and participants. Nevertheless, the

researcher made consistent efforts to limit bias and influence on the perceptions of participants (see Merriam, 2009). These limitations have implications for further research.

## Implications for Research

Future research exists in expanding beyond one school district. Explorations of how other school districts support data-driven decision making (or general data-use) will provide a better understanding of the implementation and maintaining of a data-driven decision making system. Also varying sizes and contexts of school districts will possibly provide informative results.

Further, the study only began to explore the adapted framework with organizational supports (see Gill et al., 2014; Mandinach et al., 2006). Future research could be constructed to examine the relationships of the supports and processes within this framework and create a working model. This will provide researchers and practitioners a better understanding of not only the relationships between supports and processes, but the relationships amongst supports and processes themselves. By modeling these relationships, a clearer picture of the entire data-driven decision making system within a school district can be captured.

To have a more in depth understanding of the data-driven decision making supports, a study could be constructed to investigate the specificities of each of the data-driven decision making supports. By delving into these aspects, vital information may reveal the keys to providing quality data-driven decision making supports. Moreover, educators and administrators may find practical examples more useful for their work.

Future research may also investigate into outcome effects such as instructional practices and student achievement. This study focused on the implementation process by concentrating on the data-driven decision making supports and the use of data-driven decision making. By including instructional practices and student achievement, examinations can be conducted on how data-driven decision making supports and/or data-driven decision making processes impact instructional practices and student achievement. Intermediate effects of data-driven decision making processes can also be investigated.

## Conclusion

District leaders face enormous challenges in improving educational practices and student outcomes. Add in this day-in-age in education of rigorous academic standards, high-stakes testing and heightened accountability, the task becomes even more pressurized. Data-driven decision making has become an available resource given the capacity to handle and maintain endless amounts of data. Data-driven decision making provides district leaders a concrete and evidenced approach to evaluate progress and performance, and to determine the best courses of action to make improvements. In addition to intuition and experience, data-driven decision making provides another perspective and lens to view situations. Nevertheless, with all the benefits that data-driven decision making can provide, district leaders have to understand the complexities in implementing and maintaining such a system. Therefore, how the data-driven decision making system is supported can make the difference and can determine how effective the system operates.

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**APPENDIX A**
**Information and Agreement of Consent to be Interviewed**

University of California, Santa Barbara
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS
An Exploratory Study of Data-Driven Decision Making Supports
in a Northern California School District
Principal Investigator: Raymond Tjen-A-Looi
Educational Leadership and Organizations

Consent Form

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

**Purpose:** The primary purpose of the study is to investigate how the school district supports data-driven decision making within its central office and across schools. To do so, this exploratory study will examine the data-driven decision making supports provided by the district, identify how those supports may relate to the use of data-driven decision making, and depict the general state of the data-driven decision making supports within the school district. The study aims to shed some light on the matters of improving provisions for data utilization so educators can make better educational decisions, resulting in better educational outcomes.

**Procedures:** If you decide to participate, you will be asked to be interviewed individually which will take around 30 minutes. Individual interviews will be requested of particular district administrators with overseeing knowledge of district supports for the use of data-driven decision making.

**Risks:** Risks associated with participation will be minimal. Pseudonyms will be used in all written reports and no school or district names will be used. Risks of identification are also possible from interviews with district administrators. Given the few number of personnel with relevant knowledge over the provisions of data-driven decision making supports, these individuals may be linked to particular quotes or interview data reported. Nevertheless, every effort will be made to maintain confidentiality of all participants such as name and position title will not be reported.

**Benefits:** Benefits associated with participation include the opportunity to express perceptions of school district provisions in the matters of data-use for decision making. In addition, the knowledge resulting from the study will be used to improve how the school district supports the use of data throughout the district and schools.

**Confidentiality:** Your name will not be included in any written report. Only aggregate data will be included. No district or school names will be reported.

**Costs/Payment:** There are no payments provided for participating in the study.

**Emergency Care and Treatment of Injury:** N/A

**Right to Refuse or Withdraw:** Although your participation is important to the study, it is completely voluntary. You may also withdraw your consent to participate at any time.

**Principal Investigators Disclosure of Personal and Financial Interests in the Research Study Sponsor:** The researcher has no financial interest in the study.

**Questions:** If you have any questions about this research project or if you think you may have been injured as a result of your participation, please contact Raymond Tjen-A-Looi at (916) 838-1130 or raymond@education.ucsb.edu. If you have any questions regarding your rights and participation as a research subject, please contact the UCSB Human Subjects Committee at (805) 893-3807 or hsc@research.ucsb.edu,or you may write to the following:

University of California, Santa Barbara
Human Subjects Committee
Office of Research
Santa Barbara, CA 93106-2050

**PARTICIPATION IN RESEARCH IS VOLUNTARY. YOUR SIGNATURE BELOW WILL INDICATE THAT YOU HAVE DECIDED TO PARTICIPATE AS A RESEARCH SUBJECT IN THE STUDY DESCRIBED ABOVE. YOU CAN BE GIVEN A SIGNED AND DATED COPY OF THIS FORM TO KEEP UPON REQUEST.**

_____ _____

Participant's Signature Date

_____

Participant's Name

**APPENDIX B**
**Individual Interview Protocol**

Purpose of the Study: The purpose of this interview is to get some insight into how the school district supports its personnel in the matters of using data to drive decision making.

Introduction: First of all, I would like to thank you for taking time out of your busy schedule to meet with me. As I informed you earlier, I am conducting this interview to better understand how your school district supports the use of data for decision making.

1.) How does your district ensure personnel can access, collect, and organize student data in an easy, accurate, and timely manner?
   a. Probing Question: What technologies, devices, and more specifically data systems does your district provide personnel for data-use?

2.) Please describe to me the strengths and limitations you have encountered with your district's data system infrastructure.

3.) How does your district ensure that personnel have the abilities to analyze and interpret student data?
   a. Probing Question: What other supports are provided to assist personnel with analyzing data and summarizing, or interpreting the resulting information?

4.) Please describe to me the strengths and limitations you have encountered with providing analytical support to personnel.

5.) As having integral knowledge over the data-use in your district, what is the vision for data-use in your district and across schools?
   a. Probing Question: What is the focus or priorities of your district and schools in using data to inform decision making and practice?

6.) How does your district establish a culture that encourages data-use for driving decision making and improving education practices?
   a. Probing Question: How does your district promote an environment for data-use?

7.) Please describe to me the strengths and limitations you have encountered with promoting a data-use focus and culture that emphasizes data-use for informing decision making and improving education practices.

8.) How do you think the district can better support the use of data to inform decision making and improve education practices?

Thank you participating. In light of this conversation, is there anything you would like to add or mention in regards to the topic of discussion?

**APPENDIX C**
**Information and Agreement of Consent for Online Survey**

University of California, Santa Barbara
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS
An Exploratory Study of Data-Driven Decision Making Supports
in a Northern California School District
Principal Investigator: Raymond Tjen-A-Looi
Educational Leadership and Organizations

Consent Form

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

**Purpose:** The primary purpose of the study is to investigate how the school district supports data-driven decision making within its central office and across schools. To do so, this exploratory study will examine the data-driven decision making supports provided by the district, identify how those supports may relate to the use of data-driven decision making, and depict the general state of the data-driven decision making supports within the school district. The study aims to shed some light on the matters of improving provisions for data utilization so educators can make better educational decisions, resulting in better educational outcomes.

**Procedures:** If you decide to participate, you will be asked to complete a survey which takes about 10-15 minutes. Surveys will be requested for teachers, district and site administrators, school support staff, and district staff that utilize data-driven decision making.

**Risks:** Risks associated with participation will be minimal. Pseudonyms will be used in all written reports and no school or district names will be used. Every effort will be made to maintain confidentiality of all participants.

**Benefits:** Benefits associated with participation include the opportunity to express perceptions of school district provisions in the matters of data-use for decision making. In addition, the knowledge resulting from the study will be used to improve how the school district supports the use of data throughout the district and schools.

**Confidentiality:** Your name will not be included in any written report. Only aggregate data will be included. No district or school names will be reported.

**Costs/Payment:** There are no payments provided for participating in the study.

**Emergency Care and Treatment of Injury:** N/A

**Right to Refuse or Withdraw:** Although your participation is important to the study, it is completely voluntary. You may also withdraw your consent to participate at any time.

**Principal Investigators Disclosure of Personal and Financial Interests in the Research Study Sponsor:** The researcher has no financial interest in the study.

**Questions:** If you have any questions about this research project or if you think you may have been injured as a result of your participation, please contact Raymond Tjen-A-Looi at (916) 838-1130 or raymond@education.ucsb.edu. If you have any questions regarding your rights and participation as a research subject, please contact the Human Subjects Committee at (805) 893-3807 or hsc@research.ucsb.edu,or you may write to the following:

University of California, Santa Barbara
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Office of Research
Santa Barbara, CA 93106-2050

**PARTICIPATION IN RESEARCH IS VOLUNTARY. CHECKING THE BOX BELOW WILL INDICATE THAT YOU HAVE DECIDED TO PARTICIPATE AS A RESEARCH SUBJECT IN THE STUDY DESCRIBED ABOVE. YOU CAN PRINT A COPY OF THIS FORM TO KEEP FOR YOUR RECORDS.**

☐ I understand the intent of this survey and give my consent.

**Online Survey**
**Data-Driven Decision Making Supports**

**Please identify the following:**

**Gender:** ☐ Female ☐ Male

**School/District Level:** ☐ Elementary ☐ Middle ☐ High ☐ District Office

**Position:** ☐ Teacher ☐ Principal/VP ☐ District Admin. (asst. superintendents, directors, coordinators, and managerial admin.)

☐ School Support Staff (counselors, instructional coaches, therapists/pathologists, psychologists, specialists, and librarians)

☐ District Staff (program specialists, district instructional coaches, district teachers on special assignment, and other staff personnel)

**Definition of Data:** Data can come in any of the following forms.

**Achievement Data**: Test or assessments, student grades, classroom assignments, portfolios, teacher observations, writing journals, progress checks, and conference logs. Student achievement data represents the observable measures for student learning and performance.

**Demographics Data:** Grade, gender, parent education level, ethnicity, language proficiency, home language, socioeconomic status, attendance, and disciplinary records. Demographics data provide descriptive information.

**Instructional Processes Data:** Information about course pathways, curriculum, pacing guides, teaching practices, professional development, school programs and interventions, and parent communication and involvement. Instructional processes data depict aspects of pedagogical strategies aimed at teaching and learning.

**Perceptions Data:** Individuals' views, attitudes, values, and beliefs of the school climate, instruction, and faculty and staff. Perceptions data provide insight into what students, parents, teachers, and others think about the learning environment.

## SECTION I: Data-Driven Decision Making Supports

Part A: Quality of Data System Infrastructure

This part of the questionnaire addresses your thoughts on the quality of data systems, technology, and tools the school district provides for using data.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| The accessible computer systems provide me access to lots of data. | | | | | | |
| The accessible computer systems allow me to retrieve data in a timely manner. | | | | | | |
| The accessible computer systems allow me to organize multiple types of data. | | | | | | |
| The accessible computer systems allow me to manipulate data in the way I need. | | | | | | |
| The accessible computer systems (for data use) are user-friendly. | | | | | | |
| I have the proper technology to efficiently collect/gather data. | | | | | | |
| I have the proper technology to efficiently examine data. | | | | | | |
| The data I can retrieve is accurate and trustworthy. | | | | | | |

Part B: Support for Analytic Capacity

This part of the questionnaire addresses your thoughts on the available support the school district provides for examining and analyzing data.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| The district has adequately prepared me to use data systems and data tools. | | | | | | |
| The district has adequately prepared me to examine and analyze data. | | | | | | |
| I am adequately supported to use data effectively to adjust education practices. | | | | | | |
| I am provided opportunities to improve my data analysis skills and abilities. | | | | | | |
| There is someone readily available that I can go to who can provide assistance with using data. | | | | | | |
| I am provided opportunities to collaborate and discuss data with other educators and colleagues. | | | | | | |
| There is enough time allotted to use data effectively. | | | | | | |

Part C: Data-Use Leadership (Vision & Culture)

This part of the questionnaire addresses your thoughts on the school district leadership for using data. Specifically, the questions will ask you about the vision and culture for data-use that you currently experience.

To what extent do you agree or disagree with the following statements. **Please answer all items.**

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| There are clear goals in my school/department for using data to inform decision making and improve education practices. | | | | | | |
| There are policies in place allowing for efficient usages of data systems and data information. | | | | | | |
| There are plans and structures in place that give direction for my data-use to inform decision making. | | | | | | |
| There is continuous communication and sharing of data-driven information in my school/department. | | | | | | |
| There are worthwhile incentives and benefits for using data to drive decision making. | | | | | | |
| The environment at my school/department is conducive for data-use. | | | | | | |
| I am engaged in using data to inform decision making and improve education practices. | | | | | | |

## SECTION II: Data-Driven Decision Making Processes

Part A: Collecting Data

This part of the questionnaire addresses your thoughts on the process of collecting and accessing data. These questions will ask you about your current experiences with gathering and retrieving data.

To what extent do you agree or disagree with the following statements. **Please answer all items.**

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I collect/access data on a regular basis. | | | | | | |
| I access multiple types of data on a regular basis. | | | | | | |
| I feel the need to gather and retrieve data often. | | | | | | |
| I feel comfortable with gathering and retrieving data. | | | | | | |
| I am satisfied with how I need to gather and retrieve data. | | | | | | |
| I find it useful to collect/access data. | | | | | | |

Part B: Organizing Data

This part of the questionnaire addresses your thoughts on the process of organizing data. These questions will ask you about your current experiences with sorting, grouping, manipulating, and arranging data in a variety of ways.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I organize, sort, and group data on a regular basis. | | | | | | |
| I manipulate and arrange data in ways that are helpful. | | | | | | |
| I feel comfortable with organizing and manipulating data. | | | | | | |
| I am satisfied with how I need to organize and manipulate data. | | | | | | |
| I find it useful to organize and manipulate data. | | | | | | |

Part C: Analyzing Data

This part of the questionnaire addresses your thoughts on the process of analyzing data. These questions will ask you about your current experiences with examining and analyzing data for patterns, trends, relationships, and overall information.

To what extent do you agree or disagree with the following statements. **Please answer all items.**

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I examine and analyze data for patterns, trends, relationships, and overall information on a regular basis. | | | | | | |
| I feel the need to examine and analyze data often. | | | | | | |
| I feel comfortable examining and analyzing data. | | | | | | |
| I always have help to examine and analyze data. | | | | | | |
| I find it useful to examine and analyze data. | | | | | | |
| I feel satisfied with the way I need to examine and analyze data. | | | | | | |
| I collaborate with colleagues to examine and analyze data. | | | | | | |

Part D: Summarizing Information

This part of the questionnaire addresses your thoughts on the process of summarizing information. These questions will ask you about your current experiences with interpreting and highlighting information to make meaning of the data you analyze.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I summarize and highlight information that I get from analyzing data on a regular basis. | | | | | | |
| I feel comfortable interpreting information that I get from analyzing data. | | | | | | |
| I find the information I interpret from analyzing data to be meaningful and useful. | | | | | | |
| I can highlight the useful information that I get from analyzing data. | | | | | | |
| I always have help to highlight the useful information that I get from analyzing data. | | | | | | |
| I collaborate with colleagues to interpret and highlight information that is taken from analyzing data. | | | | | | |

Part E: Synthesizing Information

This part of the questionnaire addresses your thoughts on the process of synthesizing information. These questions will ask you about your current experiences with combining useful information that is drawn from analyzing data to understand certain conditions or situations surrounding your work.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I synthesize/combine useful information that is drawn from analyzing data to understand situations on a regular basis. | | | | | | |
| I combine useful information that is drawn from analyzing data to determine progress and performance on a regular basis. | | | | | | |
| I combine useful information that is drawn from analyzing data to determine problems and issues on a regular basis. | | | | | | |
| I feel comfortable combining useful information that is drawn from analyzing data. | | | | | | |
| I understand situations and conditions surrounding my work better when I combine useful information that is drawn from analyzing data. | | | | | | |
| I collaborate with colleagues to evaluate our understanding of certain conditions or situations based on the useful information that is drawn from analyzing data. | | | | | | |

Part F: Prioritizing Knowledge

This part of the questionnaire addresses your thoughts on the process of prioritizing knowledge. These questions will ask you about your current experiences with determining the importance of useful information that is drawn from analyzing data that can lead to decisions and actionable solutions.

To what extent do you agree or disagree with the following statements. **Please answer all items**.

| | Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| I prioritize the most pressing issues based on the important information that is drawn from analyzing data. | | | | | | |
| I adjust my practices based on the most important information that is drawn from analyzing data. | | | | | | |
| I make decisions based on the most important information that is drawn from analyzing data. | | | | | | |
| I make better decisions and adjustments to my work when I base them on the most important information that is drawn from analyzing data. | | | | | | |
| I collaborate with colleagues to make decisions based on the most important information that is drawn from analyzing data. | | | | | | |
| I collaborate with colleagues to adjust practices based on the most important information that is drawn from analyzing data. | | | | | | |

## Appendix E
## Variable Scales, Reliabilities, & Items with Rotated Factor Loadings

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DATA-DRIVEN DECISION MAKING SUPPORTS

Quality of Data System Infrastructure (Cronbach's Alpha = 0.92)

1. The accessible computer systems provide me access to lots of data. [0.75][3,7]
2. The accessible computer systems allow me to retrieve data in a timely manner. [0.77][7]
3. The accessible computer systems allow me to organize multiple types of data. [0.82][1,3,7]
4. The accessible computer systems allow me to manipulate data in the way I need. [0.86][7]
5. The accessible computer systems (for data use) are user-friendly. [0.74][1,7]
6. I have the proper technology to efficiently collect/gather data. [0.76][7]
7. I have the proper technology to efficiently examine data. [0.78][7]
8. The data I can retrieve is accurate and trustworthy. [0.58][7]

Support for Analytic Capacity (Cronbach's Alpha = 0.91)

1. The district has adequately prepared me to use data systems and data tools. [0.81][3,7]
2. The district has adequately prepared me to examine and analyze data. [0.85][3,7]
3. I am adequately supported to use data effectively to adjust education practices. [0.80][1,7]
4. I am provided opportunities to improve my data analysis skills and abilities. [0.79][1,7]
5. There is someone readily available that I can go to who can provide assistance with using data. [0.72][3,6]
6. I am provided opportunities to collaborate and discuss data with other educators and colleagues. [0.65][1,2,7]
7. There is enough time allotted to use data effectively. [0.70][1,3,6]

Data-Use Leadership (Cronbach's Alpha = 0.92)

1. There are clear goals in my school/department for using data to inform decision making and improve education practices. [0.85][1,7]
2. There are policies in place allowing for efficient usages of data systems and data information. [0.84][7]
3. There are plans and structures in place that give direction for my data-use to inform decision making. [0.92][2,7]
4. There is continuous communication and sharing of data-driven information in my school/department. [0.89][2]
5. There are worthwhile incentives and benefits for using data to drive decision making. [0.66][1,2,3]

6. The environment at my school/department is conducive for data-use. [0.73][1,3]
7. I am engaged in using data to inform decision making and improve education practices. [0.59][1,3]

DATA-DRIVEN DECISION MAKING PROCESSES

Collecting Data (Cronbach's Alpha = 0.89)

1. I collect/access data on a regular basis. [0.84][4,5,7]
2. I access multiple types of data on a regular basis. [0.85][4,5,7]
3. I feel the need to gather and retrieve data often. [0.77][5,7]
4. I feel comfortable with gathering and retrieving data. [0.71][5,7]
5. I am satisfied with how I need to gather and retrieve data. [0.69][5,7]
6. I find it useful to collect/access data. [0.65][5,7]

Organizing Data (Cronbach's Alpha = 0.90)

1. I organize, sort, and group data on a regular basis. [0.85][5,7]
2. I manipulate and arrange data in ways that are helpful. [0.93][5,7]
3. I feel comfortable with organizing and manipulating data. [0.76][5,7]
4. I am satisfied with how I need to organize and manipulate data. [0.82][5,7]
5. I find it useful to organize and manipulate data. [0.61][5,7]

Analyzing Data (Cronbach's Alpha = 0.84)

1. I examine and analyze data for patterns, trends, relationships, and overall information on a regular basis. [0.74][5,7]
2. I feel the need to examine and analyze data often. [0.78][5,7]
3. I feel comfortable examining and analyzing data. [0.76][5,7]
4. I always have help to examine and analyze data. [0.54][5,6]
5. I find it useful to examine and analyze data. [0.68][5,7]
6. I feel satisfied with the way I need to examine and analyze data. [0.73][5,7]
7. I collaborate with colleagues to examine and analyze data. [0.54][5,6]

Summarizing Information (Cronbach's Alpha = 0.85)

1. I summarize and highlight information that I get from analyzing data on a regular basis. [0.74][5]
2. I feel comfortable interpreting information that I get from analyzing data. [0.87][5,7]
3. I find the information I interpret from analyzing data to be meaningful and useful. [0.76][5,7]
4. I can highlight the useful information that I get from analyzing data. [0.82][5,7]
5. I always have help to highlight the useful information that I get from analyzing data. [0.54][5]

6. I collaborate with colleagues to interpret and highlight information that is taken from analyzing data. [0.66][1,5]

Synthesizing Information (Cronbach's Alpha = 0.91)

1. I synthesize/combine useful information that is drawn from analyzing data to understand situations on a regular basis. [0.89][5]
2. I combine useful information that is drawn from analyzing data to determine progress and performance on a regular basis. [0.91][5,7]
3. I combine useful information that is drawn from analyzing data to determine problems and issues on a regular basis. [0.92][5,7]
4. I feel comfortable combining useful information that is drawn from analyzing data. [0.78][5]
5. I understand situations and conditions surrounding my work better when I combine useful information that is drawn from analyzing data. [0.60][5]
6. I collaborate with colleagues to evaluate our understanding of certain conditions or situations based on the useful information that is drawn from analyzing data. [0.63][1,5]

Prioritizing Knowledge (Cronbach's Alpha = 0.91)

1. I prioritize the most pressing issues based on the important information that is drawn from analyzing data. [0.82][5]
2. I adjust my practices based on the most important information that is drawn from analyzing data. [0.84][5,7]
3. I make decisions based on the most important information that is drawn from analyzing data. [0.85][5,7]
4. I make better decisions and adjustments to my work when I base them on the most important information that is drawn from analyzing data. [0.76][5,7]
5. I collaborate with colleagues to make decisions based on the most important information that is drawn from analyzing data. [0.75][1,5]
6. I collaborate with colleagues to adjust practices based on the most important information that is drawn from analyzing data. [0.74][1,5]

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*Note:* All items were measured on 6-point scales. Most response descriptors ranged from 1 = *Strongly Disagree* to 6 = *Strongly Agree*.

Survey Items were derived and adapted from the following sources:
[1]Datnow et al., 2007
[2]Dembosky et al., 2005
[3]Gill et al., 2014
[4]Hamilton et al., 2009
[5]Mandinach, 2012
[6]Means et al., 2010
[7]Wayman et al., 2007