ACCEPTANCE

This dissertation, EDUCATIONAL LEADERSHIP EFFICACY: THE RELATIONSHIP BETWEEN DATA USE, DATA USE CONFIDENCE, LEADERSHIP EFFICACY, AND STUDENT ACHIEVEMENT, was prepared under the direction of the candidate's Dissertation Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree of Doctor of Education in the School of Education, Concordia University Irvine.

Doug Grove, PhD
Committee Chair

Lupe Buell, PhD
Committee Member

Jason Neben, EdD
Committee Member

The Dissertation Committee, the Dean, and Executive Director of the Doctor of Education Program of the School of Education, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty.

Kent Schlichtemeier, EdD
Dean

Dwight Doering, PhD
Executive Director of the Doctor of Education Program

COPYRIGHT PERMISSION AGREEMENT

Concordia University Library
1530 Concordia West
Irvine, CA 92612
www.cui.edu/library
librarian@cui.edu

I, Matthew C. Rhoads, warrant that I have the authority to act on any copyright related matters for the work, EDUCATIONAL LEADERSHIP EFFICACY: THE RELATIONSHIP BETWEEN DATA USE, DATA USE CONFIDENCE, LEADERSHIP EFFICACY, AND STUDENT ACHIEVEMENT, in paper format dated September 6th, 2019 to be included in the Concordia University Library repository, and as such have the right to grant permission to digitize, republish and use the said work in all media now known or hereafter devised.

I grant to the Concordia University Library the nonexclusive worldwide rights to digitize, publish, exhibit, preserve, and use the work in any way that furthers the educational, research and public service purposes of the Concordia University.

This Agreement shall be governed by and interpreted in accordance with the laws of the State of California. This Agreement expresses the complete understanding of the parties with respect to the subject matter and supersedes all prior representations and understandings.

ACCESS RESTRICTIONS
My electronic thesis or dissertation can be made accessible via the Concordia University Library repository with the following status (select one):

X Option 1: Provide open access to my electronic thesis or dissertation on the internet

□ Option 2: Place an embargo on access to my electronic thesis or dissertation for a given period from date of submission (select one):

□ 6 months □ 1 year □ 3 years

Permission Granted By:

Matthew C. Rhoads_____ _____
Candidate's Name *Signature of Candidate*

[redacted] September 9th, 2019_____
Address *Date*

[redacted] _____
Phone Number or E-mail address City/State/Zip

VITA

Matthew C. Rhoads

ADDRESS [redacted]

matthew.rhoads1@eagles.cui.edu

EDUCATION

EdD	2019	Concordia University Irvine Educational Leadership
MAT	2015	Point Loma Nazarene University, San Diego Masters in Teaching
BA	2012	Point Loma Nazarene University, San Diego Political Science

PROFESSIONAL EXPERIENCE

2015	Educational Specialist San Marcos Unified School District
2015-2016	Chief Financial Officer & Co-Founder Intuidata Education

AREAS OF EXPERTISE

2015-2018	Data-Driven Decision Making
2015-2018	Educational Data, Data Mining, and Data Practices
2015-2018	Ed-Tech Tools and Pedagogy
2015-2018	Special Education
2015-2018	School Improve and Systems Thinking
2015-2018	Professional Development

EDUCATIONAL LEADERSHIP EFFICACY: THE RELATIONSHIP BETWEEN DATA USE, DATA USE CONFIDENCE, LEADERSHIP EFFICACY, AND STUDENT ACHIEVEMENT

by

Matthew Rhoads

A Dissertation

Presented in Partial Fulfillment of the
Requirements for the
Degree of
Doctor of Education
in
Educational Leadership
December 14, 2019

School of Education
Concordia University Irvine

ABSTRACT

The purpose of this study was to understand the relationships between how educational leaders use data, levels of leadership efficacy with which they use data, and the relationship between data use, efficacy toward data use, and student achievement in K-12 school settings. Also, the purpose of this study was to understand how data practices and data-driven cultures are being established and utilized by educational leaders in different leadership positions at K-12 schools and school districts.

This study utilized a mixed methods research design to answer six quantitative and two qualitative research questions. For the six quantitative research questions, the researcher employed a correlational research design to determine if correlational relationships exist between leadership efficacy, data use confidence, data use, and student achievement. For the two qualitative research questions, the researcher employed grounded theory to code the data gathered thematically.

The quantitative data results indicated that several relationships existed among several of the variables utilized for this study: data use confidence and educational leadership efficacy; educational leadership efficacy and data use; and data use and data use confidence. However, data use confidence, data use, and efficacy did not have a relationship with the student achievement variable. Qualitative findings demonstrated how educational leaders have the responsibility and obligation to implement, mandate, and model data-driven cultures. In addition, qualitative findings indicated that educational leaders perceived data practices as driving decision making for instructional and school improvement. Lastly, qualitative findings found several constraints, such as the lack of time, lack of capacity to use data, and resistance

from staff and teachers impeded the use of data and data practices by educational leaders in K-12 schools and districts.

TABLE OF CONTENTS

LIST OF TABLES vi

LIST OF FIGURES ix

ACKNOWLEDGEMENTS x

CHAPTER 1: INTRODUCTION 1

Statement of the Problem 2

Purpose of the Study 3

Significance of the Study 4

Definitions of Terms 4

Theoretical Framework 6

Self-Efficacy and Leadership 7

Effective Technology Leadership 8

Data-Driven Decision Making 9

Summary: A Concurrent Framework - Self-Efficacy, Effective Technology Leadership, and Data-Driven Decision-Making 11

Research Questions 12

Quantitative Research Questions 12

Qualitative Research Questions 12

Search Terms 12

Organization of the Study 13

Summary 14

CHAPTER 2: REVIEW OF THE LITERATURE 15

History of Data Use 16

Student Achievement and School Improvement 17
Student Achievement 18
School Improvement 19
History of Measuring Student Achievement and School Improvement 20
Defining Standardized Testing 21
Arguments For and Against Standardized Testing 22
Conclusion 24
Educational Leaders 25
Defining Educational Leaders 25
Conclusion 26
Data Usage 26
Data Use in Education: History and Background 27
Data Uses and Data Systems 28
Data Available to Educational Leaders 30
Data Use by Educational Leaders 30
Data Mining in Education 32
Decision Making 34
Conclusion 38
Barriers to Data Use in Education 38
Suggestions for Improvement of Data Use by Educational Leaders 40
Data Literacy 41
Conclusion 43
Data Use and Student Achievement 44

Educational Leader Data Use to Student Achievement 44
Conclusion 46
Leadership Efficacy 47
Locus of Control 47
Defining Self-Efficacy 48
Teacher and Leadership Efficacy 51
Measuring Efficacy for Educational Leaders 58
Conclusion 61
Leadership Efficacy, Data Use, and Student Achievement 61
Measuring Leadership Efficacy and Data Use: Principal's Perceptions of DDDM: The School's Principal's Perspective Survey 63
Measuring Data Use Efficacy: Principal's Data Use Self-Appraisal Survey 66
Conclusion 67
Importance of Correlational Research in Educational Research 67
Summary 68
CHAPTER 3: METHODOLOGY 70
Research Design 70
Participants 72
Sampling Procedures 72
Instrumentation 73
Survey Scale Modifications 75
Validity and Reliability 76
Data Collection and Ethical Considerations 77

Data Analysis 78
Quantitative 79
Qualitative 83
Summary 85
CHAPTER 4: FINDINGS 86
Quantitative Research Questions 86
Qualitative Research Questions 86
Demographic Profile 87
Quantitative Data Analysis: Descriptive Statistics of Survey Scale Results 90
Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Two 91
Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Four 98
Data Use Overall Scores of Participants 101
Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Three 102
Educational Leadership Overall Scores of Participants 104
Educational Leader's Data Use Self-Appraisal Scale 106
Overall Data Use Confidence Scores 109
Reliability Analysis of Survey Scales 111
Mean Scores and Standard Scores for Survey Scales 111
Missing Data 112
Research Question Findings 113

Summary 126
CHAPTER 5: SUMMARY AND DISCUSSION 128
Summary of the Study 128
Quantitative Research Questions 128
Qualitative Research Questions 128
Quantitative Research Question Summary 130
Qualitative Research Question Summary 141
Conclusions and Discussion 148
Conclusions 148
Discussion 150
Implications 152
Recommendations for Further Research 155
Limitations 157
Delimitations 159
Summary 160
REFERENCES 161
APPENDICES 170
APPENDIX A 176
APPENDIX B 185
APPENDIX C 197
APPENDIX D 201

LIST OF TABLES

Table 1. Summary of Research Design: A Mixed-Method study……..71

Table 2. Distribution of the Types of Educational Leaders in this Study……..88

Table 3. Participants Years of Service as an Educational Leader……..89

Table 4. Participants Highest Educational Degree……90

Table 5. Gender of Participants……90

Table 6. Student Test Scores and Grades – Availability……...92

Table 7. Student Demographic Data – Availability……...93

Table 8. School-Wide Programmatic Data – Availability……93

Table 9. Staff Data – Availability……..94

Table 10. Perception and Advisory Data – Availability……....94

Table 11. Test Scores and Grades – Used……..94

Table 12. Student Demographic Data – Used……95

Table 13. School-Wide Programmatic Data – Used……..95

Table 14. Staff Data – Used……...96

Table 15. Perception and Advisory Data – Used……...96

Table 16. Student Test Scores and Grades – Important……96

Table 17. Student Demographic Data – Important……97

Table 18. School-Wide Programmatic Data – Important……..97

Table 19. Perceptions of Staff Data – Important……...98

Table 20. Perception and Advisory Data – Important……...98

Table 21. Educational Leaders Perceptions' of Supports for Effectively Using Data to Make Decisions……99

Table 22. Overall Perceived Mean Data Use Score of Participants……102

Table 23. Perceived Mean Data Use Score Distribution of Participants…….102

Table 24. Highest Rated Educational Leadership Efficacy Survey Scale Items…….103

Table 25. Lowest Rated Educational Leadership Efficacy Survey Scale Items……..104

Table 26. Overall Perceived Mean Educational Leadership Efficacy Score of Participants…...105

Table 27. Perceived Mean Educational Leadership Efficacy Participant Score Distribution….106

Table 28. Highest Rated Data Use Confidence Survey Scale Items……108

Table 29. Lowest Rated Data Use Confidence Survey Scale Items……109

Table 30. Perceived Ability of Other Educational Leaders to Use Data and Overall Perception of Whether Data Use Will Improve Student Achievement……..109

Table 31. Overall Data Use Confidence Scores of Participating Educational Leaders……...110

Table 32. Perceived Data Use Confidence Overall Score Distribution……...110

Table 33. Mean Score and Mean Z-Scores for Survey Scales……112

Table 34. Correlation 1: Educational Leadership Efficacy (EDLF) vs. Data Use Confidence (DUC)……..115

Table 35. Correlation 2: Data Use (DU) vs. Educational Leadership Efficacy (EDLF)…….116

Table 36. Correlation 3: Data Use Confidence (DUC) vs. Data Use (DU)……..……..117

Table 37. Calculated Correlations for Quantitative Research Questions 4-6……..……118

Table 38. Intercoder Agreement: School Leader Perceptions Regarding Creating a Data-Driven Culture in Schools and/or Districts……..119

Table 39. Intercoder Agreement: School Leader Perceptions Regarding Data-Driven Practices They Employ to Create a Data-Driven Culture at their School Site and/or District……120

Table 40. Intercoder Agreement: School Leader Perceptions Regarding Creating a Data-Driven Culture in Schools and/or Districts……..122

Table 41. Findings: School Leader Perceptions Regarding Data-Driven Practices They Employ to Create a Data-Driven Culture at their School Site and/or District……..124

LIST OF FIGURES

Figure 1. Diagram of the theoretical framework……..……..…11

Figure 2. Instrumentation of variables……...……..…75

Figure 3. Operationalization of proposed correlations……...…82

Figure 4. Summary of quantitative data analysis……...……83

Figure 5. Summary of qualitative data analysis……..…84

Figure 6. Reliability Calculations of Each Section of Survey Scales Utilized in Study……..111

ACKNOWLEDGEMENTS

I am thankful for the love and support I have received from my family, friends, professors, colleagues, and most importantly, my wife, Alicia. These individuals have given me encouragement and support throughout this journey. From the beginning of this journey as well as throughout my life, I am appreciative of the sacrifices they have made to help facilitate me in the pursuit of my dreams and aspirations professionally and personally. Alicia, thank you for your unwavering love and compassion as we are both on this journey and adventure together.

Mom and Dad, thank you for always believing in me and providing me with the encouragement, support, and love throughout my life. Both of you have allowed me to experience many different places and people as well as provide me with the resources and opportunities to go to various schools within this country and abroad throughout my educational career. These experiences along with your love have culminated in my world view in addition to my values and life's mission to improve the lives of students I serve and the community I live in. Your love for me and values will always be reflected in my pursuit and fulfillment of that mission.

Finally, I am blessed and extremely thankful for the time, effort, and support of my Dissertation Committee. Thank you, Dr. Grove, for your guidance, support, and mentorship throughout this process. You have opened many creative pathways and doors not only through this research but to many endeavors in my personal and professional life. I am grateful for Dr. Buell, who also has served on my master's degree committee as well as this committee. Your support and belief in me have been instrumental. I will always remember to "keep the faith" in all endeavors I pursue in professional and personal life. Lastly, thank you, Dr. Neben, for

joining this committee and supporting me throughout this journey. Finally, every one of these committee members has been the motivating force in the conceptualization and completion of this study. Their recommendations and encouragement have allowed for this study to transform from ideas on a piece of paper to a completed dissertation.

CHAPTER 1: INTRODUCTION

Data use and the concept of "Big Data" is revolutionizing the world and allowing for the development of medical breakthroughs, business optimization, and artificial intelligence, which is intended to improve decision making for humans and optimize their lives. Now more than ever, data is being gathered at an unprecedented rate, allowing for advanced data analytics to occur. Now decision makers have the ability to analyze and visualize data and make critical decisions individually and for their collective organizations. Therefore, understanding data and how to utilize this powerful tool is of the utmost importance because success for individuals and organizations in the twenty-first century is now predicated on data use and using that knowledge to make the best decisions.

In twenty-first century schools, data use by its leaders is critical to success. Over the last twenty years, the use of data in schools has become widespread with the advent of new technologies that allow for individuals to have data and data manipulation software at their fingertips. Through this software, educational leaders and teachers can collect, organize, manipulate, and analyze data to help improve student achievement. Some of the various types of data that educational leaders and teachers analyze are student behavior, student demographics, benchmark test scores, student grade point average, standardized test scores, psychological reports, and financial records.

There are varying degrees to which educators perceive how well they use data as well as how well they use the data within their daily practice. These varying degrees of data use puts schools in a precarious position because educational leaders, such as principals, are key to how data was used at their school site (Fullan, 2010; Mandinach, 2012; Wu, 2009). Educational leaders who are proficient in data use put their schools in an advantageous position. On the other

hand, educational leaders who are not proficient in their data use put their schools at a disadvantage. Therefore, it is essential to determine how educational leaders use data as well as how they perceive their ability to use data.

Furthermore, this all relates to how educational leaders use data and how that data use by educational leaders may ultimately influence improved school performance in the form of student achievement. Understanding the perceived data use versus actual data use by educational leaders will provide insight into what data usage practices by educational leaders may or may not influence student achievement. As a result, the knowledge gleaned from this study may help inform programs that develop the capacity of educational leaders to use effective data usage practices at their school site and district that positively influence school improvement and student achievement.

Statement of the Problem

During this time of ever-increasing use of technology and expectations of academic growth in public education, data is needed to improve schools, but educational leaders in public schools often lack the capacity to fully implement data-driven schools (Lao & Hisao, 2014; Wayman, 2013). Many educational leaders, such as principals, believe they are using data at a proficient level. However, studies have shown that perceived self-efficacy regarding data use does not correlate with any increases in student achievement (McCray, 2014; Moak, 2010). Yet, other studies have shown that a principal's leadership is vital to data use in schools because studies have provided examples of schools exemplifying principal data use, which has affected student achievement indicators positively (Datnow, Park, Wohlstetter & Creighton, 2007; McLeod, 2005; Wu, 2009). There was a need for further research on this topic because there

was a discrepancy within the body of literature regarding the correlations between principal data use and student achievement, and educational leaders' perceived self-efficacy in data use.

Lastly, there was a call by researchers in this field to study how effective educational leaders use data and technology to establish data driven cultures in schools (Fullan, 2010; Mandinach, 2012; Wu, 2009). By providing research on the efficacy of educational leaders regarding their data use, it may give insight to how we can improve the skills and abilities of leaders to utilize data by constructing formal mechanisms to build this capacity as well as how we can better implement data driven cultures in schools through educational leaders.

Purpose of the Study

The purpose of this dissertation was to study whether relationships existed between educational leaders' leadership efficacy, data use, efficacy in data use (e.g., data use confidence), and student achievement in K-12 schools. The general topics in this study pertained to educational leadership efficacy, data use confidence, and data use in addition to how data use by educational leaders may affect student achievement. Covered within each of these topics included how educational leaders are using data within their daily practice as school leaders, their perception of their ability to use data and how they use data to affect student achievement. Ultimately, these topics came together as one because this study focused on determining if relationships exist amongst leadership efficacy, data use confidence, data use, and student achievement. Furthermore, the purpose of this study is to understand how data practices and data-driven cultures are being utilized and established by educational leaders in different leadership positions at K-12 schools and school districts.

Significance of the Study

This study was undertaken to contribute to the overall knowledge base on how leadership efficacy regarding data use by educational leaders relates to student achievement in K-12 schools. Specifically, this study's findings and conclusions may help provide more information to expand the body of research regarding how educational leaders use data within their capacity as leaders. Also, this study's findings and conclusions may shed light on how data use by educational leaders, such as principals, can play a crucial role in improving schools, especially how practices and attitudes towards data use relates to a leader's confidence in using data and their leadership efficacy. This study was conducted to determine if educational leaders who use data and leaders with high confidence in their ability to use data positively affect student achievement. The findings and conclusions drawn from this study may provide more information into the body of research regarding data literacy and how we can develop formal and informal mechanisms to help educational leaders increase their data skills and data literacy as well as build toward developing a universal standard for using data in education.

Definitions of Terms

The terms defined below seek to provide for a clearer understanding of how these recurring terms were used throughout this study.

Data Mining: Data mining (DM) is the process in which knowledge can be discovered in databases through data preparation (i.e., data warehousing, data cleaning, preprocessing data) and data manipulation to be analyzed through a variety of different techniques and applications to be used to solve practical problems (Coenen, 2011).

Data-Driven Decision-Making: Data-driven decision-making (DDDM) can be defined as "translating data into actions that inform all decisions within an educational organization"

(Mandinach, 2012, p. 73). It is a process where raw data is transformed into knowledge that can be used by educators to make decisions. The knowledge gained "is a collection of information used to guide actions" which, allows educators to take "actionable steps that teachers might make to improve and address student learning" (Mandinach, 2012, p. 78).

Data Literacy: Data literacy can be defined as a skill or ability required to read and understand data (Wu, 2009). It is a concept that encompasses a vast array of knowledge and skills that are assumed to be essential for the effective use of data in education.

Educational Leaders: An educator may be considered an educational leader if they are engaged in one or more of the following leadership roles: participate in a leadership team, mentor and train staff, implement professional development, engage in best practice, being a role model, develop a learning culture, inspire and motivate staff, assist staff with research, find resources for staff support, ensure policy and practice is current, communicate with upper staff and management, build effective relationships with children, families, and staff, develop a learning and questioning culture, provide updates and insights to a team from research, develop curriculum and evaluation, develop professional networks, communicate with and educate families, conduct staff appraisals, demonstrate and encourage reflective practice, assist staff to manage change, utilize the strengths of the team, and encouraging and supporting educators (Fleet, Madden, Semann & Soper, 2015). Leaders who fit this definition of school leaders include principals, assistant principals, district superintendents, teacher leaders (e.g., department heads and grade level leaders), and district coordinators (Fleet et al., 2015).

Leadership Efficacy: Self-efficacy for leaders can be defined as "using social influence processes to organize, direct, and motivate the actions of others by requiring persistent task-

directed effort, effective task strategies, and artful application of various conceptual, technical, and interpersonal skills" (McCormick, 2001, p. 28).

Student Achievement: Student achievement, also known as school performance, can be characterized as an individual student's status on a subject matter knowledge, understanding, and skills that are assessed at one point in time. Student achievement in K-12 can be measured by standardized test scores like the Smarter Balanced, also known as the California Assessment of Student Performance and Progress (CAASPP) state assessment, which is administered once a year.

School Improvement: School improvement can be defined as the features of shared goals and strategies "based on thorough needs analysis and ongoing development and renewal cycle" (Stringer, 2013, p. 11). Shared goals and strategies pertain to school-wide leadership, which allow for the expansion of knowledge of teachers in the use of student data to improve teaching and learning by establishing external connections for expertise and guidance from experts and having school-wide change occurring in multiple levels within a school (Stringer, 2013).

Theoretical Framework

For this study, the theoretical framework synthesized the characteristics of self-efficacy, effective technology leadership, and DDDM. Each of these characteristics was drawn from three distinct theoretical frameworks prevalent in the research. First, the self-efficacy framework constructed by McCray (2014) and Moak (2010) will be described, specifically relating Bandura's (1977) social cognitive theory to how educational leaders can self-assess their performance as leaders. Second, effective technology leadership will be outlined, specifically regarding how leaders can be effective when implementing technology utilizing a systems thinking approach. Third, Mandinach's (2012) DDDM framework will be outlined. Lastly,

there will be a summary of how each of these characteristics will be synthesized together for the purposes of this study.

Self-Efficacy and Leadership

The foundational basis of McCray (2014) and Moak's (2010) work was derived from Bandura's (1977) social cognitive theory. Bandura's (1977) social cognitive theory outlines the control humans have over their lives through their actions. Within this theory, human's actions are influenced by each individual's self-efficacy. Self-efficacy can be best defined as how an individual judges his or her ability to "integrate cognitive, social, and behavioral skills to produce a successful course of action to produce and regulate life events" (Bandura, 1982, p. 112). This means that individuals who have a high sense of self-efficacy tend to take on challenging tasks because they believe they can accomplish them. On the contrary, individuals with low self-efficacy tend to avoid tasks they perceive as challenging or difficult (Bandura, 1982).

In terms of self-efficacy and leadership, leaders who are confident in their abilities to accomplish various tasks that impact their organization may provide an avenue to a culture of stability and a sense of order within the organization they lead. A leader's perceived confidence in their ability to accomplish various tasks is derived from their self-efficacy beliefs. Therefore, for the theoretical analysis of looking at educational leaders, like principals, it is vital to analyze the "relationship of a principal's perception of self-efficacy and student achievement" (Moak, 2010, p. 5). Furthermore, according to Tschannen-Moran and Garesis (2004), a principal's sense of self-efficacy impacts how they evolve and develop as a leader and how effective they are in executing their leadership strategies. McCray (2014) cites McCormick's work (2001) as fundamental in outlining how the self-efficacy of principal's who use data to inform their

decisions may make decisions that "will improve their schools in terms of student achievement" (McCray, 2014, p. 10).

Effective Technology Leadership

Levin and Schrum's (2013) effective technology leadership framework is held together by a systems thinking approach that conceptualizes effective leadership when implementing technology in schools (Anthony, 2012; Davis & Sumara, 2006; Senge, Cambron-McCabe, Luca, Smith, Dutton, & Kleiner, 2000; Spillane, Halverson, & Diamond, 2001). The systems thinking approach holds organizational systems, like school districts, as interacting with many interdependent components that make up pieces of complex systems (Davis & Sumara, 2006; Senge et al., 2000). To be best employed in schools, all parts of the system must be interacting together through careful planning and dynamic integration. When adding a component like new technological practices, it may disturb the system. Several studies by Kopcha (2010), Windschitl and Sahl (2002), and Zhao and Frank (2003) outline how adding a component into the system, like technology, may not make a significant difference for the entire system resulting in no significant change. Therefore, leaders need to be aware of what attributes promote or inhibit the adoption of new innovations within their school site and district. Rogers (2003) diffusion of innovations theory explains that an innovative practice is more readily adopted when it has a relative advantage to what was used before, is compatible with existing frameworks and methods, demonstrates simplicity in its use, provides a degree of experimentation by its user, and performs observable results. Thus, for whole system reform, there "must be a dynamic nature of how each new component, like technology, is implemented because this is required for successful integration and school reform" as well as an understanding of the diffusion of a new innovation within a school system (Levin & Schrum, 2013, p. 31).

To navigate and implement new initiatives, like technology, and utilizing the systems thinking approach, leadership must be conceptualized as a "distributed practice, stretched over the school's social and situational contexts" (Spillane et al., 2001, p. 23). Distributed leadership in this context is a "system of practice comprised of a collection of interaction components: leaders, followers, and situation" (Spillman, 2005, p. 150). All of these components must be understood together as well as each individual component. When implementing technology, the systems-based model by Kopha (2010) describes how "different systems interact to support or impede successful technology integration" (Levin & Schrum, 2013, p. 32). Effective leadership in this instance involves "working beyond vision setting, developing strategic plans, purchasing equipment, and coordinating professional development" because the situational context of the system may call for school leaders such as "administrators, technology specialists, and teachers to identify and address differences in how intersystem linkages converge to affect the ability to integrate technology" (Anthony, 2012, p. 337).

Data-Driven Decision Making

Mandinach's (2012) conceptualization of DDDM is derived from existing literature, which spans across various disciplines over the last forty years (Argyris & Schoen, 1978; Williams & Hummelbrunner, 2011). Therefore, this framework is conceptualized "from a continuum in which data is transformed into information and ultimately to knowledge" (p. 77). This means that without manipulating raw data, the data is just numbers without meaning. As a result, information must be associated with the data to glean knowledge from it. Mandinach (2012) states that knowledge "is a collection of information deemed useful to guide action" (p. 77). To obtain this knowledge Long, Rivas, Light, and Mandinach (2008) recognized there must

be different cognitive skills in order to take data and transform it into knowledge on the data-to-knowledge continuum.

Mandinach (2012) outlines the skills needed to transform data into knowledge on the data-to-knowledge continuum; collecting and organizing data, analyzing and summarizing knowledge, synthesizing knowledge, and prioritizing knowledge. The skills involved at the data level are the ability to collect and organize data. Collecting data is the first step of the data-driven process, which involves collecting student performance data, demographics, behavioral data, work samples/student assignments, and other available data (Mandinach, 2012). Once this has occurred, data must be organized in a manner that makes sense to the user. Then, at the informational level, the skills involve analyzing and summarizing the information gleaned from the data. Analyzing data consists of examining trends, narrowing down categories of data, conducting statistics, and making sense of patterns seen in the data (Mandinach, 2012). Next, summaries can be developed on groups of students or individual students to determine how they are performing, determine whether interventions are needed, analyze budgetary trends, and evaluate teacher performance. Lastly, at the knowledge level, knowledge is then synthesized and prioritized by the user (Mandinach, 2012). Synthetization of data allows for decision makers to "form a knowledge base about student performance from which instructional decisions can be made" (Mandinach, 2012, p. 78). Ultimately, this allows for decision-makers to prioritize the information and determine what action to take. Thus, the synthesizing and prioritization of data allow decision-makers to "understand the possible steps that can be taken and determine which steps to take," which can be turned into steps taken to solve the problem at hand.

Summary: A Concurrent Framework - Self-Efficacy, Effective Technology Leadership, and Data-Driven Decision-Making

This study utilized the conceptual underpinnings of what has been discussed regarding self-efficacy and leadership, effective technology leadership, and data-driven decision-making for its theoretical analysis. Thus, in a concurrent fashion, we looked at how Bandura's social cognitive theory (i.e., self-efficacy) affects how educational leaders perceive their ability of how they utilized their data to make DDDM's in their practice as school leaders to improve their school's performance in terms of student achievement.

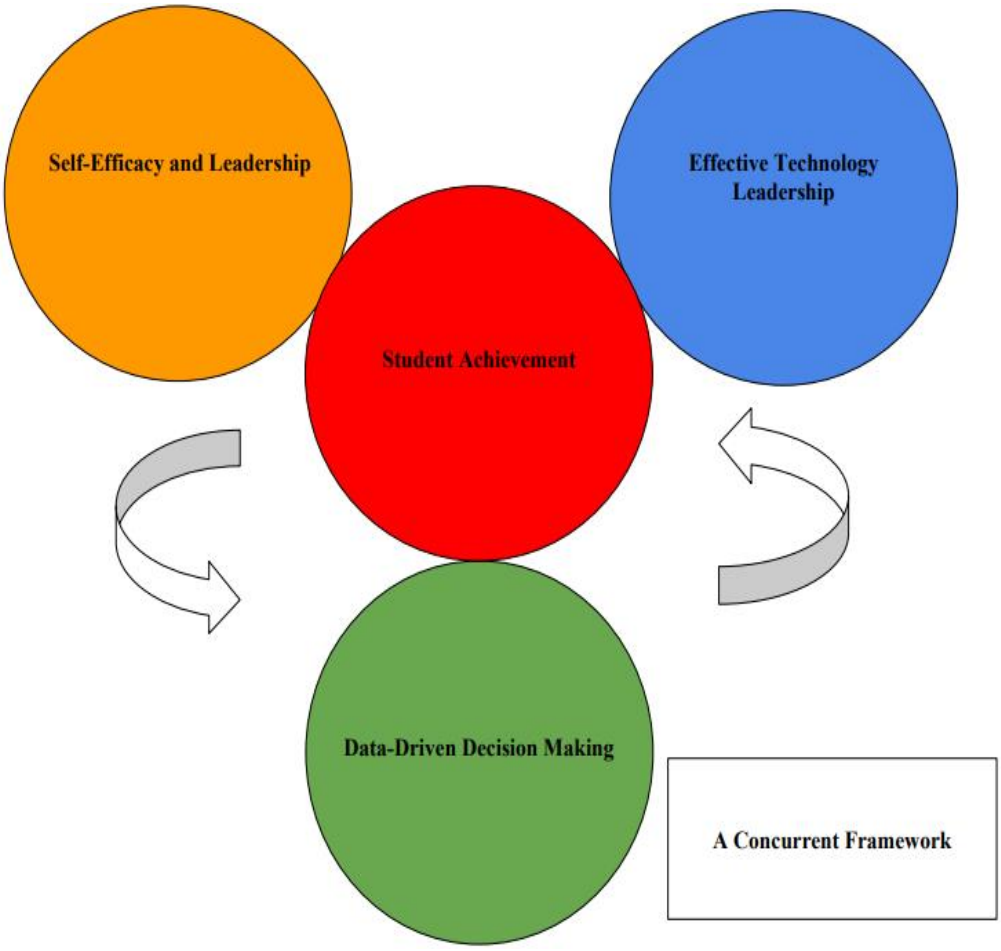

Figure 1. Diagram of the theoretical framework.

Research Questions

In order to explore how educational leader efficacy regarding their data use affects school student achievement, this study examined and answered the following research questions.

Quantitative Research Questions

1. What is the relationship between educational leadership efficacy and data use confidence?
2. What is the relationship between educational leadership efficacy and data use?
3. What is the relationship between data use and data use confidence?
4. What is the relationship between educational leadership efficacy and student achievement?
5. What is the relationship between data use confidence and student achievement?
6. What is the relationship between data use and school student achievement?

Qualitative Research Questions

7. What are the perceptions of school leaders regarding their responsibilities to create a data-driven culture at their school site and/or district?
8. What are the perceptions of school leaders regarding data-driven practices they employ to create a data-driven culture at their school site and/or district?

Search Terms

The research in this dissertation utilized several research databases, which included the Educational Resource Information Center (ERIC), EBSCO, JSTOR, and Google Scholar. The search terms I used for this study included “leadership data use in education,” principal leadership efficacy and data use,” “data-driven decision making in education,” “data mining in education,” “educational data,” “correlational research in education,” and “leadership self-

efficacy. Many sources of information were utilized, such as articles, books, and journals. Overall, the research found was robust, leaving itself to a significant review of the literature, which contributed significantly to formulating and conducting this study.

Organization of the Study

This study consists of five chapters: an introduction, literature review, methodology, results, and a summary/discussion. Chapter one of this study encompasses a broad overview of the study. Within chapter one, there is a statement of the problem, the purpose of the study, the significance of the study, the theoretical framework, a definition of terms, and an introduction to the eight research questions used for this study. Chapter two includes a review of the relevant literature to the study. This literature review covers many topics and concepts, including the historical background of self-efficacy, data use in education, and the definition of educational leaders, which provide in-depth discussions regarding measuring self-efficacy as well as outlining how data-driven decision making and data mining are used in K-12 by educational leaders. The literature review includes discussions regarding student achievement, school improvement, and how we can measure these various indicators. Chapter two will link the concepts of leadership efficacy and data use as well as ties in recent studies that use correlational research as a way to demonstrate there are similar studies in the body of research that relate to this study. Chapter three outlines the methodology used in this study, which includes providing a detailed discussion regarding the study participants, sampling procedures, instrumentation, data collection, and data analysis. Chapter four discusses the results of the study, which are based on the research questions outlined in chapter one. Chapter five, the final chapter, provides concluding remarks and discusses the implications and ramifications of this study's findings along with the study's limitations and delimitations.

Summary

In education, data use by educational leaders will be a continuing trend as we see automation technologies such as artificial intelligence become more prevalent in the coming years. Moving forward, it is critical for educational leaders to be able to understand data and data systems as well as be able to implement data-driven cultures at the schools they lead. One way to measure data competency is through understanding the efficacy of our educational leaders and their data usage. Student achievement is another indicator that can be utilized to determine if data use by our educational leaders is negatively or positively influencing yearly summative state testing scores.

This study aimed to explain if several relationships exist between leadership efficacy, data use, and data use confidence. Then, this study attempted to explain which of the three factors – data use confidence, data use, and educational leadership efficacy was the best predictor of student achievement. Additionally, this study looked to see if a number of correlations exist between data use confidence, data use, and educational leadership efficacy and student achievement indicators like the annual CAASPP English Language Arts and mathematic assessment used in California's K-12 schools, which is used to determine what students know and what they can do from a year to year basis.

CHAPTER 2: REVIEW OF THE LITERATURE

The discussion regarding the history of data use provides a foundation for this literature review. This section explains how data use has become a significant part of our society encompassing all modern industry, including education. Following this discussion on the history of data use, student achievement and school improvement are defined. It is hypothesized that there is a relationship between data use, student achievement, and school improvement. Educational leaders are defined and discussed to reveal the roles of school leaders and what their duties are leading schools. This discussion flows into how educational leaders use data and how data use by educational leaders has affected student achievement. Data use in education is described in addition to two subtopics of utilizing data: data mining (DM) and data-driven decision making (DDDM).

After discussing data use by educational leaders, locus control, and self-efficacy are defined. This moves into a discussion regarding how self-efficacy affects teachers and principals as well as what influences educational leaders, most notably principals, to have high or low efficacy in their daily practice as school leaders. This chapter will discuss what instruments are used to measure efficacy among educational leaders. Lastly, this chapter is completed with a segment on the connection between educational leader self-efficacy and data use as well as specific instruments measuring self-efficacy and data use concurrently. Specifically, the importance of correlational research in education as well as correlational studies conducted over the past few years that examine measuring self-efficacy of principals and their data use, and its effect on student achievement are outlined.

History of Data Use

The history of data use goes back to the beginning of human civilization. As taxes developed in early civilizations, records were kept regarding the assets that were collected as tribute from its subjects to its rulers. For over six thousand years, records of human civilization were written on clay tablets to paper. Throughout this time, new innovations regarding data representation were invented, such as numbers, alphabets, novels, libraries, paper, and the print press (Gray, 1996). As record-keeping began to improve over many generations, record managers utilized blocks of data in the form of punch cards to tabulate data counts. This eventually evolved into the use of multimedia databases during the twenty-first century, which manipulate and automate data calculations across the internet through a multitude of databases (Gray, 1996).

The modern advent of data use was developed by Deming (1982), Juran (1951), and Crosby (1967) to be used for the continuous improvement of performance within an organization (Deming, 1986). Each of these founder's attributed to the development of the total quality management system (TQM). During World War II, the TQM system was developed to improve industrial production by improving the performance of the entire organization, from its managers and works in an integrated effort toward improving performance at every level (Deming, 1986). In practice, this was establishing methodologies using scientific management to improve the performance of manufacturing plants.

The improved performance meant integrating management techniques such as the use of data to improve the quality, cost, scheduling, and suitability of the product in development (Deming, 1986). Deming (1986) incorporated statistic charts for war products, which Deming used to ensure quality control in a chain reaction of the industrial and organizational processes.

This was incorporated because Deming believed the cost would go down while the quality of the product would go up in addition to the productivity of workers and managers (Deming, 1986). Through Deming's work, he believed the statistical process of control and data use was an essential instrument for ensuring the quality of a product. This ultimately developed into fourteen points of management developed by Deming (1986). These fourteen points emphasized the use of data and developing action plans that can be measured and evaluated for all areas of an organization, including all its employees and managers.

The long-term implications of the TQM system are that many U.S. companies have implemented this system in order to be competitive on a national and international level (Waddock & Bodwell, 2004). From the 1980s and on, the popularity of the TQM system has spread to various industries, including universities and K-12 schools. In the 1980s, universities were encouraged to commit to TQM by integrating their school operations and courses into this systematic approach using data to evaluate their institution and progress it towards continuous improvement (Waddock & Bodwell, 2004). Currently, TQM is widely accepted due to its management principles. Most importantly, data use within TQM is critical to how organizations can ensure productivity, efficiency, and quality control.

Student Achievement and School Improvement

Student achievement and school improvement are fundamental to understanding how progress is made in education. In this section, there will be a conversation regarding California's Smarter Balanced Assessment, which is one of the major current statewide measures that can be used to determine student achievement and provides a critical indicator to measure school improvement from year to year.

Student Achievement

First, according to Zieleniak (2013), student achievement can be defined as "the status of subject matter knowledge, understanding, and skills at one point in time" (Zieleniak, 2013, p. 9). Thus, subject matter knowledge and understanding is best reflected in course grades and standardized testing scores. As a result, course grades and standardized tests reflect students' progress since they are given during a certain point in the year. For example, standardized tests such as the Smarter Balanced Assessment (also known as the California Assessment of Student Performance and Progress [CAASPP]), Scholastic Assessment Test [SAT], and ACT demonstrate student achievement during a single point in time. These tests are limited because they do not measure overall student achievement from one particular time earlier in the year to a later time in the year.

Student achievement assessments are utilized as data (Shen et al., 2010). The purpose of schools utilizing student achievement test data is to determine the status of student learning and compare it to national samples to identify where students grew or regressed in their overall achievement in various content and skill areas. Educational leaders use student achievement data to make decisions related to curriculum and instruction, which involves determining the placement of students, evaluating strengths and weaknesses of students, instruction, and teachers, and assessing the curriculum used in classrooms (Shen et al., 2010).

Student Achievement in California. In order to measure student achievement at a given point in time, the CAASPP is administered in California to determine if students are demonstrating growth in various skills as well as in English Language Arts and mathematics. The CAASPP is an adaptive online standardized test that is administered in many states nationwide once a year. This assessment is aligned with the Common Core State standards and assesses grades three,

eight, and eleven in the content areas of English Language Arts and mathematics as well as critical thinking, writing, and problem-solving. The CAASPP consists of two distinct parts: Performance Task (PT) and a Computer-Adaptive Test (CAT), which assess students through open-ended and multiple-choice questions (Smarter Balanced, 2017).

School Improvement

According to Stringer (2013), there is not one all-encompassing definition of school improvement. Instead, there are features to the definition that allow us to define school improvement. School improvement encompasses the features of shared goals and strategies "based on a thorough needs analysis and ongoing development and renewal cycle" (Stringer, 2013, p. 11). To break shared goals and strategies down further, they pertain to school-wide leadership, expanding of knowledge of teachers in their use of student data to improve their teaching and student learning outcomes, establishing external connections for expertise and guidance from experts, and having school-wide change occur in multiple levels within a school (Stringer, 2013).

School improvement encompasses the idea of capacity building. Without capacity building, school improvement does not occur (Fullan, 2005). Maden (2001) stated that capacity is "the single most important matter in trying to identify how and why some schools maintain and sustain improvement" (p. 320). Capacity building involves developing "skills, knowledge, motivation, resources, and dispositions to act together to bring about positive change" (Fullan, 2005, p. 4). In general, the most capacity building takes place in Professional Learning Communities (PLC), which are groups of educators who evaluate data and practice in an ongoing manner through reflection and collaboration (Stoll, Bohman, McMahon, & Thomas,

2006). Therefore, the ongoing capacity building allows for school improvement to take place within schools.

History of Measuring Student Achievement and School Improvement

Throughout the course of history, American schools have established more accountability measures as the American education system moved from private schools to a predominantly publicly funded education system. It was not until the mid-1800s when there was a major shift in the U.S. education system. Until then, education in the U.S. consisted of mostly private schools ran by private tutors (U.S. Education, 2010). In terms of state-run education, only colleges were where instruction was formal before mass education was established. As time progressed, when mass immigration took place during the nineteenth century, stakeholders in the industry, education, and religion noticed the lack of education amongst the U.S. population (U.S. Education, 2010).

By 1850, there was a massive growth in public schools, which resulted in them becoming abundant and taking a large portion of the student population. When Congress passed several federal policies issuing land grants to pay for the expanding education system, the Department of Education was established in 1867 to oversee education in the U.S. From its inception, the Department of Education's main objective was to collect data on schools, teachers, and administrators in order to help states establish more effective and accountable school systems (League of Women Voters, 2011). Accountability measures further increased with the passage of the Elementary and Secondary Education Act of 1965. Through this Act, there were several programs launched such as Title I, which allowed for federal aid for disadvantaged schools. With more funding from the federal government going to disadvantaged schools in the states, schools were required to provide data to their local state agencies as well as the

Department of Education for the federal government to determine whether schools were being accountable with their funding (League of Women Voters, 2011).

Currently, all states in the United States have some form of an accountability system for their schools that include accountability indicators in place for them to receive funding. These indicators involve student assessments evaluating their progress over time. In California, the California Department of Education has issued statewide student assessments since 1960 (California Department of Education, 2010). However, it was not until the Public Schools Accountability Act of 1999 (PSAA), which required all K-12 schools in the State of California to assess students in grades two through eleven to take the California Standards Tests as well as a nationally normed standardized test each year as a measure of school accountability. The California Standards Tests were based on the state's academic content standards and nationally normed content standards (California Department of Education, 2010). In 2010, California reformed its statewide student assessments to assess new types of knowledge and skills that pertain to new standards established in California as well as the Common Core Standards (California Department of Education, 2010).

Defining Standardized Testing

Standardized tests are assessments that are administered and scored under standardized and controlled settings that outline when, where, and how long students can respond and answer questions on academic content (U.S. Legal Definition of Standardized Testing, 2014). Another primary purpose of standardized tests is to help provide an evaluation of whether a student masters a domain of knowledge of a specific skill (U.S. Legal Definition of Standardized Testing, 2014). Standardized tests are used as accountability measures for state and federal

education agencies. School funding, accreditation, ranking, and improvement are other factors that need standardized tests to measure progress.

Arguments For and Against Standardized Testing

There are several arguments for the administration of standardized tests. Gawthrop (2014) argued that standardized tests remove teacher bias due to the uniformity of specific measures of fairness and objectivity of a large population of students. Gawthrop (2014) stated that standardized tests provide valid and reliable scores that can be compared to a national sample of students at the same grade level. This allows for scores across the state as well as the nation to be compared to determine how well students are performing. Another argument provided by Gawthrop (2014) stated: "standardized testing is a cheap and efficient method of measuring schools if schools are achieving state standards, sometimes forcing schools to revise curriculum and testing programs so that they can reach those standards" (p. 7). Overall, educators who favor standardized tests believe they provide a cheap and efficient avenue to measure student growth across academic content and demographics. As a result, this data collected from standardized tests can be used as one of many indicators to measure student achievement as well as to determine whether a school is improving from year to year (Gawthrop, 2014; Zieleniak, 2013).

There are several arguments against the administration of standardized tests. First, according to Ritt (2016), standardized testing negatively affects students who are in marginalized subgroups of at-risk students, which, includes students with disabilities and students of color. In addition to this finding, Ross (2018) outlines how the use of high stakes testing is damaging to students of low socioeconomic status. One can argue that standardized tests harm these groups of students because they do not provide an avenue for marginalized sub-groups of students to

demonstrate their knowledge. Furthermore, Gawthrop (2014) discussed how standardized tests have limitations of what they can actually do; standardized tests are created to assess a student's knowledge base, which means they are not representative of the student's total academic ability. Many argue that standardized tests create unnecessary test anxiety for students. Fullan (2016) found there is not a significant relationship between student test anxiety and their scores on standardized tests. As a result of studies from Gawthrop (2014), Fullan (2016), and Ross (2018), there is an argument in place that describes how the limitations of standardized tests may place an undue burden on students of various demographics and economic status'. Thus, there is a growing group of educators who are against standardized tests because they believe they may harm marginalized sub-groups of students. Moreover, they believe standardized tests are not an accurate measure to assess student achievement because they do not measure a student's overall academic ability (Ross, 2018; Ritt, 2016; Gawthrop, 2014).

CAASPP's History. According to the CAASPP's parent organization Smarter Balanced Assessment Consortium, the CAASPP was developed in 2010 when 30 states came together to submit a grant application for funding that would be used to help develop new assessments composed of test questions measuring the skills of critical thinking, writing, and problem-solving. These new assessments would be taken online and customizable for all students, which helps ensure that testing is fair for all students and supports teachers in their professional development (Smarter Balanced, 2017). The consortium of states was awarded a $178 million federal grant after they developed the Smarter Balanced Assessment in 2010 with the state of Washington acting as its primary fiscal agent (Smarter Balanced, 2017). After four years of continued development and implementation, the CAASPP became one of the most used assessments in the United States. In the state of California, the CAASPP was implemented for

the first time in 2014 and continues to be the state's primary summative assessment for K-12 education.

CAASPP's Importance. The CAASPP scores are important because they allow schools, districts, and the state of California to determine how well students are doing in English Language Arts and mathematics on a yearly basis. Also, the CAASPP scores for the eleventh-grade test help determine whether students will be ready for entry-level college courses and whether students could be exempt from remedial classes (Edsource, 2015). The CAASPP is vital for educational leaders because it allows them to collaborate with teachers in developing instructional plans and professional developments, which target the academic areas of need for students who need additional support (Edsource, 2015). As a result, educational leaders can utilize the data from the test scores to make decisions regarding what they want to do school-wide and district-wide to improve test scores for targeted student demographics as well as improve their school and district's overall score.

Conclusion

Within this section of the literature review, student achievement and school improvement were defined and linked to California's Smarter Balanced assessment. In California, the CAASPP is a major indicator of student achievement that can be measured over several years to indicate whether K-12 schools have improved in mathematics and English Language Arts. The data collected from this assessment can be used by educational leaders to make decisions at the school and district level. The decisions made by educational leaders with this data can impact curriculum, teacher evaluations, interventions, and school finance. Therefore, the CAASPP is an essential indicator to help educational leaders measure student achievement in California.

Educational Leaders

Defining Educational Leaders

The epistemology of educational leader is not entirely clear and "there is a lack of clear meaning regarding the notion of leadership, and the limitations of the current body of educational leadership literature" (Blakesley, 2011, p. 181). This problem has morphed into the inability to "define leadership, which there is no widely accepted consensus of what leadership means and no consensus of how to best develop it or foster it" (Stack, 2006, p. 31). Therefore, in order to define educational leaders for the purposes of this literature review, there will be a discussion regarding the roles of educational leaders.

Roles of Educational Leaders. According to Fleet, Madden, Semann, and Soper (2015), the roles of educational leader's encompass a wide variety of different leadership occupancies that administrators and teachers can fill at school-sites and within districts. Based on Fleet et al. (2015) findings, educators may be considered educational leaders if they are engaged in one or more of the following leadership roles: participate in a leadership team, mentor and train staff, implement professional development, engage in best practice, are being a role model, develop a learning culture, inspire and motivate staff, assist staff with research, find resources for staff support, ensure policy and practice are current, communicate with upper staff and management, build effective relationships with children, families, and staff, develop a learning and questioning culture, provide updates and insights to a team from research, develop curriculum and evaluation, develop professional networks, communicate with and educate families, conduct staff appraisals, demonstrate and encourage reflective practice, assist staff to manage change, utilize the strengths of the team, and encouraging and supporting educators. Therefore, according to Fleet et al.'s (2015) analysis of the roles and tasks of educational leaders, there are many things

one can do that encompass this role. Furthermore, the roles of educational leaders will be analyzed through the lens of a school leader, which will yield a clearer picture of who educational leaders are at schools and school districts they serve.

School Leaders. According to Harrison and Killion (2007), being a school leader "means serving as the head of a district, school, on a committee, such as a school improvement team; acting as a grade-level or department chair, supporting school initiatives, or representing the school on community or district task force communities" (p. 74). Within this capacity, a school leader shares "the vision of the school, aligns his or her professional goals with those of the school and district and shares responsibility for the success of the school as a whole" (p. 74). Leaders who fit this definition of school leaders include principals, assistant principals, district superintendents, teacher leaders, and district coordinators (Fleet et al., 2015).

Conclusion

In conclusion, there is a broad range of leadership roles that educational leaders fill. As a result, one can conclude that when educators participate in one or more of the aforementioned leadership roles, they are participating as educational leaders. Thus, educators who engage in administrative leadership roles, and teachers who participate in leadership roles at a school-sites can be both considered as educational leaders for the purpose of this study.

Data Usage

In this section of the literature review, data usage will be discussed. First, the history and background of data use in education will be outlined. Then, data use in education will be described. Within this discussion of data use in education, there will be various conversations regarding data systems, the data available to educators, data use by educational leaders, data mining, data-driven decision making, barriers to data use in education, and the concept of data

literacy. All of these topics build upon each other as this section of the literature review progresses, which outlines the importance of data use in education amongst educational leaders, teachers, and schools and how it may affect the achievement of students.

Data Use in Education: History and Background

Data use in education is widespread and has many specific purposes. However, the idea of utilizing data to inform and guide the decisions of educational leaders and the schools they serve is relatively new to education (Earl & Katz, 2006). In the history of American education, most decisions were made based on the educational leader's best judgment, not data. Earl and Katz (2006) stated in their research that data was not very available to schools until the 1970s. Within the past few decades, computers and telecommunications technology have allowed data use to explode, which has made it available to all schools (Earl & Katz, 2006). According to the U.S. Department of Education (2010), data is used for the following purposes: school improvement, planning, setting quantitative goals, curriculum planning, budget analysis, student placement and scheduling, grouping/regrouping, tailoring instruction to individual needs and small groups, evaluating teaching practices, and evaluating student and teacher performance.

Teachers, principals, superintendents, district office personnel, and policymakers use data in education to make decisions and accountability purposes in all of the areas described above. In the next segment of this literature view, DM and DDDM will be discussed. DM and DDDM are used by educational leaders for continuous school improvement and accountability purposes. Lastly, barriers of data use by educational leaders will be outlined to describe some of the difficulties these leaders have in utilizing data in K-12 schools.

Data Uses and Data Systems

Data is gathered and stored within digital data warehouses that are linked to information software programs. Data warehouses store a repository of data collected from a variety of different data sources. A data warehouse provides the option for users to analyze data from different sources of data stored in the warehouse (Bansal & Rangra, 2014). When utilizing data systems and data warehouses in education, there are a variety of different software tools that can be used. Many of these software tools take the form of Student Information Systems (SIS). SIS's can be defined as "electronic data systems whereby a collection of programs supports the digital storage, manipulation, and extraction of information from a database" (Means, Gallagher, & Padilla, 2007, p. 9). SIS also "house current and historical data on systems, attendance, managing curriculum resources, and analyzing student data (p. 9). Thus, SIS hold large amounts of student data as well as have the ability to extract, manipulate, and analyze the student data. As a result, SIS's allow for the management of school needs for teachers and administrators. Therefore, time can be saved by educators through having access to a variety of student data within their school's SIS.

Functions of SIS. There are many functions of SIS's to help educators to amplify their practice. According to Abousaleh and Alsip (2015), "comprehensive school improvement calls for a multi-facet approach that utilizes data-driven decision making through program evaluation; ideally, student information systems are at the center of the decision-making process" (p. 4). Therefore, as part of an educator's decision-making process, SIS's can help teachers and educational leaders "disaggregate data to monitor school initiatives and student progress, and even provide a means of communication within the school and between staff and parents" (p. 4). When this information is present, it allows stakeholders from across the school and district to

have the ability to "store and efficiently access data to boost efficiency and create opportunities for the effective delivery of calculated curriculum that meets student's needs" (p. 4).

SIS's provide educators with an interface to gather data as well as a place for data visualizations to be generated. Thus, within most SIS software programs, they provide data regarding the following areas for educators to analyze: attendance, behavior reports, standardized test scores, classroom formative and summative assessment scores, grade books, transcripts and course history, and demographic data. From these pieces of data, educators can disaggregate data by "querying any or all of it to identify achievement gaps and then target those achievement gaps with evidence-based interventions (Abousaleh, Alsip, 2015, p. 4). Most SIS's have the ability to generate reports to provide to educators with specific disaggregated data from multiple data categories housed in the SIS. For example, an attendance and grade report can be generated together for educators to determine how much attendance may be a factor in a student's grades. However, not all SIS's have the same abilities to generate reports nor have the abilities of others to extract and manipulate data. Thus, depending on the type of SIS, there are limited applications to disaggregate data as well as mine the data utilizing various data mining techniques.

SIS Software Programs. In K-12 education, there are many SIS's on the market for school districts to purchase. According to G2 Crowd (2018), one of the most popular SIS software review websites, some of the most popular SIS software in U.S. schools and districts include Power School, Infinite Campus, Aeries, Skyward, Illuminate Education, Campus Management, Oracle, Focus School, Synergy, and eSchoolPlus. Across the nation, differing SIS programs are used. However, this list includes the most used SIS in the U.S., Power School,

with over 13,000 school districts registered and licensed to the use of its software (U.S. Department of Education, 2010).

Data Available to Educational Leaders

Within education, there are two major types of data that educators can use to help inform their practice: hard and soft data (Ward, Fisher, Frey, & Lapp, 2013). Hard data is comprised of formative and summative assessment and demographic data that encompasses a single school site to the district level to inform educators how well students, schools, and/or districts are doing at the end of a time period (Ward et al., 2013, p. 22). Soft data pertains to "information about student learning and instruction that is acquired by observing student and adult actions in and out of classrooms" (p. 32). In terms of hard data use, the U.S. Department of Education (2010), outlines the types of hard data available, which includes, student demographics, student attendance records, student grades, test scores, statewide assessments, course histories, student behavior data, student participation in educational programs, special education data, teacher qualification data, and administrative data utilized for budgeting and scheduling purposes. McCray (2014) discovered that the most used data types regarding data use and DDDM by principals were student grades, attendance, and discipline records.

In order to warehouse the data collected by schools, districts across the United States use data systems, such as an SIS, to track these forms of data for accountability purposes (U.S. Department of Education, 2010). This provides accountability measures for funding as well as to ensure that schools are making progress on student achievement indicators.

Data Use by Educational Leaders

Data use by educational leaders widely varies depending on several variables. According to McCray (2014), educational leaders, such as principals, use data surrounding

student grades, attendance, and discipline the most when making decisions at their school. Also, principal's tended to use data to a moderate or greater degree when making decisions on school improvement and development plans, improving classroom instruction and communicating to parents of students regarding their students' progress (McCray, 2014). In order to foster this with a great degree in schools, educational leaders are advised to develop organizational structures to influence what type of data teachers can analyze in addition to organizing a shared vision that involves a plethora of goals for data use (Schildkamp, Karbautzki, Vanhoof, 2013).

In this section, literature will be discussed regarding how data use by educational leaders is circumstantial, which means data use is varied amongst educational leaders. This relates to how data can be used in an assortment of applications and practices. Through this varied use of data by educational leaders, pertinent research will be outlined that discusses how data use by educational leaders has affected student achievement in some cases (Fischer, 2011; Martinez, 2010; Williams, 2011). However, research has also shown that data use by educational leaders is limited and has not affected student achievement (Lai & Hsiao, 2014; Shen et al., 2012; Soslau, 2009).

Research has shown in many instances that data use by educational leaders has resulted in high student achievement. The extent of data use varies between schools and districts. However, findings from Brooks (2012) demonstrates that the majority of schools have a data team in place, and principals are using data in their decision making to some extent. In terms of the amount of data use, in many instances, the most substantial amount of data used by educational leaders was found in lower performing schools (Williams, 2011). In regard to data use and student achievement, Williams (2011) found that principals who used data and data systems reported significantly high use of data tools in their efforts to improve mathematic

scores. Martinez (2010) found that middle schools and high schools in which principals used data tended to meet the Adequate Yearly Progress (AYP) standards. Fischer (2011) outlined how school AYP and comprehensive assessment scores went up when principals and teachers used data to increase academic scores.

Research has shown that data use amongst educational leaders is limited (Shen et al., 2010). Overall, there was a lack of knowledge regarding computer data systems (Wayman, Cho, Jimerson, & Spikes, 2012). When there is a lack of knowledge of computer data systems amongst educational educations, it resulted in teachers being unsure about data use (Wayman et al., 2012). A study by Lai and Hsiao (2014) explain this by discussing how the majority of schools can produce high-quality data yet need criteria for how to use data and training to implement data use. To build upon this finding, Soslau (2009) found there was not a significant relationship between a principal's ability to collect and analyze data and student achievement. Therefore, a discrepancy exists within the research regarding the need to implement high-quality data use at schools and a principal's ability to use and analyze data affecting student achievement. As a result, there is a need to investigate this further within this field of research.

The most prevalent topics in the educational literature regarding data discusses how educational leaders use DDDM to make decisions regarding the problems they face. There is some literature discussing how educational leaders use DM to help augment data to be used in DDDM. Therefore, DM and DDDM will be outlined in order to provide an overview of the current research on how each is used by educational leaders in schools.

Data Mining in Education

Educational data mining (EDM) is an emerging practice within education to organize and manage the massive growth of educational data used in learning institutions. EDM can be

defined as “the application of data mining techniques to use a specific type of dataset that come from educational environments to address important educational decisions” (Romero & Ventura, 2013, p. 12). According to Romero and Ventura (2013), EDM is concerned with “developing, researching, and applying computerized methods to detect patterns in large collections of educational data that would otherwise be hard or impossible to analyze due to the enormous volume of data within which they exist” (p. 12). Through the detection of large patterns of data, EDM analyzes data generated by “any type of information systems supporting learning or education in schools, colleges, universities providing traditional and moderns forms and methods of teaching as well as informal learning” (Romero & Ventura, 2013, p. 12). The goals of EDM involve analyzing unique data sets generated from educational settings “resolve educational research issues as well as improve the quality of managerial decisions” (Bala, 2012 p. 2).

Within the field of EDM, numerous techniques allow educators to utilize various applications. There are a variety of different types of DM techniques that can be used to manipulate and analyze data, which include association, clustering, classification, prediction, and decision trees. Their applications include predicting student outcomes, providing information to support educators and educational leaders, detecting student behavior, planning and scheduling, and data visualization.

In regard to DM, there several studies that reveal a relationship between DM’s implementation within K-12 schools and student achievement and subsequent school improvement. The studies discussed outline instances when DM was used to predict student outcomes as well as provide educational leaders with information before interventions were made on particular student populations. In Streifer and Schuman’s (2005) study, artificial intelligence data-mining tools were used to predict student outcomes. The models they were able

to produce using DM could predict student outcomes. DM has also been used to predict high school dropout rates as well as being a tool that can be used by educational leaders to diagnose at-risk students to intervene in time before the student drops out of high school (Marquez-Vera, Cano, Romero, Fardoun, & Ventura, 2016).

Moreover, in Altun and Askar's (2015) study, DM was highly accurate in predicting student's grades within an online course. Thus, there is a wide variety of DM techniques and applications available for educational leaders to implement in their school-sites and districts. Overall, the research body of DM in K-12 continues to expand as it is becoming more widely used in schools and districts around the U.S. and the world.

Decision Making

Decision-making is critical for educational leaders. Educational leaders make many decisions every day that impacts the lives of the students and teachers they serve. Decision-making can be defined as "the act or process of deciding something, especially with a group of people" (Merriam-Webster, 2017). Research regarding decision-making is varied, and there are not any concrete, universally accepted frameworks for how decisions are made. Typically, there are differing frameworks for decision-making that depend on the type of organization or individual within a particular discipline. Therefore, the following discussion on decision-making will begin with a brief outline of how businesses work through the decision-making process. The greater portion of the discussion will focus on how education leaders make decisions within the organizational sphere of a school and school district.

Decision Making Within Businesses. Within traditional organizations, such as businesses, there is no universally accepted decision-making process. However, Gibson (2011) outlined a basic decision-making framework that can be used in various organizational spheres

such as business and education. Within Gibson's (2011) framework, decisions are made by using a process that involves six specific steps. According to Gibson (2011), the six steps of this decision-making framework include: establishing specific goals and objectives and measuring results, identifying problems, developing alternatives, evaluating alternatives, choosing an alternative, implementing the decision, and controlling and evaluating the consequences of the decision (Gibson, 2011, p. 479). Based on the research of Gibson's (2011) research, while using the six-step decision-making process in a group, there is a higher probability of a quality decision of a group consensus than by a lone individual. Therefore, when looking at how decisions are made, it is important to determine whether an individual or group made the decision as well as the type of problem requiring a decision (Gibson, 2011).

Data-Driven Decision Making in Education. In education, decision-making frameworks pertain to the trend of utilizing data to drive the decision-making process. Data-driven decision-making (DDDM) can be defined as translating data into actions that inform all decisions within an educational organization (Mandinach, 2012, p. 73). In order to make decisions, data must be taken from its raw state without meaning; then, data is organized and manipulated to give it meaning within a particular context where it can be used translated into knowledge (p. 78). According to Mandinach (2012), "knowledge is a collection of information used to guide actions" which, allows educators to take "actionable steps that teachers might make to improve and address student learning" (p 78). Therefore, to transform raw data into knowledge that can be used by educators to make decisions, Mandinach (2012) outlines six necessary skills to do this: collection of data, organizing data, summarizing information, analyzing data, synthesizing, and prioritizing data (p. 78). These skills are critical to

implementing a DDDM framework because, without these skills, raw data cannot be transformed into knowledgeable information for actionable steps to be made.

The Four Domains of Data-Driven School Leadership. Where does DDDM take place within an educational organization? Sun, Johnson, and Pryzbylski (2016) reveal that DDDM takes place through an extensive process of extracting various "leadership practices that are effective in promoting data use in schools" (p. 97). In order to develop four domains of data-driven school leadership, Sun et al. (2016) took 53 distinct studies, 18 common leadership practices where DDDM takes place within an educational organization and synthesized them into broader categories (p. 97). From these 18 common leadership practices where DDDM is conducted in educational organizations, the four distinct domains were developed: data-based goal setting, developing teachers' decision-making capacity, building a data-wise culture in schools, and improving instruction based on data (Sun et al., 2016).

Data-based Goal Setting. This domain has educational leaders analyzing multiple longitudinal data sources to develop long-term and short-term goals. When data is analyzed, educational leaders should work together with teachers to create a process where they meet periodically to discuss data generated by formative and summative assessments. Through this process, teachers and students "internalize school goals and develop sub-goals" for student achievement (Sun et al., 2016, p. 98). When an educational leader set clear expectations for data use in addition to "fostering a whole-school systematic approach to the goal achievement process," it develops the systems to track goal progress through data analysis and discussion to ensure goals are in the process of being met (p. 98).

Developing Teachers' Decision-Making Capacity. Within this domain, educational leaders model how to use data, thereby training to build their capacities to use data in their daily

practice. Through this process, educational leaders provide support for groups or individuals and evaluate the staff's capacity for using data in their practice. Lastly, educational leaders provide continuous professional development regarding DDDM and data-driven instruction. This support helps motivate and encourage teachers to become more committed to data use as well as build their capacity to be familiar with the tools needed for DDDM, data collection from data sources, assessments tools, and data generating and student information and management systems (Sun et al., 2016).

Building a Data-Wise Culture in Schools. Within this domain, educational leaders build and foster trust amongst teachers to develop a data-wise culture in schools. Based on the research compiled by Sun et al. (2016), there are a number of specific practices to help build a data-wise culture in schools. To build this culture, educational leaders must set up goals and communicate clear expectations for data use, utilize data-driven knowledge for sharing instructional practices, create a purpose for data-driven decision making by linking it to student achievement, develop data use for new instructional strategies, assessments, and incorporate data analysis within the collaborative structure of the school. Above all, educational leaders must have a standardized data system in place. Standardizing a data system for a school and district, it allows for transparent data use from all educators within an educational organization (Sun et al., 2016).

Improving Instruction Based on Data. In this domain, education leaders determine the needs of instructional programs, curriculum, and promote practices that work. In addition, educational leaders analyze and progress monitor for instructional effectiveness. Through these processes, educational leaders evaluate and identify the needs of students where they develop the

appropriate interventions for instruction and curriculum through their analysis of student data (Sun et al., 2016).

Conclusion

The Four Domains of School Leadership Framework outlines how the use of data and DDDM can become normalized within an educational organization. Within each of these four domains, educational leaders have the opportunity to develop a transparent use of data and DDDM within a variety of different leadership contexts to help solve problems that schools and districts face on a daily basis. As a result, educational leaders must establish the conditions and model data use to encourage their staff to grow in their data use for a framework of data-driven school leadership to be successful (Wayman & Jimerson, 2014).

Barriers to Data Use in Education

Implementing data use is not a simple process for many schools. Schools have several significant barriers that inhibit data from being used because of several constraints, which include time, training, and technology. First, a number of researchers have found that most often, "educators do not have the afforded sufficient time to review and analyze data" (McCray, 2014). To effectively use data as an educational leader, there must be time to interact with the data in meaningful ways.

On the other hand, research demonstrates the need to improve the skills of educational leaders to use data effectively (Choppin, 2002; Mandinach, 2012). According to research conducted by Mandinach (2012), there is not a lack of human capacity to learn how to utilize data. Instead, there is a lack of many formal and informal mechanisms (e.g., professional development and university courses) in place to help educational leaders increase their ability to use data in the schools they serve (Mandinach, 2012). This builds upon Bernhardt's (2000)

research, which provides evidence suggesting that most staff at schools do not have the skills to analyze and use data effectively. Furthermore, research suggests there is a lack of funding to expand the use of data-informed decision making (U.S. Department of Education, 2010).

Another noted barrier is utilizing technology to access and analyze data. To solve this barrier, there must be technology available. Technological tools are numerous but costly to install, maintain, and train personnel to utilize the technology. By 2010, 90% of districts had the technology to track student achievement data for accountability purposes (U.S. Department of Education, 2010). However, this can differ vastly from school district to school district because of the availability of software and database infrastructure, funding, and training amongst personnel using the student data. In terms of funding, Wayman (2007) concluded that many small-sized districts do not have the funding available to afford many of the technology tools available on the market.

Barriers to Data Use for Educational Leaders. The U.S. Department of Education (2010), suggested there are several barriers for educational leaders regarding the increased use of data systems. These barriers include lack of building administrator preparation on how to use data for DDDM, lack of trained technical staff available for product and service acquisition, installation, and equipment maintenance, information located in multiple disparate databases that make it difficult to link data for analysis, making a clear vision or strategic plan for DDDM, and collaborating and sharing ideas with colleagues regarding data inquiry (U.S. Department of Education, 2010). The lack of administration preparation regarding DDDM builds upon how research has shown the need to improve the skills of educational leaders to use data effectively (Choppin, 2002; Mandinach, 2012). This goes hand in hand with hiring competent technical staff to make sure the data systems are running appropriately as well as ensuring all databases are

linked, so no data is left out of data analysis. Lastly, schools and districts are not establishing a strategic plan to work with data. Therefore, this makes it challenging to collaborate and share ideas with colleagues regarding data inquiry (U.S. Department of Education, 2010).

Suggestions for Improvement of Data Use by Educational Leaders

Within the literature, there are a number of ways to improve data use by educational leaders. This can be conducted by outlining some recommendations as well as discussing the concept of data literacy. Fullan (2010) recommended that educational leaders can improve schools and districts, including data use, by ensuring the collective capacity between the schools within a district are in sync. Furthermore, this means that educational leaders are trained and versed on the same topics to ensure everyone is on the same page. To build onto this recommendation, the U.S. Department of Education (2010) provides the following steps to improve data use by educational leaders. The recommendations include prioritizing data for DDDM for school leaders, enhance data systems to collect centrally, sort, aggregate, and report data to all school staff, and provide principals more time and capacity to work on data systems and analyze data reports. To ensure these recommendations happen, the U.S. Department of Education (2010) outlines how district superintendents need to set the tone for data use and DDDM. Superintendents need to ensure principals have the resources in place such as data system acquisition and installation as well as professional development on the data system to make sure the technology is being fully utilized. Districts must train principals on how to integrate the use of data into their student improvement plans and promote and teach their teachers to use data for decision making (U.S. Department of Education, 2010).

Data Literacy

One major area of research regarding improving data use by educational leaders is the concept of data literacy. Wu (2009) defines data literacy as a skill or ability required to read and understand data. Furthermore, the concept of data literacy takes a broader perspective and comprises of a vast array of knowledge and skills that are assumed to be important for the effective use of data in education. For example, Mandinach, Honey, and Light (2006) stated that educators need to be able to transform raw data into actionable knowledge, and therefore skills such as collecting and organizing data, analyzing and summarizing data, and synthesizing and prioritizing data are required. Mandinach (2012) expanded on this description of data literacy by considering the knowledge and skills required for the interpretation and use of data and referred to this as 'pedagogical data literacy.' This definition includes the transformation of numbers, statistics, and analysis outcomes into instructional strategies that meet the students' needs at their school site. Earl and Fullan (2003) stressed that the "process of human interpretation and creating meaning has to happen to change data into information and ultimately into workable knowledge" (p. 188). The educational level of teachers and school leaders is positively associated with high levels of data literacy (Geel, Keuning, Visscher, & Fox, 2017).

Mandinach (2012) describes how not using data effectively is not due to the lack of data literacy. Rather, there is a lack of human capacity to use data because there are not many formal or informal mechanisms in place to help educational leaders increase their data skills (Mandinach, 2012). Overall, there is a need to improve data literacy among education leaders. Much of the recommendations from the body of literature on this topic discuss building capacity and developing a culture of DDDM by educational leaders to help improve student achievement (Ikemoto & Marsh, 2007; Mandinach, Honey, & Light, 2006; Mandinach, 2012; Wu, 2009).

Recommendations to Improve Data Literacy. Wu (2009) made several recommendations to improve data literacy for educational leaders. First, Wu (2009) utilized a qualitative study using interviews to see how K-12 principals and assistant principals used data in their daily practice as educational leaders. Through the interview process, Wu (2009) determined how to improve the data literacy of these school leaders because Wu was able to find through qualitatively coding several key themes from the interview participants. Wu (2009) found that principals and assistant principals in K-12 schools need more time to develop their data literacy skills by spending more time collaborating with other educational leaders at their school-site and within their district. In conjunction with the previous findings, Wu (2009) found that technology was vital in developing data literacy because there must be supports in place to implement the proper technology to conduct data analysis. Lastly, Wu (2009) found principals must be attentive to the educational leaders they are working with as well as all community stakeholders who may utilize the data in order for data use to be transparent across their school site and district.

Based on the body of research, if educational leaders are trained in utilizing data, they will be able to provide high-quality professional development (PD) where there will be better outcomes for teachers and students (Mandinach & Gunner, 2013). Timperley and Parr (2009) recommend PD programs for educational leaders and teachers that apply high-quality assessment data practices. Through these types of PD's, at school-sites practicing high-quality assessment data practices learned from these PD's, there have been gains in student reading and writing scores at a rate that was twice as what was expected. In addition, Staman, Visscher, and Luyten (2014) discuss how PD's themed around DDDM had a positive effect on the school's teaching staff regarding their knowledge and skills of using data and utilizing DDDM. The results from

their study demonstrated that teachers increase in knowledge regarding their student monitoring system (Staman et al., 2014).

Overall, school principals are key regarding how to use data and technology to establish a data-driven culture in schools (Fullan, 2010; Mandinach, 2012; Wu, 2009). Educational leaders who are data literate have the ability to affect schools positively because they are critical in developing a culture of building capacity regarding DDDM, data collection, and analysis, stimulating inquiry amongst other leaders and teachers, and impacting how teachers use data to monitor and adjust their practice to improve instruction within classrooms (Fullan 2010; Mandinach, 2012; Wu, 2009). Furthermore, according to Wayman et al. (2010), the principals leadership is vital for data use in schools. Lastly, in schools where principal data use has been shown, it has positively affected student achievement indicators by increasing the scores on English Language Arts and mathematic standardized tests (Datnow, Park, & Wohlstetter, 2007; Creighton, 2000; McLeod, 2005; Wu, 2009).

Conclusion

Data use in education is utilized for a wide variety of uses by educational leaders and teachers. Many of the major topics regarding data use in education range from the types of data available to be used, how data is mined and organized for analysis, and how data is used in the decision-making process. Along with topics regarding data use, the barriers to data use along with the data literacy are essential to note because data use can become a complicated matter without the proper training, technical infrastructure, or budget. Principals have the most influence in schools regarding how to use data, technology, and establishing a data-driven culture. Thus, research states that educational leaders, such as principals, must be data literate in order to develop a culture of building capacity in data use within schools and school districts.

Data Use and Student Achievement

In this section of the literature review, there will be a discussion regarding how data use by educational leaders can influence student achievement. Research has demonstrated that data use by educational leaders has resulted in higher student achievement as measured by test scores. Research has also stated that data use by educational leaders has not correlated with improvement in student achievement. As a result, the research described in this section of the literature review will describe this discrepancy in the academic literature.

Educational Leader Data Use to Student Achievement

In regard to data use by educational leaders impacting student achievement, there are several studies that show data use by educational leaders has positively impacted test scores and overall student achievement. For example, Martinez (2010) indicated that in middle schools and high schools where data use took place by principals tended to have schools meeting AYP while Fischer (2011) described how school AYP and comprehensive assessment scores went up when principals and teachers used data to increase academic scores. Williams (2011), demonstrated that principals in lower performing schools who used data systems to a great extent reported significantly higher use of data tools to improve student mathematics scores. Therefore, data use across the board can help student achievement and school improvement in K-12 schools.

One notable study is by Kapan and Miyake (2010), which shows how the Atlanta Public School system saw a major improvement in student academic achievement throughout a ten-year period when educational leaders began to utilize data in their daily practice. In this study, educational leaders focused on student assessment data, which allowed for principals and teachers to see where and how improvements could be made. By following the data, educational leaders were able to see results over time through the collaborative examination of data by

measuring and monitoring it closely (Kapan & Miyake, 2010). Furthermore, Togneri and Anderson (2003) found major improvement in terms of student achievement in high poverty districts that were focused on making instructional improvement through the use of data, not professional judgment or instinct.

In regard to the use of data for DDDM, several studies relate to DDDM's implementation within K-12 schools to student achievement and school improvement. First, in Datnow et al. (2007), it stated that the key strategies to achieve data use in high performing elementary school is to build a solid foundation for DDDM and a data-use culture while investing in information management, selecting the appropriate data, building school capacity for DDDM, and using data to improve performance. Moreover, when focused training activities regarding DDDM were implemented in the Netherlands, it had a positive effect on the school staff's knowledge and skills of utilizing DDDM (Staman et al., 2014).

Increasing data use by educational leaders helps improve student achievement. Crum, Sherman, and Myran, (2009) demonstrated this conclusion by finding when principals use data, they are successful as educational leaders. However, it must be noted that in many instances, increased data use by educational leaders was one variable in a system-wide approach that ultimately impacted student achievement. Other variables each study focused on along with data use a by educational leaders was systemwide reform focused on student learning and improving instruction by adopting a shared vision, reforming professional development, redefining leadership roles, and establishing a culture of accountability by educational leaders and teachers within schools and/or entire school districts (Fischer, 2011, Fullan, 2010; Kapan & Miyake, 2010; Togneri & Anderson, 2003). Similar findings were outlined by the U.S. Government Accountability Office (2009), which describe how principals utilized student achievement data to

align the curriculum with standards and assessments, provide academic support and instruction to low achievement students, and use student achievement data to inform school decision making, instruction, and school improvement.

There is a limited body of recent literature discussing how data use by educational leaders does not correlate with some gains in student achievement. Consequently, much of the research regarding limited data use by educational leaders outlines how data use is not implemented effectively at school sites and districts (Lai & Hsiao, 2014; Wayman, 2013). Soslau (2009) explored the relationship between a principal's ability to collect, analyze, and use student achievement data. The findings of this study demonstrated that there was no correlation between the principal's ability to collect, analyze, use student achievement data and an improvement in student achievement scores. Shen et al. (2010) examined the perspectives of principals regarding the types of data they used as well as how they used that information in their daily practice as educational leaders. The findings from this small study indicated that principals applying their data to decisions was limited. Lai and Hsaio (2014) outlined how high-quality data were being collected, but not being utilized due to the need for training. This is built on by Wayman (2013), which states principals had problems leading with data use by not implementing a variety of strategies provided by research to facilitate school-wide data use.

Conclusion

From the body of available literature, more studies found a correlation between principal data use and student achievement than studies that did not find a correlation. Much of the research outlines how educational leaders utilize data and why the implementation of data use within schools is working or not working. The research focuses on the many aspects of implementing data at schools. These topics include building a shared vision, capacity, and

establishing accountability measures to ensure that data use is being utilized by teachers and leaders alike. Therefore, while several of the studies reviewed point towards a correlation between educational leader data use and student achievement, there is a need within the field to provide a detailed analysis of why this phenomenon is occurring because data use encompasses a wide range of practices and variables within schools and districts.

Leadership Efficacy

Locus of Control

To understand leadership efficacy, a discussion regarding the locus of control is needed to determine how one's self-perception can be assessed by an individual based on positive or negative consequences of a situation. Rotter (1966) proposed how an individual's beliefs can develop over time as a result of their past experiences and encounters. Through these events over time, these reoccurring experiences establish reinforced behaviors. Locus of control is a concept derived from Rotter's social learning theory as a mechanism to study an individual's self-perceptions and control (Rotter, 1966). Within Rotter's work, differences were outlined in how individuals act towards rewards versus reinforcements influence their behavior. In this analysis, Rotter (1966) discussed how the degree to which an individual feels is contingent on their behavior.

On the other hand, at times, these situations are not controlled by an individual's behavior. Throughout this process, an individual will ultimately determine their view towards the rewards or reinforcements given for their behavior. As a result, this establishes a causal relationship between an individual's own behavior and the rewards or punishments they may receive based on their actions or forces that are not under their control (Rotter, 1996). Therefore,

these are key factors for individuals to determine their own self-perceptions of control in situations they may encounter.

Under the locus of control, there are two ways an individual can perceive situations: external and internal control. External control takes place when events are not viewed as a result of one's own actions. Instead, the individual perceives events as the causation of luck, chance, fate, or as under the control of an individual who holds power over them or within society (Rotter, 1966). Internal control takes place when individuals perceive an event as a result of their own behavior. As a result, there is a relationship between their action and the outcome of the situation (Rotter, 1966). For example, an individual who may have had success in controlling their actions to shape a particular situation, these successful behaviors will be reinforced as control attempts in that will establish beliefs of internal control than behaviors that were unsuccessful attempts in the past (Rotter, 1966).

One area Rotter (1975) built upon the locus of control is the concept of generalized control and expectancy beliefs. Generalized control and expectancy beliefs affect an individual when an event is new or ambiguous. This occurs when individuals come into these events do not have any preconceived notions about how to act or react (Rotter, 1975). An example of this occurring is when there is a complex interaction between an individual's level of uncertainty and their controlled beliefs. Furthermore, this can result in the interaction of the individual's gaining a deeper depth of understanding of how an individual's beliefs about control impact the functioning situations they face (e.g., behaviors resulting from external and internal control).

Defining Self-Efficacy

Locus of control is a foundational building block for the concept of self-efficacy. Self-efficacy is one way to determine how an individual perceives his or her ability in a multitude of

different facets to complete a given task (Bandura, 1982). Bandura (1982) developed the concept of self-efficacy whereby individuals judge their abilities to "integrate cognitive, social, and behavioral skills to produce a successful course of action to produce and regulate life events" (pg. 112). Furthermore, this refers to "the global confidence in one's coping ability across a wide range of demanding or novel situations (Schwarzer, Beaßler, Kwiatek, Schroder, & Zhang, 1997, p. 71). According to Bandura (1994), self-efficacy consists of four variables that interact with one another: mastery experiences, vicarious experiences, social persuasion, and emotional and physiological conditions. Each variable associated with self-efficacy will be defined and discussed in this section of the literature review, as well as how self-efficacy relates to achievement.

Mastery Experiences. Mastery experiences are defined as the effect of directly experiencing the achievement or mastery of a goal an individual has set for himself or herself (Bandura, 1994). Furthermore, Woolfolk (1998) deemed mastery experiences as the strongest source of efficacy information. This is because efficacy beliefs are promoted strongly when an individual successfully accomplishes a goal in a given particular context or exhibits a successful behavior or skill, whereas failure of past performance decreases self-efficacy (Khan, 2012).

Vicarious Experiences. Vicarious experiences can be defined as the effect of observing the successful events of others (Bandura, 1994). This occurs when an individual observes others who are modeling successful behaviors or skills. Ultimately, through this observation, it helps an individual shape their own efficacy beliefs through the model doing an action successfully, which causes the self-efficacy of the observer to increase (Bandura, 1994). On the other hand, when poor modeling is exhibited by an individual, the observer's efficacy decreases. Moran and Hoy (1998) state that vicarious experiences can be enhanced the more closely an observer

identifies with the model, which will cause a greater impact of self-efficacy on the observing individual.

Social Persuasion. Social persuasion can be defined as verbal feedback that can strengthen one's own belief in success (Bandura, 1994). Through positive comments, they act as a source of encouragement and motivation for an individual to work harder to complete the task at hand. On the other hand, negative opinions and comments or doubtful remarks from important individuals in one's life can weaken their efficacy beliefs (Khan 2012). Pajares (1997) builds upon this concept because their findings suggest verbal comments from significant others are not as a powerful source of efficacy as the other variables like mastery experiences and vicarious experiences because they have much more impact on an individual's efficacy beliefs.

Emotional and Physiological Conditions. Emotional and physiological conditions can be defined as emotional states in a given situation that impact an individual's beliefs about their capabilities and capacity to perform a given task (Bandura, 1994). According to Bandura (1994), when an individual reacts to these emotions and physiological states, the beliefs of an individual cause them to react and understand the emotional and physiological state they are experiencing. Therefore, an individual's beliefs about their ability ultimately impact the extent they experience positive or negative emotions or physiological states during particular circumstances, which affects their motivational standard to complete a given a task (Bandura, 1994).

Self-Efficacy and Achievement. Self-efficacy can cause positive or negative influences on an individual's motivation and achievement. By having a string of positive or negative experiences, it can affect an individual's feeling of competence and capacity to either succeed or fail (Bandura, 1996). As a result, an individual will either feel confident in their abilities after

succeeding or distraught and stressed after failing. Therefore, understanding the four variables of self-efficacy is essential in deciphering an individual's competence, confidence, and capacity to succeed or fail in a given task. In various industries, including education, it is vital for individuals to assess where they are regarding their efficacy in a given task and occupation. Furthermore, this will provide insight into how well they are doing the job as well as why an individual is performing the way they are in either a successful or failing manner (Bandura, 1996).

Teacher and Leadership Efficacy

Within this section of the literature review, teacher and leadership efficacy will be explored. Teacher efficacy will be defined in addition to providing the variables influencing how teachers perceive their ability in the classroom. This then will be linked to student achievement. After discussing teacher efficacy, leadership efficacy will be defined. Then, leadership efficacy will be connected to school leaders, which includes principals. There will be a discussion outlining the effects of efficacy on school leaders and their performance as principals. Finally, there will be a discussion involving the variables influencing principal self-efficacy.

Teacher Efficacy. In education, teachers assess their ability to succeed or fail when it comes to teaching competencies to promote student learning, providing leadership among their teaching colleagues, and academic achievement. Haung, Liu, and Siomi (2007) stated that teacher efficacy works in two ways. First, it affects the students learning approach. Second, teacher efficacy positively controls teachers in their practice, and their student’s approach to learning in their teacher's classroom. To build onto this idea, Alinder (1994) outlines how teacher self-efficacy allows teachers to indicate their confidence and skill levels in all facets of

their job. Ultimately, this allows teachers to assess their confidence and skill to promote student learning and academic achievement to their desired level (Alinder, 1994). When teachers have high efficacy regarding their teaching practice, they are more motivated to teach new ideas to their students as well as share those ideas with their colleagues (Alinder, 1994). Teachers with high efficacy tend to continue to teach in the most difficult of circumstances and change their teaching strategies to overwhelm the obstacles they face in addition to taking on various leadership initiatives on campus (Alinder, 1994; Fullan, 2010).

Furthermore, teachers affect student performance when their efficacy beliefs promote desired learning and achievement levels (Tschannen-Moran & Hoy, 2001). On the contrary, if teachers have low efficacy, they will not be motivated to experiment with new ideas to teach their students (Alinder, 1994). Furthermore, student performance will be stagnant or downturn if a teacher has low self-efficacy in their ability to teach in the classroom (Tschannen-Moran & Hoy, 2001).

Influencing Teacher Efficacy. Several factors influence teacher efficacy. Pre-service teacher preparation, in-service teacher preparation, and administrative support are the most significant factors affecting teacher efficacy (Hoy & Spiero, 2005; Hoy & Woolfolk, 1993; Khan, 2012; Yost, 2002). Pre-service teacher preparation affects teacher efficacy by allowing teachers to practice teaching. Through this practice, their personal efficacy beliefs increase (Hoy & Spero, 2005). Hoy and Spero (2005) found a high efficacy perception of novice teachers and their skills and capabilities after completion of their practice teaching.

Another area affecting teacher efficacy is in-service participation. This occurs when teachers are full-time teachers who continue to expand their capabilities on the job. In-service participation involves teachers participating in professional development and mentoring by

senior teachers (Khan, 2012). Khan (2012) outlines how in-service education is conducted to enhance knowledge and assist teachers in the skills necessary to be successful in their practice. Research has shown professional development, and mentoring have positively correlated with student achievement in addition to being critical for teacher learning and development (Desimone, Smith, & Ueno, 2006; Coehn & Hill, 2001). The last major influence on teacher efficacy is administrator support. According to Khan (2012), a strong principal can establish and emphasize academic success amongst teachers because the principal will act as an advocate for teachers as well as provide opportunities to take ownership and lead school initiatives (i.e., professional development, leadership roles in grade levels and departments, and administrative duties). As a result, for teachers, this will increase their efficacy (Khan, 2012). Furthermore, teachers had higher efficacy when they were provided with conducive learning environments in which various instructional methods were practiced (Yost, 2012). On the other hand, in environments where instructional methods were not practiced nor mentored, less efficacious teachers were more inclined to practice traditional teaching practices in their classroom (Yost, 2012).

Teacher Efficacy and Student Achievement. Teacher efficacy has shown to be a variable affecting student achievement. Several studies demonstrate that teacher efficacy impacts student achievement in mathematics and English Language Arts (Gulistan et al., 2017; Khan, 2012). First, in Gulistan, Hussian, and Mustaq (2017), determined there was a strong correlation between mathematics teachers' self-efficacy and their student's performance. Students benefited when their teachers had a higher level of efficacy in their teaching practices (Hussian & Mustaq, 2017). In another study by Khan (2012), it demonstrated there is a significant relationship between teacher's self-efficacy and student academic achievement in the

subjects of mathematics and English Language Arts. In mathematics, male teachers had a higher perception of their self-efficacy than female teachers whereas, in English Language Arts, female teachers performed better due to their higher perception of their self-efficacy than male teachers (Khan, 2012).

On the other hand, low academic achievement can result from teachers who have low self-efficacy beliefs (Gulistan et al., 2017). In these cases, teachers with low self-efficacy blamed students for their poor learning. Furthermore, research has shown that teachers with lower perceived self-efficacy had lower student scores at the end of the year for mathematic assessments (Eberle, 2012). Overall, teacher efficacy is an important variable for student achievement and cannot be discounted as a variable that influences how teachers and their students perform.

Leadership Efficacy. Efficacy is a variable that not only affects teachers in the classroom. It also affects teachers in leadership positions, school leaders, and school district leaders, which include grade level teacher leaders/teacher department chairs, assistant principals, principals, district coordinators, district assistant superintendents, and district superintendents. Before outlining how school leaders are affected by efficacy, leadership efficacy will be defined. McCormick (2001) outlines self-efficacy for leaders as "using social influence processes to organize, direct, and motivate the actions of others by requiring persistent task-directed effort, effective task strategies, and artful application of various conceptual, technical, and interpersonal skills" (p. 28). To be successful in this instance, Wood and Bandura (1989) outlined how leaders must have a robust sense of efficacy in order to be productive, focused, and demonstrate a

needed effort to persevere and succeed at organizational levels that encompass their leadership scope.

Leaders who view themselves as competent in various capacities are more likely to gain followers committed to their organization. Additionally, leaders who view themselves as competent are persistent in overcoming the obstacles of change (Paglis & Green, 2002). Research has shown this to be evident because leadership self-efficacy was strongly related to performance evaluations given by peers and subordinates on their leadership ability. Leaders who view themselves highly as leaders correlate with highly rated performance evaluations that they were given by their peers (Paglis & Green, 2002). Within situations where leaders who believe they are highly efficacious in their leadership position, they were able to mediate and control their employee's engagement with their work. Therefore, it is critical for leaders to develop a rapport with their employees through their ability to engage them in their work because it will determine their employees' level of engagement to complete given tasks by their leader (Luthans & Peterson, 2002).

Efficacy and School leaders. In terms of school leaders, leadership efficacy is a driving force for principals to accomplish their goals within their leadership capacity. However, it must be noted that there is not much evidence linking the impact of principal or school leader self-efficacy to student achievement. The research will be summarized regarding how the efficacy of school leaders affects school leaders as well as the schools they serve. Lastly, the variables influencing principal self-efficacy will be discussed.

Osterman and Sullivan (1996) determined principals were more willing to adapt their leadership to meet their school's climate and context when they had a strong sense of self-efficacy because they were found to be persistent in pursuing their goals. Principals who were

highly efficacious were persistent in their efforts to achieve their goals for their school site. It also must be noted that highly efficacy principals did not persist using unsuccessful leadership strategies. Rather, they adapted to what worked in their specific contextual setting (Osterman & Sullivan, 1996). Furthermore, highly efficacious principals regulate their personal expectations to correspond to the conditions they are facing instead of interpreting their ability to solve problems quickly (Lyons & Murphy, 1994). This means principals who perceive themselves highly efficacious remain confident, calm, and have a heightened sense of humility because they are more likely to use personal power that is internally based, which allows them to act more like an expert and reference power when carrying out their roles at a school site (Lyons & Murphy, 1994).

Principals with a low sense of efficacy are at a complete contrast with principals who have a high sense of efficacy. Furthermore, principals with a low sense of leadership efficacy perceive they do not have the ability to control their environments and do not modify or apply appropriate strategies after using unsuccessful strategies (Osterman & Sullivan, 1996). Principals with low efficacy in their leadership abilities are more likely to blame others after consistently using a strategy that has failed. In situations like this, principals cannot see the opportunities to develop support or adapt to, which makes it challenging for them to effectively lead their school (Osterman & Sullivan, 1996). Another area that low efficacious principals struggle with is working through emotions of anxiety, stress, and frustration. When working through these emotions, principals who do not have much confidence in their abilities are more likely to rely on institutional bases of power, such as their ability to reward and punish their followers, positional and hierarchical derived power, and coercive power (Lyons & Murphy, 1994). This means that principals will not use their leadership ability to get what they want.

Rather, principals will use their hierarchical position as the school leader to influence situations occurring at their school site. Lastly, Friedman (1997) described how inefficacious beliefs of principals would lead to higher levels of burnout from the profession. Over time, when an individual exhibits negative attitudes, lack of empathy, lack of accomplishment, and depersonalization occur, burnout is more likely amongst the principals (Friedman, 1997).

There are several variables associated with influencing a principal's self-efficacy. Dillard's (2014) study found that principals self-efficacy beliefs were influenced by mastery experiences, vicarious experiences, social persuasion, and affective states. Mastery experiences involve principals accomplishing or not accomplishing their goals, and vicarious experiences allow principals to see successful or unsuccessful actions in their contextual setting. Social persuasion occurs when principals hear positive comments reinforcing their leadership actions. Lastly, affective states involve the positive or negative emotions a principal may feel before, during, or after an event occurs. Overall, each of these variables is dynamic because they are constantly changing over the course of the principal's time at the school site as well as mold the principals development as a leader over time (Dillard, 2014). Lastly, Dillard (2014) recommended the need for leadership development programs to review efficacy development practices to ensure leaders were aware of what may be influencing their perception as a leader as well as their perception of their ability to lead in their respective school leadership positions.

Finally, it must be noted, the literature on this topic links effective leadership and self-confidence with self-efficacy. Scholars differ on this notion as Tschannen-Moran and Garesis (2004) believe self-confidence differs from self-efficacy while Leithwood and Jantzi (2008) believe "every major review of the leadership literature lists self-confidence as an essential characteristic for effective leadership (p. 23). Therefore, for the purposes of this study, data use

and data use confidence will be associated directly with the notion of effective leadership, which will be an area efficacy will be measured for educational leaders.

Measuring Efficacy for Educational Leaders

Efficacy for educational leaders can be measured in several ways through the development of instruments by several notable researchers. However, before going into how to measure self-efficacy, it is important to note that Bandura (2006) describes that there is not an "all-purpose measure to self-efficacy" because it has "limited explanatory and predictive value" to be an all-purpose test (Bandura, 2006, p. 307). Measures exist from Bandura (2001), Tschannen-Moran (2014), Hillman (1986), Dimmock and Hattie (1996), and Leithwood and Jantzi (2008), which all attempt to measure the efficacy for educational leaders like principals. In this section, each of these researcher's methods of measuring self-efficacy for educational leaders will be briefly explained because the literature on self-efficacy and educational leaders is sparse, but not incomplete. Specifically, Tschannen-Moran's (2014) measure of a principal's sense of self-efficacy will be discussed. Then, one of the most extensive studies measuring principal self-efficacy in Leithwood and Jantzi (2008) will be outlined. Each of these discussions is important in piecing together how principal self-efficacy is measured and how successful researchers have been in measuring self-efficacy for principals.

In Hillman (1986), principal self-efficacy was measured following attribution theory where the stability of the cause of fixed variables and the locus of control were tapped to be measured. For a number of situations principals face on a daily basis, principals were given four answer choices to a given question, which looked at attributing the situation principals faced to their natural ability, the effort they had to put into the situation, the difficulty of the task, and perceived luck (Hillman, 1986). Based on the principals answer to given situations, self-efficacy

was measured by this instrument to determine how the principals felt about their ability, effort, the difficulty of the task, and luck that went into situations they faced as principals leading schools.

Dimmock and Hattie (1996) measured self-efficacy through utilizing vignettes to measure various situations a principal might face at the schools where they are the leader. The six areas the vignettes were used to measure self-efficacy were in principal functioning, school development, planning, teaching, learning and curriculum, managing staff, budgeting, managing parents, and managing the environment (Dimmock & Hattie, 1996). Principals were able to define the situation in their own terms within these six areas, which helped elicit their opinions, beliefs, attitudes, and comments to the situations they may experience in their role as an educational leader.

One of the most notable self-efficacy measures is from Bandura (2001), which states self-efficacy measures should include both a level and strength of efficacy beliefs in relation to a given task. This means the instrument should refer to the level of task difficulty and the range of task difficulty. Ultimately, through measuring task difficulty and the range of tasks at varying difficulties, it can tap into an individual's efficacy beliefs (Bandura, 2001).

When measuring efficacy beliefs, the strength of the efficacy beliefs should be assessed on a continuum so that respondents can identify a point along the continuum instead of a yes or no format (Bandura, 2001). Furthermore, Tschannen-Moran (2014) developed a similar instrument, as Bandura (2001) for researchers to measure a principal’s sense of self-efficacy as an educational leader leading a school. This instrument is used to help researchers gain a better understanding of how principals perceive their everyday tasks and how the tasks they complete may create challenges for principals.

One of the most extensive studies regarding measuring principal leader efficacy was conducted by Leithwood and Jantzi (2008). This study examined leader efficacy and leader self-efficacy and leader collective-efficacy (McCray, 2014). Self-efficacy was defined in this study as a leader's perception of their ability and beliefs to student learning and improve instruction (McCray, 2014). Then, leader collective-efficacy is defined as the leader's beliefs in the collective group that there is "the capacity to improve instruction and student learning" (McCray, 2014, p. 35). Leithwood and Jantzi (2008) found there to be significant effects of leadership self-efficacy and collective self-efficacy on the leaders' "behaviors but also the conditions of learning and ultimately student learning" (p. 35). Leithwood and Jantzi found is that there is not much empirical evidence to support this conclusion. Therefore, Leithwood and Jantzi (2008) were able to develop a large-scale national study to address how leader efficacy influences a leader's behavior within the entire school, its classrooms, and on student learning.

Within Leithwood and Jantzi (2008) study, they were able to sample 96 schools and administrators along with 2,654 teachers from 45 districts across nine states. The instrument consisted of a principal survey and a teacher survey to acquire measures of principal self-efficacy and principal collective efficacy (Leithwood & Jantzi, 2008). Then, Leithwood and Jantzi (2008) measured student learning by obtaining assessment scores of students meeting or exceeding proficiency levels in English Language Arts and mathematics over three years from 2003 to 2005. To determine whether any student learning and achievement occurred, they compared the percentage of students scoring proficient or above in 2001 to students scoring proficient or above in 2005. Leithwood and Jantzi (2008) were able to compute results through several bivariate correlations, which found that leader self-efficacy was not related to English Language Arts or mathematics levels of student achievement. However, their findings regarding

leader collective-efficacy "was moderately related to the percent of students scoring proficient or above for both the 2003 and 2004 academic years" (McCray, 2014, p. 37). Overall, in terms of student achievement, it was found that leader self-efficacy or leader collective-efficacy were not related (Leithwood & Jantzi, 2008).

Conclusion

Discussing self-efficacy is vital in understanding how a leader perceives his or her ability to lead a wide range of attributes. Self-efficacy is influenced by several variables: mastery experiences, vicarious experiences, social persuasion, and emotional and physiological conditions. Teachers and principal's efficacy is determined by various factors, which has been shown to affect student achievement in different ways. Teacher efficacy was shown to affect student achievement in mathematics and English Language Arts positively (Khan, 2012). However, principal self-efficacy was shown to not have a significant impact on student achievement in English Language Arts and mathematics scores (Leithwood & Jantzi, 2008). Principal self-efficacy is measured in several ways ranging through to use of vignettes and surveys to measure various efficacy attributes to varying degrees (Bandura, 2001; Dimmock & Hattie, 1998; Hillman, 1986; Leithwood & Jantzi, 2008; Schneider, 2007). Further on in this review, more specific instruments measuring leadership self-efficacy in the form of leadership, data use, and data use confidence will be discussed.

Leadership Efficacy, Data Use, and Student Achievement

Leadership efficacy regarding data use amongst educational leaders is a growing field of research. Historically, much of the research has been on self-efficacy beliefs of teachers and how it may relate to student achievement (Barr, 2002; Guskey & Passaro, 1994; Khan, 2012; Gullistan et al., 2017; Tschannen-Moran et al., 1998). Much of the research regarding leadership

efficacy relates to how a principal perceives their ability to do all aspects of the job as a school leader. Lockard (2013) finds there is evidence to support common leadership behaviors of principals who report high levels of self-efficacy, which parallels the schools with high reading achievement scores. However, there is literature that narrows this lens to discuss the topic of how a principals perceived ability regarding data may or may not yield positive gains in student achievement (McCray, 2014; Miller, 2007; Vanhoof, Vanlommel, Thijis, & Vanderlocht, 2014).

From this body of literature, a number of studies evaluate how a principals level of self-efficacy regarding data use as well as how a principals perceived level of data use and competency of data use affects student achievement in the form of test scores (McCray, 2014; Miller, 2007; Schneider, 2007; Vanhoof et al., 2014). Miller (2007) first describes how principals perceive their DDDM skills and found that the majority of principals perceived they were demonstrating proficiency in using data to drive their decision making. To build onto Miller (2007) findings, Vanhoof et al. (2014) discuss how attitude exhibited the strongest correlation with data use by principals. Therefore, principals who had the best attitude towards data used data the most. However, this study did not look at how a principal's attitude regarding their data use affects student achievement. McCray (2014) outlines how principals who highly perceived their ability to use data utilized data extensively to make decisions regarding school improvement plans, informing parents of progress, assigning students to remedial programs, and improving classroom instruction. Overall, it was determined in this study that there was no relationship between the measures of principal's data use perceived self-efficacy and student achievement (McCray, 2014).

Through this review of the literature, it found various studies that exist which encapsulate measuring perceived leadership efficacy and data use (Miller, 2007; Schneider, 2007; Moak, 2010; McCray, 2014; Vanhoof et al., 2014). Furthermore, for this study, there will be a narrowed discussion focusing on how educational leader's efficacy and data use, which can be measured simultaneously. Thus, the following two subsections will outline two different survey scales used to measure leadership efficacy concurrently with data use.

Measuring Leadership Efficacy and Data Use: Principal's Perceptions of DDDM: The School's Principal's Perspective Survey

The Principals Perceptions of DDDM: The School's Principal's Perspective is a four-part survey scale that will be modified and utilized for the purposes of this study. This scale was initially developed by Schneider (2007) and modified by McCray (2014). McCray (2014) modified this scale by deleting and rewriting various items throughout the survey that did not relate to the population being studied or items that did not relate to the study's research questions. Overall, for the purposes of this study, this scale will be used to help determine how educational leaders perceive educational data's availability/importance and how different types of data are used, the extent in which educational leaders use data, and how educational leaders perceive the importance of different data items they use and their ability to use data for making effective decisions in their position as educational leaders. Thus, through this discussion, each part of the survey will be briefly outlined. Then, there will be a discussion regarding how Schneider (2007) established the validity and reliability of this scale during its development within her research.

Section 1: Demographics. The first section of this scale is used to gather demographic data on educational leaders. Data gathered in this section provides for background information

for each participant, which includes their position as an educational leader, years of service, highest educational degree, and current school district and school of employment.

Section 2: Types of Data Educational Leaders Use. The second section of this scale requires participants to check columns relating to the "importance, availability, and utility of different types of data" (McCray, 2014, p. 46). This portion of the scale measures data use by educational leaders by determining what types of data educational leaders utilize in their leadership position as well as its availability and importance (McCray, 2014).

Section 3: Educational Leader Efficacy. The third section of this scale requires participants to record their answers on a four-point Likert scale relating to the "extent in which they utilize data to make different types of decisions" (McCray, 2014, p. 47). Participants' responses will be recorded on a Likert scale where selecting one on the scale represents "Not at all," and responding with a four represents "To a Great Degree" (McCray, 2014). This portion of the scale is designed to measure the efficacy of educational leaders to gain a better understanding of their perception of their leadership ability in their school or district leadership role (McCray, 2014).

Section 4: Data Use for an Educational Leader to Make Data-Driven Decisions. The fourth and final section of this scale requires participants to record their answers on a six-point Likert scale relating to "determining the principals perceptions of the importance of different items in their ability to use data effectively in their decision making" (McCray, 2014, p. 47). Participants responses will be recorded on a Likert scale with six choices ranging from one "Don't know/No opinion" to six "Extremely Important" (McCray, 2014). Overall, this portion

of the scale is designed to measure how educational leaders use data to make decisions in their capacity as leaders at schools and districts.

Validity and Reliability of Survey Scale. In terms of ensuring the reliability and validity of the scale during its development, Schneider (2007) incorporated relevant research, interviewed pertinent administrators at the school and district level, and conducted a pilot study where experts in educational administration participated as participants to evaluate the scales' contents (McCray, 2014). As a result, this scale meets the construct validity criterion in educational research (Lunenberg & Irby, 2008). Successive studies such as McCray's (2014) study have utilized this scale in a modified version, which demonstrates further evidence of its validity.

Second, Schneider (2007) established the reliability of the scale by utilizing a pilot study. The form of reliability established with the pilot study is called stability reliability because the scale has been tested and retested to the same group of expert participants two times during its development (Lunenberg & Irby, 2008; McCray, 2014). When Schneider (2007) conducted the pilot test, participants of the same group were administered the scale twice over a two-week period where "the frequency and percentage of agreement between responses were calculated" (McCray, 2014, p. 50). During this pilot test in Schneider (2007), the scores from each test administration were highly related because the scores during the initial test and retest were comparable in regard to the frequency agreement between responses and the percentage agreement between responses. This means the "survey scale had good test-retest reliability" (McCray, 2014, p. 50).

Measuring Data Use Efficacy: Principal's Data Use Self-Appraisal Survey

The Principal Data Use Self-Appraisal Scale was developed by McCray (2014) to ask educational leaders, like principals, to "rate their ability to performance specific tasks related to data use," which relates to an individual's confidence to complete specific tasks involving data use (p. 50). This self-efficacy scale developed by McCray (2014) is derived from Bandura's (2006) Guide for Constructing Self-Efficacy Surveys. Bandura (2006) developed this guide to help researchers build item scales to measure self-efficacy that "accurately reflects what a person can do as opposed to what they will do or have done" (McCray, 2014, p. 51). As a result, McCray (2014) developed an instrument in the form of a survey scale that has 31 items with a scale ranging from 0 to 100, whereby participants rate their abilities on whether they can complete a task relating to data use in their capacity as educational leaders (e.g., 0 relates to not being able to do the task at all; 100 relates to highly certain of ability to complete a task).

Validity and Reliability of Survey Scale. In order to ensure the validity of this scale, McCray (2014) built a strong conceptual understanding of this topic by utilizing Mandinach's 2008 and 2012 research on effective data use for school improvement. Thus, this rests upon Bandura's (2006) recommendation that the validity of the self-efficacy scale is predicated on a conceptual understanding of the topic from a leading researcher in a field of study.

During the construction of this scale, McCray (2014) relied on Bandura's (2006) recommendations of building a scale that included, gradations of challenge, response scales that rate the strength of belief in one's abilities, collects data anonymously, and be called something other than self-efficacy. Prior to McCray (2014) completing the study, McCray secured the measures of validity and reliability by reviewing the literature on self-efficacy scale development and effective data use and DDDM, completed a pilot study utilizing various participants filling

out the scale to ensure its content was clear, ensured the scale was interpreted by experts in the field of educational leadership, and the scale was re-tested to establish reliability.

Conclusion

Through this review of the literature about leadership efficacy and data use, it outlined how studies on the self-efficacy of teachers and principals ultimately funneled into studies measuring self-efficacy and data use of educational leaders. Two distinct measurement scales that measure self-efficacy and data use were discussed in-depth. Within this discussion, both survey scales were deconstructed to determine how they measured leadership self-efficacy, data use, and data use confidence. Lastly, the validity and reliability of the scales were discussed.

Importance of Correlational Research in Educational Research

Correlational research is regularly used in educational research as a way of determining "a relationship between one or more variables" (Lunenberg & Irby, 2008, p. 35). Correlations are associated with associational research because they "look at the relationships among two or more variables that are studied without an attempt to influence them" (Fraenkel & Wallen, 2000, p. 359). When there is a relationship between one or more variables, the variables are correlated with one another. There are positive and negative correlations. Positive correlations relate to whether a variable goes up or down in tandem with one another (Lunenberg & Irby, 2008). Negative correlation relates to when the value of a variables goes up; the other variables go down (Lunenberg & Irby, 2008). In correlational research, it is represented by the statistical letter of *r* to indicate a correlation coefficient, which represents "the strength and direction and range between two variables that indicate a positive association (0 to +1)" (Lunenberg & Irby, 2008, p. 36). Therefore, in educational research, a "correlation of .30 may be considered significant, and any relation above .70 is almost always significant" (p. 36). This means the

higher the decimal is to one, the stronger the correlation. Consequently, if the decimal is closer to absolute zero, the weaker the correlation.

Relevant Research: Principal Data Use Efficacy and Student Achievement. There are a few educational, correlational studies that analyze the connection between principal self-efficacy, data use, and student achievement (McCray, 2014; Moak, 2010). First, Moak (2010) looked at how the perceived self-efficacy of elementary principals may correlate with the student achievement of students from third to sixth grade. Moak (2010) assessed the self-efficacy of each principal participating in the research by collecting data using an online survey, which was then correlated with a yearly academic assessment score of student participants to determine if a relationship existed between these variables. In this study, there was no relationship found between principal perceptions of self-efficacy and student achievement during the year of the principal survey and when the student assessment data was collected. Second, McCray (2014) utilized correlational research to "determine if measures of principals data use self-efficacy are related to measures of student achievement at their respective schools" (p. 45). McCray (2014) utilized a self-appraisal survey, which collected data regarding principal data use self-efficacy that measured the participant's confidence in conducting various data uses and practices as an educational leader at their school site. The data collected was then correlated to yearly district mathematic and English Language Arts assessments. Ultimately, the results of the study show there was no correlation between "the measures of principal data use perceived self-efficacy and measures of student achievement" (p. 90).

Summary

In summary, this chapter evaluated the literature regarding educational leader efficacy and their data use. Overall, data use amongst educational leaders has increased over the last few

decades. This was due to the explosion of technology and software available for educators to use. In turn, educational leaders have many responsibilities regarding their own data use as well as implementing school-wide and district-wide data initiatives for other educational leaders and teachers to utilize.

Data literacy of educational leaders is a growing topic within educational literature. Mandinach (2012) warns there are not many formal mechanisms to build capacity for the data use of educational leaders. However, there is research available that discusses how to improve data use amongst educational leaders and teachers (Ikemoto & Marsh, 2007; Mandinach et al., 2006; Wu, 2009). Therefore, further research needs to help bridge this gap in order to develop formal mechanisms to improve how educational leaders build capacity in their data use.

Research has demonstrated in some cases that data use by educational leaders has not affected student achievement. Many educational leaders, like principals, believe they are using data at a proficient level. However, two studies have shown perceived self-efficacy regarding data use. Ultimately, these studies concluded that high levels of perceived self-efficacy among principals and their data use do not correlate with student achievement (McCray, 2014; Moak, 2010). Therefore, further research can investigate why there is a gap regarding some educational leaders' perceived ability to use data and its non-correlation with student achievement.

CHAPTER 3: METHODOLOGY

The purpose of this study was to understand the relationships between educational leadership efficacy, data use confidence, data use, and student achievement with leaders in education. This study utilized two research methods. The first research method employed will be quantitative, and the second research method will be qualitative. The quantitative research method will be a correlational research design, and the qualitative research method that will be employed is a qualitative analysis in the form of thematic coding. This chapter provided the details on the following aspects of this study: research design, participants, instrumentation, data collection, and data analysis.

Research Design

This study utilized two research methods in a mixed methods approach. The most dominant research method employed in this study was a correlational research design. According to Lunenberg and Irby (2008), a correlational research design determines a relationship between two or more quantifiable variables in addition to measuring the magnitude of the relationship between the variables. When a relationship among variables occurs in correlational studies, the variables being looked at are not being experimentally controlled (Gall, 2007). There are two different types of correlational studies that can be conducted, which are considered relationship studies or prediction studies. In education, correlational research helps determine if variables are associated with noteworthy and intricate variables such as student achievement (Gay, Mills, & Airasian, 2009). Thus, correlational research is used to "determine if a numerical measure in the form of a relationship is found between two or more variables based on the strength and direction via the correlation coefficient" (Lunenberg & Irby, 2008, p. 36). This study will look at the relationships between various variables. Furthermore,

correlational research does not analyze causal relationships, but in a wide array of studies, it looks at the consistency of the relationships as well as has the possibility of providing predictions when correlations are high whereby one variable can be used as a measure to predict the measure of another variable (Lunenberg & Irby, 2008). Therefore, to fulfill the purpose of this study, a correlational research design was used to determine if the following measures were related to one another: educational leadership efficacy and data use confidence; educational leadership efficacy and data use; data use and data use confidence; educational leadership efficacy and student achievement; data use confidence and student achievement; and data use and student achievement.

The second research method the researcher incorporated into this study was a qualitative research design. This qualitative research design incorporated grounded theory, which is the process of taking gathered data from a phenomenon and developing categories to disseminate relationships and construct themes (Lunenberg & Irby, 2008). In order to do this, the researcher employed thematic coding to construct themes from various data categories to determine what types of relationships and themes were found in the collected data.

Table 1

Summary of Research Design: A Mixed-Method Study

Quantitative	Qualitative
• Correlational research design • 6 Research Questions • Determining various relationships among four variables by computing correlations	• Qualitative research design utilizing grounded theory • 2 Research Questions • Thematic coding of data to determine relationships and themes

• Conclusions developed from the quantitative findings may help reinforce and further enhance the qualitative findings	• Conclusions developed from the qualitative findings may help reinforce and further enhance the quantitative findings

Participants

The participants of this study included educational leaders who were employed in various K-12 school districts. Participants recruited by the researcher were from various geographical areas in California. The list of participants recruited for this study included principals, assistant principals, district superintendent's, teacher leaders (e.g., department heads and grade level leaders), and district coordinators (e.g., Special Education, Technology, Primary/Secondary Curriculum Coordinators). Participants were chosen for this study because of their leadership positions they currently held at their school site and district at the time this study was undertaken. Overall, this study was able to recruit 111 participants from K-12 schools and districts throughout California.

An indicator for student achievement for K-12 schools in California is the California Assessment of Student Performance and Progress (CAASPP), which is administered to grades 3-8, and 11 in the subjects of English Language Arts and mathematics. For all the measurements in this study, including the accessed student achievement data, they were all collected from participants who participated in this study regardless of their location in California.

Sampling Procedures

In this study, snowball convenience sampling was used to select the studies participants and the collected data from schools and school districts recruited for this study. Convenience

sampling “involves including in the sample whoever happens to be available at the time” (Lunenberg & Irby, 2008, p. 174). As a result, participants for this study were identified through several list serves and work alike groups via a recruiting email and were ultimately selected to participate in this study through their completion of the survey scale distributed by the researcher. Participants sampled for this study were put into groups based on the leadership role they held at their school site and district at the time of data collection. Thus, the participant sample of educational leaders for this study included principals, assistant principals, district superintendent's, teacher leaders (e.g., department heads and grade level leaders), and district coordinators (e.g., Special Education, Primary/Secondary Curriculum Coordinators).

Through this sampling procedure, the survey was sent to a large population of participants statewide to ensure a wide variety and diversity of participants from varying backgrounds, schools, and districts were surveyed to make up this study’s sampling population. Thus, due to the study’s scope and size, the researcher was able to recruit a diverse body of participants within the sampled population, which ultimately boosted the study’s overall validity.

Instrumentation

In order to fulfill the purpose of this study, three sources of quantitative and qualitative data were used as outlined in Figure 2. Archived 2017-2018 CAASPP English Language Arts and mathematic assessment scores were operationalized as the student achievement variable, and the data gathered from two survey scales were operationalized as the data use, data use confidence, and educational leadership efficacy variables. In regard to the 2017-2018 CAASPP English Language Arts and mathematic assessment data, the student achievement data derived from this data was the percentage of students at a respective educational leader’s school who scored at the standard met, and standard exceeded level on the CAASPP English Language Arts,

and mathematic assessment scores. Next, the two scales that were used to collect data for this study were the following: Principal's Perceptions of DDDM: The School's Principal's Perspective scale and the Principal Data Use Self-Appraisal scale. The first scale, the Principal's Perceptions of DDDM: The School's Principal's Perspective, was developed by Schneider (2007) and modified by McCray (2014) and was further modified by the researcher for the purposes of this study. Questions on this scale related to how educational leaders perceived their ability to lead their schools and school districts.

Moreover, questions on this scale were related to what types of data educational leaders use as well as how they used that data within their leadership capacity. The second scale, the Principal's Data Use Self-Appraisal, was used to measure an educational leader's self-efficacy in terms of data use and data use confidence. Questions on this scale related to the confidence that educational leaders have to accomplish various tasks utilizing data in a variety of different ways. Furthermore, The Principal's Data Use Self-Appraisal scale was modified by McCray (2014) and was further modified by the researcher to fit the needs of this study.

Variables	**Scale**	**Number of Questions on Scale**
Data Use	Principal's Perceptions of DDDM: The School's Principal's Perspective Scale • Section 2: Data Use by Educational Leaders • Section 4: Data Use by Educational Leaders to Make Data-Driven Decisions	Section 2: 20 Questions Section 4: 13 Questions & 1 Open-Ended Response Question

Leadership Efficacy	Principal's Perceptions of DDDM: The School's Principal's Perspective Scale • Section 3: Educational Leader Efficacy	Section 3: 15 Questions & 1 Open-Ended Response Question
Data Use Confidence	Data Use Self-Appraisal Scale	21 Questions
Student Achievement	2017-2018 CAASPP English Language Arts and Mathematics Archive	Archived Assessment Data from the State of California

Figure 2. Instrumentation of variables.

Survey Scale Modifications

In this section, there will be a short discussion regarding the modifications that were made to the survey scales by the researcher. The first question of the demographics section of the Principal's Perceptions of DDDM: The School's Principal's Perspective scale was modified to include the term "educational leaders", which was defined earlier in the study to include school leaders such as principals, assistant principals, superintendents, district coordinators (e.g., technology, special education, primary/secondary curriculum), and teacher leaders (e.g., department heads, content leader, or grade level leader). The rationale for incorporating the term educational leaders as the broad definition for the participants in this study is that research from the body of literature indicates all of these leaders described above utilize data within their leadership capacities (Fischer, 2011, Fullan, 2010; Harrison & Killion, 2007; Ikemoto & Marsh, 2007; Mandinach et al., 2006; Mandinach, 2012; Wu, 2009). The other addition to this scale included the addition of two open-ended free response questions that were utilized as a mechanism to capture the qualitative data for this study. The first and second open-ended

questions were located in sections three and four of the Principal's Perceptions of DDDM: The School's Principal's Perspective Scale. Lastly, for the purposes of this study, the survey scales utilized were renamed to include "educational leader" within its title to represent the broad group of participants the researcher recruited to participate in this study. Therefore, the Principal's Perceptions of DDDM: The School's Principal's Perspective Scale was renamed to the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale and the Principal's Data Use of Self-Appraisal Scale was renamed to the Educational Leader's Data Use Self-Appraisal Scale.

Validity and Reliability

Quantitative. Validity and reliability were previously established for both survey scales by Schneider (2007) and McCray (2014). Validity and reliability of this scale were established through the data collected in the study. After the data was collected, it was compared to the results of McCray (2014) to determine the reliability of this scale. Also, Cronbach alpha coefficients as well as standard scores were computed for each scale as another step to ensure their reliability. Lastly, the scales utilized for this study were measured for similar variables as in the scales employed by Schneider (2007) and McCray (2014), which helped safeguard the study's overall validity.

Qualitative. Validity and reliability for the qualitative data gathered from the two open-ended response survey questions were two-fold. First, to ensure validity, the researcher clarified his research bias by describing his background in utilizing data practices and knowledge of participating in and establishing data-driven cultures in K-12 schools (Creswell, 2013).

Second, to ensure reliability during qualitative data analysis, the researcher utilized an inter-coder agreement with one of the researcher's dissertation committee members as described

by Creswell (2013) for the data gathered from the two open-ended response questions located in sections three and four of Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale. The researcher's dissertation committee member conducted a comprehensive data review through the development of the inter-coder agreement. Overall, the inter-coder agreement was put in place to ensure the coded thematic data was reliable by having multiple professionals in the field review the coded data in a uniform manner (Creswell, 2013).

Through the validity and reliability mechanisms described above for the qualitative method employed in this study, it provided several checks to ensure that the results of this study can be validated and reliable. The researcher implemented these validity and reliability checks during and at the completion of the qualitative data analysis.

Data Collection and Ethical Considerations

Quantitative and qualitative data was collected by distributing the survey to educational leaders throughout various districts and school sites in California. Data gathered was from recruited participants who agreed to complete the survey scales. The researcher sought approval of the study from Concordia University, Irvine's Institutional Review Board (IRB), and from the recruited participants. The researcher ensured that the IRB and university protocols were followed throughout the duration of this study. To protect the confidentiality of the study's participants, participants placed their school-sites' or districts' National Center of Educational Statistics (NCES) identifier code instead of their specific school or district names on the surveys unless done so voluntarily by the participant. Ultimately, this protocol heightened the confidentiality of all the participants who participated in this study. Lastly, all data was secured and will be stored for three years after the completion of the study and will be destroyed on March 1, 2021.

After the study was approved by Concordia University's IRB, the researcher sent out the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale and the Educational Leader's Data Use of Self-Appraisal Scale at one point in time to educational leaders across K-12 schools and school districts recruited to participate in this study, which included elementary, middle, and high schools. Each survey was sent using Google Forms, whereby each participant consented to participate in the study by completing the survey scales. The surveys yielded both quantitative and qualitative data. Results from the survey were linked to the acquired 2017-2018 CAASPP English Language Arts, and mathematic score data for educational leaders sampled in California. This data was gathered directly from caaspp.cde.ca.gov, which provided free access to the public to look at and download the CAASPP yearly test results for all schools and school districts in California.

In regard to the qualitative data collection that was utilized for this study, two-open ended questions were added to section three and section four of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale. Participants responded to each of these open-ended questions in the form of a short narrative to allow the researcher to collect the data. The qualitative data collected from participants who completed the open-response questions found on the survey scales were used for data analysis.

Data Analysis

The quantitative and qualitative data collected was analyzed using descriptive statistics, correlation analysis, and thematic coding analysis. The sources of the data included the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale, the Educational Leader's Data Use of Self-Appraisal Scale, and the 2017-2018 CAASPP English

Language Arts and mathematics scores from the schools and school districts of this study's participants.

Quantitative

The researcher of this study incorporated one type of quantitative analysis for this study: correlation analysis. Along with outlining the study's correlation analysis, the researcher provided a discussion regarding how the CAASPP scores were calculated for the purposes of this study.

Descriptive Statistics. First, for descriptive statistics, data was taken from both surveys and analyzed by computing the frequencies and percentages of each item and developed an overall score for each participant who took the survey scales. For example, the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale and the Educational Leader's Data Use of Self-Appraisal Scale, the researcher added each participant's item selections to compute an overall score for each survey resulting in an educational leadership efficacy, data use, and data use confidence score. For each survey, the higher the overall score related to higher educational leadership efficacy, higher data use, and higher data use confidence for an educational leader. The overall total scores in leadership efficacy, data use, and data use confidence of all the participants participating in this study were averaged to determine a mean score. The mean score from each of these categories was used for the correlation analysis this study employed. The results of this analysis were used, in part, to answer research questions one through six.

Calculating CAASPP Scores. The 2017-2018 CAASPP English Language Arts and mathematics scores of the school sites of each participant were utilized. For the elementary school grades of 3-5 and the middle school grades 6 and 8, an overall score was computed by

averaging each grade levels ‘standard met’ and ‘standard exceeded CAASPP percentage pass scores, which computed an overall mean score that incorporates all grade level scores pertaining to that specific school site. As a result, an overall school-site percentage pass score for both English Language Arts and mathematics were calculated. For participants who were employed at high school sites, the grade 11 ‘standard met’ and ‘standard exceeded’ CAASPP percentage pass scores were averaged to develop a mean score for these school sites. Therefore, for each school site of each participant, they had an overall CAASPP English Language Arts percentage passing score and mathematics percentage passing score that was compared and analyzed for further data analysis.

CAASPP scores were utilized for participants in this study who were not associated with one specific school site. Participants who were employed at the district level as a coordinator, superintendent, or within a district-wide leadership position had their districts overall 2017-2018 CAASPP English Language Arts and mathematics scores utilized. Furthermore, for these participants, their districts overall ‘standard met’ and ‘standard exceeded’ CAASPP percentage pass scores were used to represent the participant's school districts CAASPP English Language Arts and mathematics scores.

Correlational Analysis. For the correlation analysis of this study, the operationalization of variables will be described, the proposed correlations will be outlined, and how the calculations of the correlation coefficients will be conducted will be discussed.

Operationalization of Variables to be Used in Correlations. The variables used for this correlation analysis included the scales that measure educational leadership efficacy, data use, data use confidence, and student achievement. The educational leadership efficacy variable consisted of the overall mean score from all participants who completed the leadership efficacy

portion of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale. The data use variable consisted of the overall mean score from all participants who completed the data use portion of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale. The data use confidence variable consisted of the overall mean score from all participants who completed the Educational Leader's Data Use of Self-Appraisal Scale. The student achievement variable consisted of the overall 2017-2018 CAASPP English Language Arts and mathematics percentage pass scores of the participant school sites or school districts.

Proposed Correlations. Below are the proposed correlations that were computed for this study. The correlations computed from the following variables provided data that helped answer research questions one through six.

1. Education leadership efficacy and Data use confidence
2. Educational leadership efficacy and Data use
3. Data use, and Data use confidence
4. Educational leadership efficacy and Student achievement
5. Data use and Student achievement
6. Data use confidence and Student achievement

Operationalization of Proposed Correlations

Proposed Correlations	Dependent Variable 1	Dependent Variable 2
Correlation 1	Educational leadership efficacy	Data use confidence
Correlation 2	Educational leadership efficacy	Data use
Correlation 3	Data use	Data use confidence
Correlation 4	Educational leadership efficacy	Student achievement
Correlation 5	Data use	Student achievement
Correlation 6	Data use confidence	Student achievement

Figure 3. Operationalization of proposed correlations.

Computing Correlations. Each of the proposed correlations was computed to determine a Pearson's *r* correlation, which was the appropriate analysis to use when the above variables were measured at the interval or ratio level. Lunenberg and Irby (2008) stated that Pearson's *r* is calculated to determine the "strength and direction" of the correlation coefficient ranges from -1 to 1 (p. 36). Therefore, if the coefficient is closer to 0 than to 1, it will indicate a positive association, which means "if one variable increases, the other variable increase, and vice versa" if one variable decreases, the other variable decreases (p. 36). In educational research, a "correlation of .30 may be considered significant, and any correlated relationship above .70 is almost always significant" (p. 36). This means the higher the decimal is to one, the stronger the correlation between the two variables. Consequently, if the decimal is closer to absolute zero,

the weaker the correlation. All of the data was analyzed using the StatsPlus add-on program for Microsoft Excel.

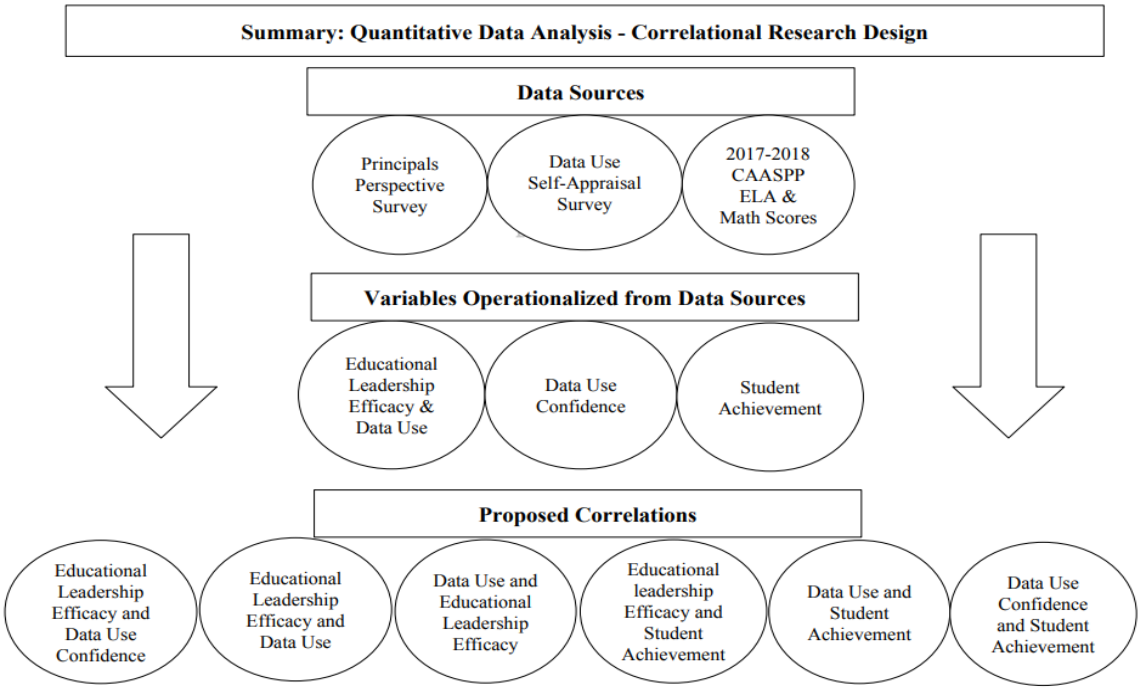

Figure 4. Summary of quantitative data analysis

Qualitative

The researcher of this study incorporated a qualitative analysis in the form of thematic coding. Thematic coding occurred when the researcher utilized open, axial, and selective coding procedures for grounded theory provided by Creswell (2013). Within the survey, there was one open-ended question that helped the researcher understand how educational leaders perceived their responsibility as leaders in creating a data-driven culture at their school site, and there was one open-ended question regarding what the most important data-driven practices educational leaders employ as part of their leadership. The first open-ended question was located in section three of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale, which asked the participants to evaluate their leadership ability in their capacity as

educational leaders in their school site and district. The second open-ended question was located in section four of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale, which asked participants the extent of how they use data in their position as an educational leader.

After the completion of each of the surveys by the study's participants, the researcher employed qualitative thematic coding analysis using open, axial, and selective coding to analyze the qualitative data (Creswell, 2013). The researcher utilized AutoMap software to code the data into initial theme categories and then further analyzed the themes to develop the open codes. Then, the researcher analyzed the thematic categories during the axial coding process to further evaluate the results and categorize themes derived from the data. Finally, for selective coding, the researcher finalized the coding process by selecting the final overarching themes that were derived from the open and axial coding processes. As a result, the data gathered and analyzed from these two open-ended questions helped answer research questions seven and eight.

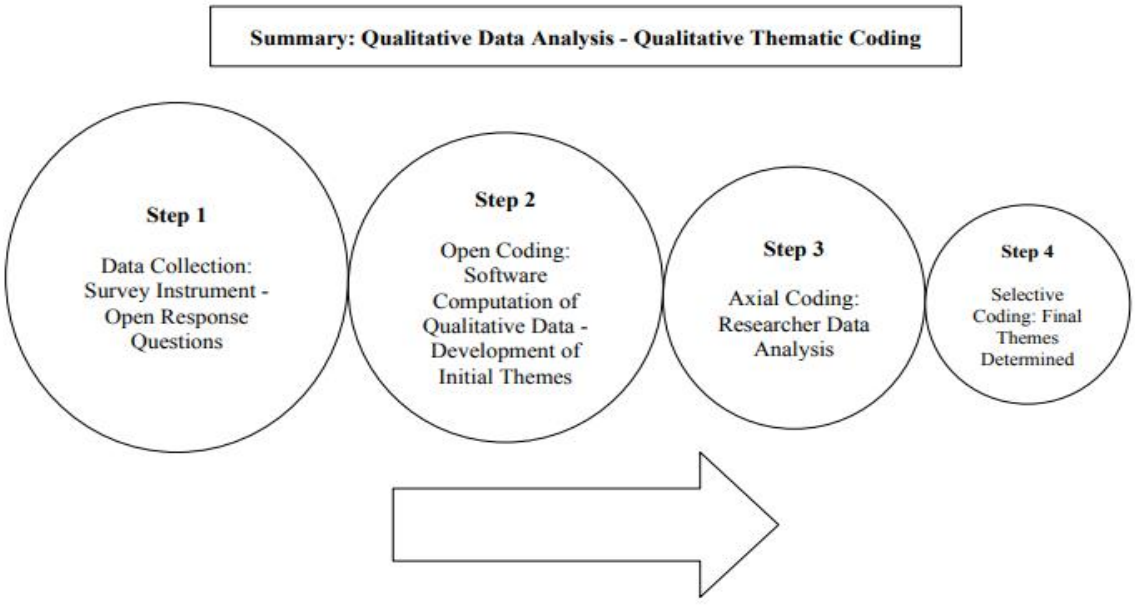

Figure 5. Summary of qualitative data analysis

Summary

This chapter discussed a mixed methods research design that was used for this study. This discussion primarily focused on a mixed methods research, which was comprised of a majority descriptive and correlational research design as well as a minor qualitative research design. Also, this chapter discussed the instrumentation of two surveys. Lastly, the quantitative and qualitative data analysis procedures used for this study were discussed thoroughly.

CHAPTER 4: FINDINGS

The purpose of this study was to determine whether relationships exist between educational leaders' leadership efficacy, data use, efficacy in data use (e.g., data use confidence), and school performance in K-12 schools. Another purpose of this study was to ascertain how data practices and data-driven cultures are being utilized and established by educational leaders in different leadership positions in K-12 schools and school districts. This chapter provided a synopsis of the participating educational leaders and the results of the data analysis used to answer the following research questions:

Quantitative Research Questions

1. What is the relationship between educational leadership efficacy and data use confidence?
2. What is the relationship between educational leadership efficacy and data use?
3. What is the relationship between data use and data use confidence?
4. What is the relationship between educational leadership efficacy and student achievement?
5. What is the relationship between data use confidence and student achievement?
6. What is the relationship between data use and school student achievement?

Qualitative Research Questions

7. What are the perceptions of school leaders regarding their responsibilities to create a data-driven culture at their school site and/or district?
8. What are the perceptions of school leaders regarding data-driven practices they employ to create a data-driven culture at their school site and/or district?

Overall, chapter four is organized into four main sections. First, the demographic profile of the sampled participants of this study will be discussed in the first section. Then, the descriptive statistics of each section of each of the individual survey scales will first be outlined. Thirdly, the Cronbach alpha scores, mean scores, and standard scores for the survey scales utilized for this study will be provided along with how the researcher dealt with missing participant data when computing the study's findings. Lastly, the six quantitative and two qualitative research question findings will be presented and reviewed for the reader.

Demographic Profile

Quantitative and qualitative data was collected by distributing survey scales to educational leaders throughout various districts and school sites in California. Data gathered was from recruited participants who agreed to complete the survey scales. Collected data from participants included the following demographic variables: type of educational leader, years of service, highest educational degree, and gender. Frequency distributions of each demographic are provided in tables 2-4.

Table 2 illustrates a frequency distribution of the types of educational leaders who participated in this study. The largest percentage of participants were Principals (50.45%). The second largest group of participants were coordinators (11.71%). Assistant Principals were the third largest group of participants (9.01%). The fourth largest group of participants were Superintendents (9.01%). Teacher leaders were the fifth largest group of participants (7.21%). District Directors were the sixth largest group of participants (5.41%). Associate Superintendents were the seventh largest group of participants (3.60%). Lastly, four participants tied for the eighth largest group of participants (0.90%). These participants included a Program

Manager of an Independent Studies Program, a SELPA Program Specialist, a participant who denoted they were in District Management, and a participant who did not state their position.

Table 2

Distribution of the Types of Educational Leaders in this Study

Type of Educational Leader	Frequency	Percentage
Principal	56	50.45
Coordinator	13	11.71
Assistant Principal	10	9.01
Superintendent	10	9.01
Teacher Leader	8	7.21
District Director	6	5.41
Associate Superintendent	4	3.60
Program Manager of Independent Studies Program	1	0.90
SELPA Program Specialist	1	0.90
District Management	1	0.90
Other	1	0.90
Total	111	100.00

The frequency distribution of the participants' years of service as an educational leader is shown in Table 3. Of the responses, the majority of educational leaders who participated in this study had 10 or more years of experience (54.05%). The second largest group of educational leaders who participated in this study had five to nine years of experience (28.83%). Educational

leaders who have served one to four years were the third largest group of participants (12.61%). Only 4.50% of the participants were in their first year of service as an educational leader.

Table 3

Participants Years of Service as an Educational Leader

Years of Service	Frequency	Percentage
First Year	5	4.50
1-4 Years	14	12.61
5-9 Years	32	28.83
10 Years and Over	60	54.05
Total	111	100

The frequency distribution of the highest educational degree for the participants is represented in Table 4. When viewing the responses as a whole, the majority of participants had earned a master's degree (51.15%). The second largest group included participants who had earned a doctoral degree (i.e., Ed.D/Ph.D.) (41.44%). The third largest group included participants who had earned an Educational Specialist degree (i.e., Ed.S) (2.70%). Doctoral candidates made up the fourth largest group of participants who participated in this study (1.80%). Lastly, one participant denoted that they had earned a bachelor's degree (0.90%).

Table 4

Participants' Highest Educational Degree

Highest Educational Degree	Frequency	Percentage
Masters	59	53.15
Ed.D/Ph.D	46	41.44
Ed.S	3	2.70
Doctoral candidate	2	1.80
Bachelor's degree	1	0.90
Total	100	100

The frequency distribution of the gender of the participants is shown in Table 5. The majority of the participants listed their gender as female (63.96%). Males represented 36.04% of the participants in this study.

Table 5

Gender of Participants

Gender	Frequency	Percentage
Male	40	36.04
Female	71	63.96
Total	100	100

Quantitative Data Analysis: Descriptive Statistics of Survey Scale Results

The findings of each survey scale will be provided throughout this section. First, sections two and four outline the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale will be outlined. These findings will describe the perceived data use of the

participants in this study. Then, section three will provide the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale. The following findings will describe the perceived educational leadership efficacy of the participants in this study. Next, the findings will be reviewed from the Educational Leader's Data Use Self-Appraisal Scale. In these findings, the perceived data use confidence of the participants in this study will be presented and reviewed for the reader.

Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Two

Section two of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale contains 20 items to which educational leaders were asked to determine if data were available, used, and important in their school site and school district. All 20 items represent five different categories of data: (a) demographic data, (b) test score, and student grade data, (c) school-wide programmatic data, (d) staff data, and (e) perception and advisory data.

In terms of data availability, the findings presented by educational leaders who participated in this study demonstrates that reading and mathematics assessment score data (i.e., Lexile, Star, DRA, etc.) are the most available data type (76.58%), English Language Learner enrollment data is the second most available data type (72.97%), Special Education enrollment data is the third most available data type (67.57%), transportation data is the fourth most available data type (67.57%), parent, staff, and student satisfaction survey data is the fifth most available data type (66.67%), and student attendance data is the sixth most available data type (65.77%).

Next, in relation to used data by educational leaders who participated in this study, student attendance data was the most used data type (68.47%), enrollment by gender is the second most used data type (65.77%), free and reduced lunch data and minority enrollment data are tied for the third most used data type (64.86%), discipline data is the fourth most used data type (61.26%), Special Education enrollment data is the fifth most used data type (60.36%), and teacher turnover and school safety data are tied for the sixth most used data type (55.86%).

In regard to important data perceived by educational leaders, educational leaders who participated in this study denoted student attendance data as the most important data type (86.49%), minority enrollment data was noted as the second most important data type (79.28%), reading and mathematics testing scores (i.e., Lexile, Star, DRA, etc.) data was the third most important data type (76.58), parent, staff, and student satisfaction survey and free and reduced lunch data types were tied for the fourth most important data type (72.97%), discipline data and school safety data were tied as the fifth most important data type (71.17%), and student schedules was the sixth most important data type (69.37%).

Table 6

Student Test Scores and Grades – Availability

Data Sources	Frequency	Percentage
State Testing Scores	71	63.96
Reading and Mathematics Scores (i.e., Lexile, Star, DRA, etc.)	85	76.58

Table 7

Student Demographic Data – Availability

Data Sources	Frequency	Percentage
Student Attendance	73	65.77
Discipline Data	68	61.26
Minority Enrollment	70	63.06
Special Education Enrollment	75	67.57
Enrollment by Gender	74	66.67
English Language Learner Enrollment	81	72.97
Free and Reduced Lunch	71	63.96

Table 8

School-Wide Programmatic Data – Availability

Data Sources	Frequency	Percentage
Student Schedules	66	59.46
Student Retention	68	61.26
Transportation Data	75	67.57
Student Movement	66	59.46

Table 9

Staff Data - Availability

Data Sources	Frequency	Percentage
Budget and Financial	69	62.16
School Safety	73	65.77
Transportation Data	75	67.57
Teacher Turnover Rates	67	60.36

Table 10

Perception and Advisory Data - Availability

Data Sources	Frequency	Percentage
Parent, Staff, and Student Satisfaction Surveys	74	66.67
Parent Satisfaction Surveys	71	63.96

Table 11

Test Scores and Grades - Used

Data Sources	Frequency	Percentage
State Testing Scores	61	54.95
Reading and Mathematics Scores (i.e., Lexile, Star, DRA, etc.)	71	63.96

Table 12

Student Demographic Data - Used

Data Sources	Frequency	Percentage
Student Attendance	76	68.47
Discipline Data	68	61.26
Minority Enrollment	72	64.86
Special Education Enrollment	67	60.36
Enrollment by Gender	73	65.77
English Language Learner Enrollment	56	50.45
Free and Reduced Lunch	72	64.86

Table 13

School-Wide Programmatic Data - Used

Data Sources	Frequency	Percentage
Student Schedules	60	54.05
Student Retention	62	55.86
Transportation Data	42	37.84
Student Movement	25	22.52

Table 14

Staff Data - Used

Data Sources	Frequency	Percentage
Budget and Financial	28	25.23
School Safety	62	55.86
Transportation Data	42	37.84
Teacher Turnover Rates	62	55.86

Table 15

Perception and Advisory Data - Used

Data Sources	Frequency	Percentage
Parent, Staff, and Student Satisfaction Surveys	44	39.64
Parent Satisfaction Surveys	56	50.45

Table 16

Student Test Scores and Grades - Important

Data Sources	Frequency	Percentage
State Testing Scores	67	60.36
Reading and Mathematics Scores (i.e., Lexile, Star, DRA, etc.)	85	76.58

Table 17

Student Demographic Data - Important

Data Sources	Frequency	Percentage
Student Attendance	96	86.49
Discipline Data	79	71.17
Minority Enrollment	88	79.28
Special Education Enrollment	62	55.86
Enrollment by Gender	62	55.86
English Language Learner Enrollment	25	22.52
Free and Reduced Lunch	81	72.97

Table 18

School-Wide Programmatic Data - Important

Data Sources	Frequency	Percentage
Student Schedules	77	69.37
Student Retention	74	66.57
Transportation Data	29	26.13
Student Movement	25	22.52

Table 19

Perceptions of Staff Data - Important

Data Sources	Frequency	Percentage
Budget and Financial	15	13.51
School Safety	79	71.17
Transportation Data	29	26.13
Teacher Turnover Rates	72	64.86

Table 20

Perception and Advisory Data - Important

Data Sources	Frequency	Percentage
Parent, Staff, and Student Satisfaction Surveys	81	72.97

Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Four

Section four of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale contains 13 items to which educational leaders were asked to rate the following items regarding the importance of different types of supports for making decisions by effectively using data. Participants were given nine choices ranging from don't know to extremely important regarding each item's importance to their decision-making processes of using data effectively.

According to the responses provided by the participants on the scale, most educational leaders noted that the top five supports for effectively using data in their decision-making

processes included: help supporting school improvement team in data analysis, staff development in data analysis, sufficient time for the data analysis process, having staff believe that data analysis is important, and having data analysis courses as part of administrative preparation programs. On the other hand, based on the participant responses, the least effective supports for educational leaders to use data in their decision-making processes included: training in data analysis software (i.e., Excel, SPSS, etc.), training in creating effective school level and/or district surveys, public understanding of the correct use of data, school-level personnel ability to create spreadsheets and databases, and access to professional literature regarding decision making.

Table 21

Educational Leaders Perceptions' of Supports for Effectively Using Data to Make Decisions

Questions	Don't Know	Of No Importance At All	Not Very Important	Somewhat Important	Very Important	Extremely Important
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Staff development in data analysis	2	6	3	13	36 (32.43)	51 (45.95)
School/district personnel trained in data analysis	5	3	11	17	31 (27.93)	44 (39.64)
Public understanding of the correct use of data	5	10	9	29 (26.13)	27	31 (27.93)
Data analysis coursework as part of administrative	7	8	13	8	30 (27.03)	45 (40.54)

preparation programs						
Training in data analysis software (e.g., Excel, SPSS, etc.)	5	12	17	25 (22.52)	24	28 (25.23)
School-level personnel able to create spreadsheets and databases	3	7	5	30 (27.03)	39 (35.14)	27
Training in creating effective school level and/or district level surveys	8	10	8	34 (30.63)	26 (23.42)	25
Access to professional literature regarding decision making	5	5	10	19	42 (37.84)	30 (27.03)
Staff believe that data analysis is important	1	2	7	20	33 (29.73)	48 (43.24)
Help the school improvement team in data analysis	1	5	2	17	32 (28.83)	52 (46.85)
Sufficient time for the data analysis process	1	4	6	19	30 (27.03)	51 (45.95)

Staff development in the data analysis process	2	2	8	16	36 (32.43)	47 (42.34)
Analyzing data (test scores, enrollments, etc.) over time	5	3	7	12	39 (35.14)	45 (40.54)

Data Use Overall Scores of Participants

The overall perceived data use scores of the educational leaders who participated in this study were recorded in Table 21. The data use scores derived from sections two and four of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale for each participant was computed and then averaged to determine an overall perceived mean data use score for all educational leaders who participated in this study. In this section, the findings of the mean data use scores for all participants will be outlined in addition to a frequency distribution of all of the data use scores of this study's participants.

The overall perceived mean data use score for all participants in this study was 75.67, as exhibited in Table 22. This demonstrates that the majority of educational leaders who participated in this study believed they had an above average proficiency in their ability to use an assortment of different data types as well as use data to make decisions in their position as an educational leader. Finally, Table 23 outlines the breakdown of the perceived mean data use score distribution among all participants of this study.

Table 22

Overall Perceived Mean Data Use Score of Participants

N	Valid	111
	Missing	0
Mean		75.67
Mode		74
Std. Deviation		14.02
Minimum		36
Maximum		107

Table 23

Perceived Mean Data Use Score Distribution of Participants

Perceived Data Use Scores	Frequency	Percentage
99-130 (High Data Use)	6	5.41
70-98 (Quite a Bit of Data Use)	69	62.16
41-69 (Average Data Use)	35	31.53
12-40 (Very Little Data Use)	1	0.90
0-12 (No Data Use)	0	0

Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale: Section Three

Section three of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale contains 15 items to which educational leaders were asked to rate the following items to determine their perceived leadership ability in their current position in their

school and district. Participants were given nine choices ranging from none at all to a great deal regarding the extent to which they can complete the listed leadership tasks.

In Table 24 and 25, educational leader responses are exhibited regarding the highest and lowest perceived leadership efficacy are exhibited. Participants rated themselves the highest in their perceived leadership efficacy in the following areas leadership tasks: creating a positive learning environment in their school/district, generating enthusiasm for a shared vision for the school/district, and facilitating student learning in their school/district. Conversely, participants rated their lowest perceived leadership efficacy in the following leadership tasks: coping with the stress of the job, handling the paperwork required of the job, and maintaining control of their daily schedule.

Table 24

Highest Rated Educational Leadership Efficacy Survey Scale Items

Question	None at All	2	Very Little	4	Some Degree	6	Quite a Bit	8	A Great Deal
Create a positive learning environment in your school/district	2	1	1	4	4	10	8	35 (31.53)	47 (42.34)
Facilitate student learning in your school/district	1	1	3	4	4	3	24	28 (25.23)	41 (36.94)

Generate enthusiasm for a shared vision for the school/district	2	3	1	3	3	12	15	25 (22.52)	45 (40.54)

Table 25

Lowest Rated Educational Leadership Efficacy Survey Scale Items

Question	None at All	2	Very Little	4	Some Degree	6	Quite a Bit	8	A Great Deal
Cope with the stress of the job	1	6	6	4	4	19	20	23 (20.72)	20 (18.02)
Handle the paperwork required of the job	4	1	9	3	3	19	24 (21.62)	23 (20.72)	17
Maintain control of your own daily schedule	2	4	7	7	7	17 (15.32)	22 (19.82)	22	16

Educational Leadership Overall Scores of Participants

The overall mean of perceived educational leadership efficacy scores for the educational leaders who participated in this study are recorded in Table 26. The educational leadership efficacy scores for section three of the Educational Leader's Perspectives of DDDM: The

Educational Leader's Perspective Scale for each participant were computed and then averaged to determine an overall perceived educational leadership efficacy score for all educational leaders who participated in this study. In this section, the findings are outlined of the average educational leadership efficacy scores for all participants will be outlined. Also, Table 27 outlines the frequency distribution of each different level of educational leadership efficacy scores of the participants.

The overall perceived mean educational leadership efficacy score for all participants in this study was 105.71, as exhibited in Table 26. This demonstrates that a majority of educational leaders who participated in this study believed that they have a great deal of leadership efficacy and believed they have an above average proficiency in their leadership ability in their position as an educational leader. Finally, Table 27 outlines a breakdown of the perceived mean educational leadership efficacy score distribution among all participants of this study further exemplifying this finding.

Table 26

Overall Perceived Mean Educational Leadership Efficacy Score of Participants

N	Valid	111
	Missing	0
Mean		105.71
Mode		108
Std. Deviation		20.61
Minimum		39
Maximum		135

Table 27

Perceived Mean Educational Leadership Efficacy Participant Score Distribution

Perceived Educational Leadership Efficacy Scores	Frequency	Percentage
96-120 (A Great Deal of Leadership Efficacy)	85	76.58
72-95 (Quite a Bit of Leadership Efficacy)	16	14.41
48-71 (Average Leadership Efficacy)	6	5.41
24-47 (Very Little Leadership Efficacy)	2	1.80
0-23 (No At All/No Leadership Efficacy)	0	0

Educational Leader's Data Use Self-Appraisal Scale

The Educational Leader's Data Use Self-Appraisal Scale contains 21 items to which educational leaders were asked to rate the following items regarding their data use self-efficacy proficiency from 0 to 100 with 100 being the highest level of efficacy (i.e., data use confidence). Data use confidence scores for each participant were computed and then averaged to determine an overall score for all educational leaders who participated in this study. In this section, the findings will be discussed by first summarizing the highest and lowest rated data use confidence survey scale items. Then, there will be a discussion provided regarding the perceived rating scale of the data use confidence scores among the participants will be provided. Lastly, the results will be discussed of how participants rated their confidence of other educational leader's

ability to use data as well as their overall perception of whether their confidence in data use will increase student achievement.

In regard to the highest rated data use confidence survey scale items described in Table 28, participants rated the item about analyzing data to identify student achievement problems as the highest data use self-efficacy item. Secondly, participants rated the item about analyzing data to detect trends and patterns as the second highest rated data use self-efficacy item. Next, the items of proposing solutions to problems based on the result of data analysis and identifying pertinent data to answer questions regarding student achievement tied in terms of ratings provided by participants. Finally, participants rated accessing pertinent data to answer questions regarding student achievement as the fourth highest rated data use self-efficacy item.

In relation to the lowest rated data use confidence survey scale items as outlined in Table 29, participants rated the item about conducting correlation analysis to determine the relationships among variables as the lowest data use self-efficacy item. Participants then rated the item about utilizing descriptive statistics as a means to analyze data as the second lowest data use self-efficacy item. Third, participants rated identifying appropriate statistical strategies to analyze and select data as the third lowest data use self-efficacy item. Lastly, participants rated the item about spending sufficient time analyzing data as the fourth lowest data use self-efficacy item.

Lastly, as exemplified in Table 30, participants in this study were given two distinct questions regarding their confidence in other educational leader's abilities to use data and how confident in how they perceived data use improved student achievement. In regard to participants' confidence of other educational leader's abilities to use data, the average participant response for this item was 7.25. This means participants believed other educational leaders had

above average confidence in their data use abilities. Then, in relation to how participants perceived their confidence in using data to improve student achievement, the average participant response for this item was 8.58. This result signifies that participants in this study believed they had a high level of confidence that data use by educational leaders improves student achievement.

Table 28

Highest Rated Data Use Confidence Survey Scale Items

Question	Data Use Confidence Score (Mean)
Analyze data to identify student achievement problems	8.05
Analyze data to detect trends and patterns	8.02
Propose a solution to problems based on the result of data analysis	8
Identify pertinent data to answer questions regarding student achievement	8
Access pertinent data to answer questions regarding student achievement	7.91

Table 29

Lowest Rated Data Use Confidence Survey Scale Items

Question	Data Use Confidence Score (Mean)
Conduct correlation analysis to determine the relationships among variables	6.17
Utilize descriptive statistics as a means to analyze data	6.32
Identify appropriate statistical strategies to analyze and select data	6.82

Spend sufficient time analyzing data	7.07

Table 30

Perceived Ability of Other Educational Leaders to Use Data and Overall Perception of Whether Data Use Will Improve Student Achievement

Question	Data Use Confidence Score (Mean)
Rate your confidence in another educational leader's ability (coworker) in their ability to use data effectively.	7.25
Rate your level of confidence that data use will improve student achievement	8.58

Overall Data Use Confidence Scores

The overall perceived data use confidence scores of the educational leaders who participated in this study were recorded in Table 31. The data use confidence scores from the Educational Leader's Data Use Self-Appraisal Scale for each of the participants were computed and then averaged to determine an overall perceived data use confidence score for all educational leaders who participated in this study.

The overall perceived mean data confidence score for all participants in this study was 150.39, as exhibited in Table 31. This demonstrates a majority of educational leaders who participated in this study believed that they had quite a bit of confidence in their data use and believed they have above average confidence in their ability to use data in their position as an educational leader. Furthermore, Table 32 outlines a breakdown of the perceived data use confidence score distribution among all participants of this study.

Table 31

Overall Data Use Confidence Scores of Participating Educational Leaders

N	Valid	108
	Missing	3
Mean		150.39
Mode		163
Std. Deviation		39.72
Minimum		0
Maximum		210

Table 32

Perceived Data Use Confidence Overall Score Distribution

Perceived Data Use Confidence Scores	Frequency	Percentage
168-210 (Extreme Confidence in their Data Use)	37	34.26
126-167 (Quite a bit of Confidence in their Data Use)	56	51.85
84-125 (Average Confidence in their Data Use)	13	12.04
42-83 (Very Little Confidence in their Data Use)	0	0
0-41 (No Confidence in their Data Use)	0	0

Reliability Analysis of Survey Scales

In order to measure and assess reliability within each section of the Educational Leaders Perceptions of DDDM and Educational Leaders Data Use Self-Appraisal surveys, a Cronbach's Alpha was computed for each scale. Figure 6 below shows the reliabilities for each section of the survey scales utilized for this study. The reliabilities found within the four sections of the survey scales utilized within this study had a Cronbach's Alpha that ranged from .77 to .96, which demonstrates a range from acceptable levels of internal consistency to high levels of internal consistency.

Survey Scale	Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Section 2 – Data Use: Types of Data Educational Leaders Use	Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Section 3 – Educational Leadership Efficacy Survey	Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Section 4 – Data Use for an Educational Leader to Make Data-Driven Decisions	Educational Leaders Data Use Self-Appraisal Scale
No. of Items	20	15	13	21
Cronbach's Alpha	.77	.90	.93	.96

Figure 6. Reliability Calculations of Each Section of Survey Scales Utilized in Study.

Mean Scores and Standard Scores for Survey Scales

The mean scores and z-scores were computed from the data sets derived from participant responses to the Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Sections 2, 3, and 4 as well as the Educational Leaders Data Use Self-

Appraisal Scale. Mean scores for each scale represent the average score of all the participant responses. Standard scores (i.e., Z-Scores) describe how "far a raw score from each participant's scale responses are from the mean score in terms of standard deviation units" (Lunenberg & Irby, 2008, p. 66). For this study, Z-scores were utilized to compare the results of each mean score derived from each scale participants responded to. Table 33 outlines the mean scores and z-scores for each of the study's scales, which exhibit an almost identical performance among participant responses of the same variable measured for each scale.

Table 33

Mean Score and Mean Z-Scores for Survey Scales

Survey Scale	Mean Score of Scale	Mean Z-Score of Scale
Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Section 2 & 4 - Data Use: Types of Data Educational leaders Use & Data Use for an Educational Leader to Make Data-Driven Decisions	75.67	-8.40e-17
Educational Leaders Perceptions of DDDM: The Educational Leader's Perspective Scale: Section 3 – Educational Leadership Efficacy Survey	105.71	-2.80e-16
Educational Leaders Data Use Self-Appraisal Scale	150.39	9.9e-16

Missing Data

There were only four cases of missing data due to participants not completing the Educational Leaders Data Use Self-Appraisal Scale. The researcher conducted a mean

substitution to replace missing data for this scale. Graham (2009) notes this as a reasonable procedure for treating missing data when a small amount of data is missing from participants in a study.

Research Question Findings

In order to fulfill the purpose of this study, data collected from two survey scales (i.e., Educational Leaders Perceptions of DDDM Scale and Educational Leaders Data Use Self-Appraisal Scale) were analyzed to answer eight research questions. All eight of this study's research questions were analyzed using data gathered from the survey scales outlined in this study.

Participant Data Utilized in Calculating Correlations. In regard to the data utilized for research questions one through six, it must be noted that the number of participants for research questions four to six differs from research questions one through three. This was due to participants having to provide the information required for the researcher to access their school site and districts student achievement data. Of the total 111 participants who provided data for this study, 21 participants decided to not provide the researcher with access to their student achievement data. Therefore, a distinction regarding the number of participants for research questions one through six must be made. As a result, for research questions one through three, all 111 participants provided the required data to calculate each of the three proposed correlations. However, for research questions four through six, 90 out of 111 participants provided the required data to calculate each of these three proposed correlations. Thus, the

number of participants for research questions one through three was 111, while the number of participants for research questions four through six was 90.

Research Questions 1-6. Research question one through six will be discussed as outlined in Table 5. In this discussion outlining the results of these computations, the calculations of each variable will be described as well as the computed Pearson's *r* coefficient.

Research Question 1: What is the relationship between educational leadership efficacy and data use confidence? The educational leadership efficacy variable was calculated by averaging the mean scores of all participants in section three of the Principal's Perceptions of DDDM Scale. The data use confidence variable was calculated by averaging all of the participants mean scores on the Educational Leader's Data Use Self-Appraisal Scale. A Pearson's *r* was calculated to assess the relationship between educational leadership efficacy and data use confidence variables. The result of this analysis indicated in Table 34 shows that there was a moderate correlation between the two variables, $r(109)=.33$, $p < .01$.

Table 34

Correlation 1: Educational Leadership Efficacy (EDLF) vs. Data Use Confidence (DUC) (N=111)

		EDLF	DUC
EDL	Pearson Correlation	1.000	.330**
	Sig (2-tailed)		.0004
	N	111	111
DUC	Pearson Correlation	.330**	1.000

	Sig (2-tailed)	.0004	
	N	111	111

**. Correlation is significant at the 0.01 level.

Research Question 2: What is the relationship between educational leadership efficacy and data use? The educational leadership efficacy variable was calculated by averaging the mean scores of all participants in section three of the Principal's Perceptions of DDDM Scale. The data use variable was calculated by averaging the mean of all the participant' scores on section two and four of the Principal's Perceptions of DDDM Scale. A Pearson's *r* was calculated to assess the relationship between educational leadership efficacy and data use variables. The result of this analysis indicated in Table 35 shows that there was a moderate correlation between the two variables, $r(109)=.33$, $p < .01$.

Table 35

Correlation 2: Data Use (DU) vs. Educational Leadership Efficacy (EDLF) (N=111)

		DU	EDLF
EDL	Pearson Correlation	1.000	.334**
	Sig (2-tailed)		.0003
	N	111	111
DUC	Pearson Correlation	.334**	1.000
	Sig (2-tailed)	.0003	

	N	111	111

**. Correlation is significant at the 0.01 level.

Research Question 3: What is the relationship between data use and data use confidence? The data use variable was calculated by averaging the mean scores of all of the participant's scores on section two and four of the Principal's Perceptions of DDDM Scale. The data use confidence variable was calculated by averaging all of the participants' mean scores on the Educational Leader's Data Use Self-Appraisal Scale. A Pearson's *r* was calculated to assess the relationship between the data use and data use confidence variables. The result of this analysis indicated in Table 36 shows that there was a moderate correlation between the two variables, $r(109)=.41$, $p < .01$.

Table 36

Correlation 3: Data Use Confidence (DUC) vs. Data Use (DU) (N=111)

		DUC	DU
EDL	Pearson Correlation	1.000	.416**
	Sig (2-tailed)		.000006
	N	111	111
DUC	Pearson Correlation	.416**	1.000
	Sig (2-tailed)	.000006	
	N	111	111

**. Correlation is significant at the 0.01 level.

Research Question 4: What is the relationship between educational leadership efficacy and student achievement? The educational leadership efficacy variable was calculated by averaging the mean scores of all participants in section three of the Principal's Perceptions of DDDM Scale. The student achievement variable was calculated by averaging all of the participants mean pass scores on the 2017-2018 CAASPP English Language Arts and mathematics assessment. A Pearson's *r* was calculated to assess the relationship between the educational leadership efficacy and school performance variables. The result of this analysis indicated that there was not a statistically significant relationship found between the variables.

Research Question 5: What is the relationship between data use confidence and student achievement? The data use confidence variable was calculated by averaging all of the participants mean scores on the Educational Leader's Data Use Self-Appraisal Scale. The student achievement variable was calculated by averaging all of the participants mean pass scores on the 2017-2018 CAASPP English Language Arts and mathematics assessment. A Pearson's *r* was calculated to assess the relationship between the data use confidence and school performance variables. The result of this analysis indicated that there was not a statistically significant relationship found between the variables.

Research Question 6: What is the relationship between data use and student achievement? The data use variable was calculated by averaging the mean of all the participants' scores on section two and four of the Principal's Perceptions of DDDM Scale. The student achievement variable was calculated by averaging all of the participants mean pass scores on the 2017-2018 CAASPP English Language Arts and mathematics assessment. A Pearson's *r* was calculated to assess the relationship between the data use and school

performance variables. The result of this analysis indicated that there was not a statistically significant relationship found between the variables.

Table 37

Calculated Correlations for Quantitative Research Questions 4-6 (N=111)

		Student Achievement
Educational Leadership Efficacy	Pearson's r	.09
	p-value	.38*
Data Use Confidence	Pearson's r	-.07
	p-value	.47*
Data Use	Pearson's r	.11
	p-value	.29*

Note: *p > .05.

Research Questions 7-8. For research questions seven and eight, qualitative data analysis was conducted on two open-ended questions embedded within the survey scale. These two questions were designed to elicit examples of the responsibilities of educational leaders in terms of creating a data-driven culture in their school and district and data practices employed as part of their leadership. For the first question regarding the perception of responsibilities of educational leaders in creating a data-driven culture at their school and district, 84 out of 111 participants answered this question on the survey. In regard to the second question asking educational leaders to discuss the data practices they employ in their capacity as a leader, 71 out of 111 participants answered this question on the survey. Furthermore, Tables 38 and 39 outline the intercoder agreements for research questions seven and eight provided by the researcher and

a doctoral committee member who helped facilitate the development of the intercoder agreement. Finally, within Tables 39 and 40, the results of the coded qualitative data analysis will be provided as well as the major themes derived from the data will be reviewed.

Table 38

Intercoder Agreement: School Leader Perceptions Regarding Creating a Data-Driven Culture in Schools and/or Districts

Code	Code #
Time constraints/restraints get in the way of utilizing data practices	1
Data practices drive decisions and instruction	2
Lack of knowledge/training to use data by school/district leaders	3
Data practices are used for setting and monitoring goals	4
Lack of accountability by school/district leaders to use data practices	5
Lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.)	6
Leaders need to promote data practices with a purpose to encourage teacher participation in using data (i.e., professional development)	7
Responsibility of Leaders to know and share data practices	8
Schools/districts need in-house experts to refine/teach leaders data practices	9
Resistance (i.e., Open vs. Passive)	10

Other	11

Table 38 describes the intercoder agreement codes developed by the researcher and a doctoral committee member for the question regarding school leader perceptions regarding their responsibilities to create a data-driven culture at their school site and district. Codes 1, 4, 7, 8, 9, 10, 11, 12, and 13 were new codes developed by the researcher and a doctoral committee member after reviewing their initial open codes and ultimately compromising on new code categories. Codes 2 and 6 were provided by the researcher's doctoral committee member, which the researcher agreed to keep within the intercoder agreement. Code 5 was provided by the researcher, which the doctoral committee member agreed to keep within the intercoder agreement. Code 3 on the intercoder agreement is the only code the researcher and his doctoral committee member had in each of their initial open codes that were agreed upon to be added to the intercoder agreement.

Table 39

Intercoder Agreement: School Leader Perceptions Regarding Data-Driven Practices They Employ to Create a Data-Driven Culture at their School Site and/or District

Code	Code #
Data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans)	1
Leaders as role models that set the culture	2
Time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, the process takes time)	3
Responsibility and obligation to implement/mandate the use of data in schools and districts	4

School/district leader's responsibility to build the capacity of staff to use data	5
Resistance from various leaders and teachers	6
Leaders must use data in context to provide it to teachers	7
Leaders do not have an in-depth understanding of how to use data and implement data-driven cultures	8
Lack of support from leaders to implement data-driven cultures in schools and districts	9
Viewing data as important and a high priority	10
No direction or plan from various districts, which resulted in no accountability from school site leaders and teachers	11
Lack of resources to implement data-driven cultures	12
Other	13

Table 39 outlines the intercoder agreement codes developed by the researcher and a doctoral committee developed for the question regarding the perceptions of school leaders regarding data-driven practices they employ to create a data-driven culture at their school site and district. Codes 3, 4, 5, 6, 7, 9, 10, and 11 were new codes developed by the researcher and the doctoral committee member after reviewing their initial open codes and ultimately compromising on new code categories. Code 8 was provided by the researcher's doctoral committee member, which the researcher agreed to keep within the intercoder agreement. Codes 1 and 2 on the intercoder agreement were the only two codes the researcher and the doctoral

committee member had in each of their initial open codes that were agreed upon to be added to the intercoder agreement.

Table 40

Findings: School Leader Perceptions Regarding Creating a Data-Driven Culture in Schools and/or Districts

Code	Code #	Category	Category #
Responsibility and obligation to implement/mandate the use of data in schools and districts	1	Leadership*	100
Leaders as role models that set the culture	2	Leadership*	100
Data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans)	3	Data Use*	300
Leaders do not have an in-depth understanding of how to use data and implement data-driven cultures	4	Lack of Capacity*	400
Resistance from various leaders and teachers	5	Resistance	500
Lack of resources to implement data-driven cultures	6	Restraints	200
Viewing data as important and a high priority	7	Data Use	300

No direction or plan from various districts, which resulted in no accountability from school site leaders and teachers	8	Accountability	600
Leaders must use data in context to provide it to teachers	9	Leadership	100
Other	10	Other	600
Lack of support from leaders to implement data-driven cultures in schools and districts	11	Restraints	200
Time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, process takes time).	12	Restraints	200
School/district leader's responsibility to build the capacity of staff to use data	13	Leadership	100

Note: *indicates most prevalent response categories from participants.

Research Question 7: What do you believe to be your responsibility as a leader in terms of creating a data-driven culture at your school site and school district? Themes derived from the final selective codes included (a) leadership, (b) restraints, (c) data use, (d) and lack of capacity. All of these themes described above in Table 40 have been placed in order from the most prevalent to least prevalent based on the number of participant responses that were coded into each theme. Furthermore, each theme is broken down to include all of the major axial

coding categories each theme was derived from. First, in regard to the theme of leadership, it was derived from the following axial coded categories: (a) responsibility and obligation to implement/mandate the use of data in schools and districts, (b) leaders as role models that set culture, (c) leaders must use data in context to provide it to teachers, (d) and school/district leaders responsibility to build capacity of staff to use data. Secondly, in relation to the theme of restraints, it was derived from the following axial coded categories: (a) lack of resources to implement data-driven cultures, (b) lack of support from leaders to implement data-driven cultures in schools and districts, (c) and time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, process takes time). Thirdly, in regard to the theme of data use, it was derived from the following axial coded categories: (a) data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans), (b) and viewing data as important and a high priority. Finally, for the theme of the lack of capacity, it was derived from the following axial coded category: (a) leaders do not have an in-depth understanding of how to use data and implement data-driven cultures.

Table 41

Findings: School Leader Perceptions Regarding Data-Driven Practices They Employ to Create a Data-Driven Culture at their School Site and/or District

Code	Code #	Category	Category #
Data practices drive decisions and instruction	1	Data-driven decision-making*	100
Lack of knowledge/training to use data by school/district leaders	2	Lack of capacity*	200
Time constraints/restraints get	3	Time*	400

in the way of utilizing data practices			
Resistance (i.e., Open vs. Passive)	4	Resistance*	500
Data practices are used for setting and monitoring goals	5	Data-driven decision-making	100
Responsibilities of leaders to know and share data practices	6	Leadership	300
Leaders need to promote data practices with a purpose to encourage teacher participation in using data (i.e., professional development)	7	Leadership	300
Lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.)	8	Lack of capacity	200
Lack of accountability by school and district leaders to use data practices	9	Lack of capacity	200
Other	10	Other	600
Schools/districts need in-house experts to refine/teach leaders data practices	11	Lack of capacity	200

Note: *indicates most prevalent response categories from participants.

Research Question 8: What do you believe to be the most important data-driven practices that you employ as part of your leadership? Themes from the data analysis that emerged from the final selective coding included (a) data-driven decision-making, (b) lack of capacity, (c) time and, (d) resistance. All of these themes described above in Table 41 have been placed in order from the most prevalent to least prevalent based on the number of participant responses that were coded into each theme. Furthermore, each theme is broken down to include all of the major axial coding categories each theme is derived from. First, in regard to the theme of data-driven decision-making, it was derived from the following axial coded categories: (a) data practices drive decisions and instruction, (b) and data practices are used for setting and monitoring goals. Secondly, in relation to the theme of the lack of capacity, it was derived from the following axial coded categories: (a) lack of knowledge/training to use data by school/district leaders, (b) lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.), (c) lack of accountability by school/district leaders to use data practices, (d) and schools/districts need in-house experts to refine/teach leaders data practices. Third, in regard to the theme of time, it was derived from the following axial coded category: (a) time constraints/restraints get in the way of utilizing data practices. Finally, for the theme of resistance, it was derived from the following axial coded category: (a) resistance (i.e., open vs. passive).

Summary

This chapter presented a summary of the findings regarding the eight quantitative and qualitative research questions. Survey results and descriptive statistics of the demographics were discussed. In addition, the standard scores and reliability of the survey scales were analyzed. Also, the findings were outlined regarding the six quantitative research questions. Lastly, the

findings were discussed and reviewed for each of the qualitative research question. The findings outlined within chapter four will be further elaborated and discussed throughout chapter five.

CHAPTER 5: SUMMARY AND DISCUSSION

This study was designed to determine whether relationships existed between educational leaders' leadership efficacy, data use, efficacy in data use (e.g., data use confidence), and school performance in K-12 schools. The purpose of Chapter five is to elaborate on the findings outlined in Chapter four for each research question and provide a discussion connecting the results to pertinent literature reviewed in Chapter five. Chapter five will outline recommendations for future research on this topic and describe the implications of the study to the existing research. Lastly, the limitations and delimitations were reviewed for this study.

Summary of the Study

The following six quantitative and two qualitative research questions guided the design of this study:

Quantitative Research Questions

1. What is the relationship between educational leadership efficacy and data use confidence?
2. What is the relationship between educational leadership efficacy and data use?
3. What is the relationship between data use and data use confidence?
4. What is the relationship between educational leadership efficacy and student achievement?
5. What is the relationship between data use confidence and student achievement?
6. What is the relationship between data use and student achievement?

Qualitative Research Questions

7. What do you believe to be your responsibility as a leader in terms of creating a data-driven culture at your school site and/or school district?

8. What do you believe to be the most important data-driven practices that you employ as a part of your leadership?

Overall, this study utilized a mixed-method research methodology to answer the research questions. The most dominant research methodology employed in this study was a correlational research design, which was used to help answer research questions one through six. The researcher incorporated a qualitative research methodology, which helped provide insight in answering research questions seven and eight.

For the correlational research design, the quantitative data collected for this study focused on data concerning the variables of educational leadership efficacy, data use, data use confidence, and student achievement. Within Chapter four, descriptive statistics were conducted on the survey scales and the demographic profile. Throughout each section of the chapter, measures of frequency and percentage were employed with which the data were analyzed. Then, based on the data collected, variable weights were calculated in relation to how participants answered the various survey scales and items relating to the variables of educational leadership efficacy, data use, and data use confidence. In addition to the variables derived from survey scales, the student achievement variable consisted of the averaged 2017-2018 English Language Arts and mathematics CAASPP assessment scores provided by the study's participants. Finally, all four of these variables were then computed into six separate correlations, which then produced the findings for research questions one through six.

For the qualitative research design, the qualitative data collected for this study focused on the responsibility of educational leaders in creating data-driven cultures as well as the data-driven practices they employ as a part of their leadership. Open, axial, and selective coding took place, including the development of an intercoder agreement among the researcher and

dissertation committee member after the initial open codes were developed. Furthermore, the intercoder agreement, along with the coded qualitative data, was presented in addition to reviewing the top themes that were derived from coding the qualitative data.

Quantitative Research Question Summary

Research Question 1: What is the relationship between educational leadership efficacy and data use confidence? To address and answer research question one, descriptive statistics from section three of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale and the Educational Leader's Data Use of Self-Appraisal Scale provided the overall educational leadership efficacy and data use confidence scores of the study's participants. The results of the descriptive statistics indicated that a majority of participants perceived they had a great deal of leadership efficacy and had quite a bit of confidence in their data use. Furthermore, Pearson's *r* was calculated to assess the relationship between educational leadership efficacy and data use confidence variables. The result of this analysis indicated that there was a moderate correlation between the two variables, $r(109)=.33$, $p < .01$.

The results of this weak positive correlation indicated that a relationship existed between the perceived leadership efficacy of participants, who perceived they had a great deal of efficacy in their leadership ability (85 out of 111 participants), and the participants perceived confidence in their ability in employing various data practices was above average at quite a bit of confidence (56 out of 111 participants) in their positions as educational leaders. Overall, this indicated that participants had a high degree of self-efficacy in their ability to lead relative to their specific leadership role as an educational leader. Likewise, they had quite a bit of confidence (above average efficacy) in conducting various data practices within the capacity of their leadership

position at their school and district. As a result, a conversation regarding the various survey scale items will provide a further explanation of why a positive relationship exists between these variables in addition to how these results relate to the body of literature.

When looking closer at the educational leadership efficacy survey scale item results, participants perceived they had a high degree of efficacy in their ability to create a positive learning environment, generate enthusiasm for their shared vision of their school/district, and facilitate student learning in their school/district. Conversely, participants perceived they had a low degree of efficacy in their ability to cope with the stress of the job, handle the paperwork required of the job, and maintain control of their daily schedule.

When considering the data use confidence survey scale item results, participants perceived they had high confidence in their ability to use data when they analyzed data to identify student achievement problems in addition to when they analyzed data to detect trends and patterns. Also, participants perceived they had a high level of self-efficacy in their ability to use data when they proposed solutions to problems based on the result of their data analysis. In contrast, participants perceived they had low confidence in their ability to conduct correlational analysis to determine relationships among variables, utilize descriptive statistics, and identify appropriate statistical strategies to analyze and select data. Finally, participants also perceived that they did not have much confidence in the amount of time they had to conduct data analysis in their positions as educational leaders.

The findings regarding educational leadership efficacy and data use confidence relate to Bandura (1994) and Dillard's (2014) findings regarding how the variables of mastery experiences, vicarious experiences, social persuasion, and emotional and physiological conditions all influence one's self-efficacy. Furthermore, in regard to the survey scale items in

relation to educational leadership efficacy and data use confidence variables in which participants rated their self-efficacy low, the possibility exists that the vast majority of participants have not had the opportunity, time, nor exposure to master these areas in order to have a high level of self-efficacy. For example, if more time and exposure were provided to participants to learn how to utilize descriptive statistics as well as conducting correlation analysis fully, participants would have more self-efficacy in their ability to use these data practices in their capacity as educational leaders. Possibilities also exist that there are vast amounts of social pressure on educational leaders to stay on top of other leadership activities like creating a positive learning environment and facilitating student learning versus a low social persuasion by districts towards training educational leaders to use data in the manner of conducting correlations and descriptive statistics.

The results also demonstrated these findings align with McCray (2014) and Wu's (2009) conclusions on data use by principals because both researchers found that educational leaders, like principals, do not have enough time to interact, review, and analyze data in meaningful ways. This goes hand in hand with Mandinach's (2012) findings regarding the lack of human capacity existing among educational leaders, such as principals, to learn how to use data because there are not many formal or informal mechanisms within districts or administrative preparation programs in place to help educational leaders increase their data skills.

Research Question 2: What is the relationship between educational leadership efficacy and data use? In order to address and answer research question two, descriptive statistics from sections two, three, and four of the Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale provided the overall educational leadership efficacy and data use scores of this study's participants. The results of the descriptive statistics indicated

that a majority of participants perceived they had a great deal of leadership efficacy and participants perceived they were using data quite a bit (above average) in their positions as educational leaders. Furthermore, Pearson's *r* was calculated to assess the relationship between educational leadership efficacy and data use variables. The result of this analysis indicated that there was a moderate correlation between the two variables, $r(109)=.33$, $p < .01$.

The results of this weak positive correlation indicated that a relationship exists between the perceived educational leadership efficacy of participants and perceived efficacy of participants regarding their data use. First, in regard to educational leadership efficacy, participants believed they had a great deal of efficacy in their leadership ability (85 out of 111 participants) based on the overall educational leadership efficacy scores. Next, in regard to data use, participants provided their perceptions regarding the types of data they interacted with and used by describing what types of data were available, used, and important at their school site and/or district as well as the types of supports they believed to help them effectively make decisions using data. Therefore, the aggregate data use scores were derived from the average scores from the types of data (i.e., available, used, and important data) utilized by participants, as well as, the averaged data use scores regarding the importance of different types of supports for making decisions using data. Altogether, the aggregate scores demonstrated that the majority of participants perceiving they used quite a bit of data (69 out of 111 participants) in their position as an educational leader. This means participants had a high degree of self-efficacy in their ability to lead relative to their specific leadership role at their school site and/or district as well as their perception that their use of data was above average in terms of utilizing various types of data in conjunction with the supports that were in place to aid them in using data to make data-driven-decisions in their capacity as a leader. Therefore, based on these results, a further

discussion of various survey scale items needs to be provided in order to fully describe why there was a positive relationship existing among these variables. These findings will also allow the researcher to explain how these results relate to the body of literature.

When looking closer at the educational leadership efficacy survey scale items, participants perceived they had a high degree of efficacy in their ability to create a positive learning environment, generate enthusiasm for their shared vision of their school/district, and facilitate student learning in their school/district. Conversely, participants perceived they had a low degree of efficacy in their ability to cope with the stress of the job, handle the paperwork required of the job, and maintain control of their daily schedule.

When zooming in on the data use survey scale item results, participants perceived the most available types of data included reading and mathematics assessment data (i.e., Lexile, Star, DRA, etc.), English Language Learner enrollment data, and Special Education enrollment data, transportation data, parent, staff, and student satisfaction survey data, and student attendance data. In terms of the most used data types, student attendance data, enrollment by gender data, free and reduced lunch data, minority enrollment data, discipline data, Special Education data, teacher turnover data, and school safety data are most used by the participants in this study. Finally, participants perceived the most important data types included student attendance data, minority enrollment data, reading and mathematics assessment data (i.e., Lexile, Star, DRA, etc.), parent, staff, and student satisfaction survey data, discipline data, ad school safety data.

Then, in addition to the perceived available, used, and important data types participants interact with and use, participants also provided their most and least effective supports for effectively using data in their decision-making processes. The top supports for effectively using data in their decision-making processes included: helping to support school improvement team in

data analysis, staff development in data analysis, sufficient time for the data analysis process, having staff believe that data analysis is important, and having data analysis courses as part of administrative preparation programs. In contrast, the least effective supports for education leaders to use data in their decision-making processes included training in data analysis software (i.e., Excel, SPSS, etc.), training in creating effective school level and/or district surveys, public understanding of the correct use of data, school-level personnel able to create spreadsheets and databases, and access to professional literature regarding decision making.

Previous studies found within the literature can further explain the findings found in this study regarding the relationship between educational leadership efficacy and data use. In Vanhoof et al. (2014), McCray (2014), and Moak (2010), their findings further elaborate on the relationship that exists between these variables. For example, Vanhoof et al. (2014) found that attitude provided the strongest relationship with data use by principals. While attitude is distinguishable from leadership efficacy because of how both variables were measured, they are interrelated because the body of literature demonstrates that efficacy and attitude are both related to an individual's motivations regarding ability level and task completion (Bandura, 2001). Therefore, when there is an above average motivation regarding task completion, particularly in the utilization of data, there is a likelihood that data will be used much more.

McCray's (2014) findings further narrowed the findings of this study. McCray (2014) found principals who perceived they used data extensively in their leadership capacity. Specifically, regarding their data use, these principals perceived highly in their ability to make decisions regarding school improvement plans, informing parents of progress, assigning students to remedial programs, and improving classroom instruction (McCray, 2014).

Lastly, in regard to educational leadership efficacy, the results relating to how participants perceived they had a low degree of efficacy in their ability to cope with the stress of the job, handle the paperwork required of the job, and maintain control of their own daily schedule links directly to Moak's (2010) findings found regarding how principals do not have enough time to complete all of their necessary leadership tasks. Ultimately, this study and Moak's (2010) study found that principals and educational leaders ultimately did not have much time on their hands as well as did not have much confidence in their ability to prioritize their schedules. Thus, competing for demands like facilitating student learning and fostering a positive learning environment may take precedence over utilizing data and further developing their capacity in their ability to use data in more capacities as an educational leader because of their lack of time and inability to prioritize their schedule when many competing demands exist.

Research Question 3: What is the relationship between data use and data use confidence? The data use variable was calculated by averaging the mean scores of all of the participant's scores on section two and four of the Principal's Perceptions of DDDM Scale. The data use confidence variable was calculated by averaging all of the participants mean scores on the Educational Leader's Data Use Self-Appraisal Scale. A Pearson's *r* was calculated to assess the relationship between the data use and data use confidence variables. The result of this analysis indicated that there was a moderate correlation between the two variables, $r(109)=.41$, $p < .01$.

The results of this positive correlation indicated that a relationship exists between the perceived efficacy of participants regarding their data use and their perceived confidence in their ability in using various practices in their position as an educational leader. First, in regard to data use, participants provided their perceptions regarding the types of data they interact with

and use by describing what types of data were available, used, and important at their school site and/or district as well as the types of supports they believe in helping them effectively make decisions using data. Therefore, the aggregate data use scores were derived from the averaged data use scores from the types of data (i.e., available, used, and important data) utilized by participants, as well as, the averaged data use scores regarding the importance of different types of supports for making decisions using data. Altogether, the aggregate scores demonstrated that the majority of participants perceived they used quite a bit (above average) of data (69 out of 111 participants) in their position as an educational leader. For data use confidence, which is the participant's perceived ability in using various data practices in their role as educational leaders, was denoted as a quite a bit of confidence (above average) (56 out of 111 participants) from participant responses. This means participants perceived they were able to use various data types and supports to help them make decisions, which also further facilitated their perception in their belief in their ability to use various data practices in their positions as educational leaders within their schools and districts. Thus, based on these results, a further discussion of various survey scale items needs to be provided in order to fully describe why there is a positive relationship existing among these variables. Furthermore, these findings will also allow the researcher to explain how these results relate to the body of literature.

When evaluating the data use survey scale item results, participants perceived the most available types of data included reading and mathematics assessment data (i.e., Lexile, Star, DRA, etc.). English Language Learner enrollment data, and Special Education enrollment data, transportation data, parent, staff, and student satisfaction survey data, and student attendance data. In terms of the most used data types, student attendance data, enrollment by gender data, free and reduced lunch data, minority enrollment data, discipline data, Special Education data,

teacher turnover data, and school safety data are most used by the participants in this study. Finally, participants perceived the most important data types included student attendance data, minority enrollment data, reading and mathematics assessment data (i.e., Lexile, Star, DRA, etc.), parent, staff, and student satisfaction survey data, discipline data, and school safety data. In addition to the perceived available, used, and important data types participants interact with and use, participants also provided their most and least effective supports for effectively using data in their decision-making processes. The top supports for effectively using data in their decision-making processes included helping to support school improvement team in data analysis, staff development in data analysis, sufficient time for the data analysis process, having staff believe that data analysis is important, and having data analysis courses as part of administrative preparation programs. In contrast, the least effective supports for education leaders to use data in their decision-making processes included training in data analysis software (i.e., Excel, SPSS, etc.), training in creating effective school level and/or district surveys, public understanding of the correct use of data, school-level personnel able to create spreadsheets and databases, and access to professional literature regarding decision making.

Similarly, when analyzing the data use confidence survey scale results, participants perceived they had high confidence in their ability to use data when they analyzed data to identify student achievement problems in addition to when they analyzed data to detect trends and patterns. Also, participants perceived they had a high level of self-efficacy in their ability to use data when they proposed solutions to problems based on the result of their data analysis. Conversely, participants perceived they had low confidence in their ability to conduct correlational analysis to determine relationships among variables, utilize descriptive statistics, and identify appropriate statistical strategies to analyze and select data. Finally, participants also

perceived that they did not have much confidence in the amount of time they had to conduct data analysis in their positions as an educational leader.

This relationship between the data use and data use confidence variables can best be connected to the body of literature by describing how the various survey scale items described above relate to a previous study by McCray (2014). Regarding data use, McCray (2014) found that educational leaders, such as principals, use data surrounding student grades, attendance, and discipline the most when making decisions at their school. This relates directly to this study's results because attendance and discipline were some of the most available, used, and important data types rated by participants. Then, in regard to data use confidence, McCray (2014) describes how principals in that study were highly certain they could use a variety of data practices as well as use data effectively. Furthermore, this relates to how participants in this study believed they had an above average confidence in utilizing various data practices like analyzing data to identify student achievement problems, analyzing data to detect trends and patterns, and in their ability to use data when they propose solutions to problems based on the result of their data analysis.

Research Questions 4-6: All research questions four through six involve discerning whether there is a relationship between the data use, educational leadership efficacy, and data use confidence variable and the student achievement variable. A Pearson's *r* was calculated for each of these computations, and the results of each analysis indicated that there was not a statistically significant relationship found between the data use, educational leadership efficacy, and data use confidence variables and the student achievement variable. Each correlation computation for research questions four through six resulted in the p-value of each calculated correlation being

above 0.05, which means these results cannot be reported due to not being statistically significant.

The results for research questions four through six relate to various studies including Soslau's (2009), Moak's (2010), and McCray's (2014) findings because their results also demonstrated that there were no significant relationships to report about principal data use self-efficacy and leadership self-efficacy and student achievement. Similarly, Moak (2010) and McCray (2014) employed survey scales to measure educational leadership efficacy, data use, and data use confidence, which this study then replicated, modified, and computed. Ultimately, some of this study's conclusions were concurrent to these previous studies findings because the educational leadership efficacy, data use, and data use confidence variables did not have significant relationships with the student achievement variable.

On the other hand, these results are in contrast with studies that describe how increasing data use by principals and teachers increased overall AYP and standardized English Language Arts and mathematics test scores (Creighton, 2000; Crum et al., 2009; Datnow et al., 2007; Fischer, 2011; McLeod, 2005; Martinez, 2010;Wu, 2009). However, it must be noted that each of these studies utilized a different methodology and survey scale to measure their data use variable than the data use variable employed in this study as well as in Moak's (2010) and McCray's (2014) studies.

Lastly, student achievement did not have a relationship with these variables because the student achievement variable has many extraneous variables in play, which may have contributed to this finding. Extraneous variables like demographics and socioeconomics are among many variables influencing student achievement that were outside the researcher's

control. Thus, looking for relationships with student achievement within educational studies can be extremely difficult (Creswell, 2013).

Qualitative Research Question Summary

Research Question 7: What do you believe to be your responsibility as a leader in terms of creating a data-driven culture at your school site and/or school district? Open coding was first conducted by the researcher as well as a doctoral committee member on the original qualitative data collected from the survey scale open-ended response question. Then, the researcher clarified his bias regarding his background in participating and establishing a data-driven culture by developing an intercoder agreement with the doctoral committee member before axial and selective coding took place. The final broad themes derived from the selective codes included: (a) leadership, (b) restraints, (c) data use, (d) and lack of capacity.

First, in regard to the theme of leadership, it was derived from the following axial coded categories: (a) responsibility and obligation to implement/mandate the use of data in schools and districts, (b) leaders as role models that set culture, (c) leaders must use data in context to provide it to teachers, (d) and school/district leaders responsibility to build capacity of staff to use data. The findings regarding the theme of leadership relate directly to literature from Fullan (2010), Mandinach (2012), and Wu (2009) that described how educational leaders must be the ones to develop a culture of utilizing data as well as the leaders responsible for building the capacity to use data within their school and/or district setting. The majority of participant responses within this theme described how leadership was one of the key factors to ensure data-driven cultures were being fully implemented as well as holding teachers and staff accountable. As a result, educational leaders, like principals, must be at the forefront of establishing data-driven cultures because they are critical in building the capacity of their teachers and staff in data

literacy, inspire inquiry among other leaders and teachers to use data, and are responsible for modeling what data-driven instruction looks like within classrooms. Therefore, educational leaders are advised to develop the necessary organizational structures within their school and district to influence the types of data teachers can use and analyze. Also, these organizational structures must align to a shared vision within schools and districts that is built upon goals that require data use to achieve that vision (Schildkamp et al., 2013).

Second, in relation to the theme of restraints, it was derived from the following axial coded categories: (a) lack of resources to implement data-driven cultures, (b) lack of support from leaders to implement data-driven cultures in schools and districts, (c) and time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, process takes time). This finding coincides with research by the U.S. Department of Education (2010) and Wayman (2007) in relation to the lack of funding to install, maintain, and train personnel to utilize technology. More specifically, several of the participant comments regarding the lack of resources described how educational leaders in smaller schools and districts do not have the funding to afford up to date technology. Additionally, other restraints such as the lack of support from leaders to implement data-driven cultures and lack of time to conduct data analysis relates to research by Choppin (2002), Mandinach (2012), and the U.S. Department of Education (2010). Choppin (2002) and Mandinach (2012) outlined how educational leaders lack the preparation to employ DDDM because they are not taught data literacy skills within their school administration credentialing programs. This goes hand in hand with the U.S. Department of Education's (2010) finding in relation to how schools and districts do not have strategic plans in place to work with data in addition to not dedicating time throughout the week to analyze data.

Third, in regard to the theme of data use, it was derived from the following axial coded categories: (a) data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans), (b) and viewing data as important and a high priority. The findings regarding the theme of data use relates to research by McCray (2014) and the U.S. Department of Education (2010) in regard to how data can be used to drive instructional development and school improvement. Furthermore, McCray's (2014) findings regarding how principals tended to use data to a moderate or greater degree when making decisions in relation to school improvement and improving classroom instruction paralleled with the majority of the participant responses coded within this theme. Participants in this study noted they used data the most to inform instructional practices within classrooms to monitor and adjust instruction to ensure student needs were being met. Also, participants stated that data was used to develop instructional goals, professional development for teachers, and coaching plans for teachers, which is related to school improvement. Overall, this aligns with the U.S. Department of Education's (2010) comprehensive list in which data was used by educational leaders through the nation in K-12 schools and districts.

Fourth, the theme of the lack of capacity was derived from the following axial coded category: (a) leaders do not have an in-depth understanding of how to use data and implement data-driven cultures. The findings regarding the theme of the lack of capacity to establish data-driven cultures relates to research regarding the educational leader's leadership ability as well as their data literacy skills. Participant responses within this theme described how educational leaders overwhelmingly perceived other educational leaders as not having the necessary leadership abilities to establish organizational structures and buy-in while implementing data-driven cultures. More importantly, the majority of participant responses within this theme was

that there was a lack of overall knowledge of how to use data as well as teach it to others. Research by Datnow et al., (2007) concluded concurrently with the finding presented in this study regarding the perception among educational leaders that other educational leaders did not have the abilities within their capacity as leaders to establish data-driven cultures within schools and districts. Specifically, Datnow et al, (2007) suggested key strategies to build a solid foundation for implementing DDDM and a data-use culture while investing in information management, selecting the appropriate data, building school capacity for DDDM, and using data to improve student achievement. Furthermore, Wu (2009) found that data literary among educational leaders was low. Thus, in conjunction with developing data literary skills, Wu (2009) suggests that educational leaders must spend time collaborating with other educational leaders and teachers in data analysis to ensure transparency and cohesion across their school site and district.

Research Question 8: What do you believe to be the most important data-driven practices that you employ as part of your leadership? Open coding was first conducted by the researcher as well as a doctoral committee member on the original qualitative data collected from the survey scale open-ended response question. Then, the researcher clarified his bias regarding his background in employing various data-driven practices in his leadership capacities by developing an intercoder agreement with the doctoral committee member before axial and selective coding took place. The final themes from the data analysis that emerged from the selective coding included: (a) data-driven decision-making, (b) lack of capacity, (c) time and, (d) resistance.

The theme of data-driven decision-making was derived from the following axial coded categories: (a) data practices drive decisions and instruction, and (b) data practices are used for

setting and monitoring goals. The findings regarding the theme of data-driven decision-making and its derived axial code categories relate to research presented by Sun et al. (2016) on improving instruction based on data and data-based goal setting within their Four Domains of Data-Driven School Leadership. Sun et al. (2016) found that educational leaders must analyze data sources to develop long term and short-term goals regarding driving instructional and other site and district-based goals. The majority of the participant's responses derived from this theme and axial codes outlined how educational leaders utilized data to decide upon various district-wide, school-wide, and grade level instructional practices employing assessment data in addition to how that very same data was utilized to ensure school and teacher accountability. Accountability was measured by developing goals regarding how instructional practices were influencing how students scored on standardized assessments. Ultimately, throughout this process, data on goals were assessed and analyzed by school leaders and teachers to determine if the instructional practices were working; thus, driving instruction.

Second, in relation to the theme of the lack of capacity, it was derived from the following axial coded categories: (a) lack of knowledge/training to use data by school/district leaders, (b) lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.), (c) lack of accountability by school/district leaders to use data practices, and (d) schools/districts need in-house experts to refine/teach leaders data practices. The findings regarding the theme of lack of capacity and its axial codes relates to research by Mandinach et al. (2006), Mandinach (2012) and the U.S. Department of Education (2010) on how educational leaders do not have the training to use data as well as the ability to articulate data to the greater community. Responses for this theme were predominately focused on how school leaders do not have the skills to provide training to teachers on utilizing data-driven practices. Ultimately, this

falls under the notion of data literacy presented by Mandinach et al. (2006) regarding the skills needed to become data literate, which includes collecting and organizing data, analyzing and summarizing data, and synthesizing and prioritizing data. Going further, educational leaders in this study believed that in-house experts were needed to ensure that data practices were being taught. This aligns with research provided by the U.S. Department of Education (2010) regarding how district superintendents need to distribute resources like proper technology, trained professionals in technological hardware and software, and professional development to ensure principals and teachers have what they need in order to use data to make data-driven decisions. Finally, in regard to the finding of the lack of accountability by school/district leaders in the use of data practices, it relates to findings regarding the need to establish a culture of accountability as a pivotal step in order to increase data use to improve student achievement (Fischer, 2011, Fullan, 2010; Kapan & Miyake, 2010; Togneri & Anderson, 2003). Furthermore, recommendations provided by Fullan (2010), Datnow et al. (2007) U.S. Department of Education (2010), and Staman et al. (2014) described how data must be prioritized by school and district leaders, training must be focused on specific data practices aligned with instructional goals, investing in user-friendly SIS's, and aligning data use to district and/or school visions in a system-wide approach.

Third, in regard to the theme of time, it was derived from the following axial coded category: (a) time constraints/restraints get in the way of utilizing data practices. The findings regarding the theme of time and its axial code relate to research from McCray (2016) and the U.S. Department of Education (2010) on how educational leaders do not have enough time to interact with data and conduct data analysis. The majority of responses coded into this theme describe how educational leaders have too many other responsibilities that get in the way of

available time that can be utilized to analyze data. Also, responses included descriptions of how there was not enough time to employ data and data practices since context (i.e., environment of school, classroom, and district) is not always given nor is data prioritized by district and school leaders. This goes hand in hand with Fullan's (2010) work regarding how districts and schools must have a focused direction on an initiative in order for it to be successfully incorporated into the culture. Thus, without specific context or prioritization in alignment to a school or districts vision, no time, energy, or resources will be devoted to particular initiatives. In many of the participant responses found in this study, this seems to be the case across many California schools and districts.

Fourth, for the theme of resistance, it was derived from the following axial coded category: (a) resistance (i.e., open vs. passive). The findings regarding the theme of resistance and its axial code were derived from several participant responses on how some school leaders, teachers, and staff tended to be resistant to using data practices in their various educational settings (i.e., within the classroom, district office, etc.). One school leader was completely resistant to data use because they outlined how data is not the only measure to determine individual student needs. In regard to teachers, many of the responses from this study's participants described how teachers were unmotivated to change their behavior due to the nature of their job security (e.g., tenure and teacher unions). In turn, due to these reasons, participants perceived that teachers were unwilling to be coached to use data and data practices to drive their instruction. Also, comments outlined how teachers are excited but overwhelmed at times when data initiatives are reviewed by administrators. Again, this falls under research by Fullan (2010) regarding how to establish buy-in from teachers and staff during the implementation of new system-wide initiatives, like using data to drive instruction. Fullan (2010) recommended

educational leaders can improve the success of school and district initiatives, like data use, by ensuring that at the school and district level the initiative is fully aligned, which will better support the initiative with district-wide goals to further establish buy-in, collaboration, and endorsement from teachers and staff.

Conclusions and Discussion

This study was undertaken to address whether relationships existed between educational leaders' leadership efficacy, data use, efficacy in data use (e.g., data use confidence), and student achievement in K-12 schools. Overall, several relationships were found between data use and educational leadership efficacy, data use, and data use confidence, and data use confidence and educational leadership efficacy. This study was able to provide valuable information that may help assist other educational leaders on how to utilize various types of data, establish data-driven cultures within schools and districts, and employ data practices within differing leadership capacities in K-12 educational settings to drive instruction and school improvement. Ultimately, these conclusions may help educational leaders make effective decisions using data that will improve and assist schools and districts in serving their students in effective ways. Thus, the conclusions of this study will be outlined in addition to their connections to the body of literature on these topics.

Conclusions

- Participants believed they were highly efficacious in their ability to lead in their respective leadership positions in K-12 schools and districts.
- Participants believed they had high levels of data use self-efficacy in regard to the types of data they utilized in their leadership positions and adequate supports in place at their school sites and districts to assist them in making data-driven decisions.

- Participants believed they had an above average efficacy in their ability to use data practices in their leadership positions within K-12 educational settings.
- Participants in this study who believed they had a high level of educational leadership efficacy also believed they had above average confidence in their ability to utilize data practices in their positions as educational leaders. This was exemplified by the relationship found between the educational leadership efficacy and data use confidence variable.
- Participants in this study who believed they had a high level of educational leadership efficacy also believed they utilized a wide variety of types of data in addition to believing they had adequate supports in place at their school site and district to make data-driven decisions in their practice as educational leaders. This was exemplified by the relationship found between the educational leadership efficacy and data use variable.
- Participants who believed they used a variety of different types of data and had adequate supports in place to make data-driven decisions also believed they had above average confidence in their ability to utilize various data practices in their positions as educational leaders to help them make data-driven decisions. This was exemplified by the relationship found between the data use and data use confidence variable.
- The variables of data use, educational leadership efficacy, and data use confidence did not have a relationship with the student achievement variable.
- Participants perceived it was their responsibility and obligation, as educational leaders, to mandate and model data-driven cultures in schools and districts.
- Participants perceived data practices drive decision making for instruction and school and district improvement.

- Participants perceived that there was a lack of training among educational leaders to use data effectively.
- Participants outlined how time constraints and other restraints were the main culprits' educational leaders perceived as getting in the way of utilizing data practices in their leadership positions.

Discussion

This study utilized survey scales developed by Schneider (2007), Moak (2010), and McCray (2014), which were modified for the purposes of this study. The results derived from this study affirm several of the main conclusions found in Moak (2010) and McCray (2014). First, participants believed they had above average or high levels of self-efficacy regarding their leadership ability, the amount of data and types of data they were using to make data-driven decisions, and their utilization of various data practices within their capacity as educational leaders in K-12 schools and districts. Neither McCray (2014) nor this this study, found a relationship between perceived data use self-efficacy and student achievement. This is also concurrent with the findings in Moak's (2010) and Soslau's (2009) findings.

What differentiates this study's conclusions from the conclusions found in Moak (2010) and McCray (2014) were the relationships between the following variables: data use and data use confidence; data use and educational leadership efficacy; educational leadership efficacy and data use confidence. Furthermore, differences were also found in the qualitative findings. Participants had the overwhelming belief that educational leaders had the onus of the responsibility to implement data-driven cultures as well as model how to do so. Also, participants believed that data was to be used primarily for driving instruction, school improvement, and monitoring school and district-wide goals.

Other conclusions derived from this study relate to many of the conclusions found within the body of literature on this topic. First, the conclusion that it was an educational leader's responsibility to mandate and model data-driven cultures and data practices within schools and districts was significant. This goes hand in hand regarding much of what has been found in the body of literature in relation to how educational leaders must build capacity that is in sync at the school and district level while concurrently developing a culture where utilizing data practices to help make decisions to improve student achievement is normalized (Fullan, 2010; Ikemoto & Marsh, 2007; Mandinach et al., 2006; Mandinach, 2012; Wu, 2009). Therefore, educational leaders must focus on strategically intertwining the use of data within the fabric of their school and district culture.

Second, there were two major conclusions regarding the perception from this study's participants that educational leaders did not have the time to review and analyze data as well as had adequate training in data to utilize data in making decisions in their capacity as leaders. In regard to the lack of time, McCray (2014), U.S. Department of Education (2010), and Wu (2009) stated there was not enough time to fully review and analyze data. Then, in regard to the conclusion regarding the perception that there was a lack of training among educational leaders in data use across K-12 schools and districts, it has been found in several studies that teachers, principals, and staff in K-12 schools and districts do not have the skills in place to analyze and use data effectively (Bernhardt, 2000; Choppin, 2002; Mandinach, 2012; U.S. Department of Education, 2010). Thus, the recommendations stemming from this study as well as the body of literature described how educational leaders need time to collaborate in the analysis of data, sufficient training in technology software to utilize gather and transform data (i.e., Excel, SPSS,

SIS's, etc.), knowledge in foundational data concepts/statistics, and training in applying various data practices in making decisions in K-12 educational settings.

Implications

The largest implication of this study were the perceptions among educational leaders across California who perceived they were highly efficacious in terms of their leadership ability, the amount of data and the types of data they were using, the supports in place to help them make data-driven decisions, and the various types of data practices they are employing in their capacity as leaders. Therefore, educational leaders ranging from teacher leaders, principals, and superintendents overwhelmingly believe in their ability to lead and use data in their leadership roles in K-12 schools and districts. However, in strict contrast with this, the findings regarding the qualitative research questions paint a somewhat different picture regarding how educational leaders perceive how they were using data as well as how other educational leaders are using data because of the various constraints and resistance educational leaders face when instituting data-driven cultures and implementing data practices in K-12 schools and districts. Furthermore, much of this discussion will center on the implications the researcher believes that need to be further discussed to bridge the divide found between the quantitative and qualitative findings.

One implication of this study has to do with the necessity for the new curriculum and professional development to improve the data literacy of educational leaders and teachers in K-12 schools and districts. This also begs the question of how schools, districts, and university preparation programs can train educational leaders to collect, transform, analyze, and make decisions with data. Both quantitative and qualitative findings from this study demonstrated that educational leaders perceived there was a lack of capacity in their understanding of basic descriptive statistic calculations while analyzing data as well as more complex calculations that

included conducting correlation analysis. Furthermore, previous research described the need to incorporate meaningful professional development within schools and school districts as well as new curriculum (Mandinach, 2012; Mandinach & Gunner, 2013; Staman et al., 2014). However, new professional development and curriculum regarding data use and DDDM in education are sparse within the body of literature. As a result, the researcher recommends training programs for educational leaders to provide an integrated curriculum involving the following: the utilization of various software programs used to collect, warehouse data, and analyze data (i.e., SIS's concurrently with either Microsoft Excel, Google Sheets, and/or SPSS), foundational data concepts, basic and intermediate statistics, quantitative research design, and presenting findings derived from data to colleagues and community stakeholders. A curriculum with these components may help improve the data literacy of educational leaders as well as the teachers, and staff that educational leaders could train at their school and district through professional development.

Another implication derived from this study relates to several major constraints educational leaders noted that could get in the way of analyzing data to make data-driven decisions, instituting data practices, and implementing and maintaining data-driven cultures in K-12 schools and districts. These constraints included lack of time, resistance from teachers and staff, ability to cope with the stress of the job, handle the paperwork required of the job, and maintain control of their daily schedule. The largest constraints were the lack of time to conduct data analysis on their own time as well as time to conduct data analysis with teachers and other educational leaders. Much of the relevant literature described how the lack of time was one of the main culprits getting in the way of educational leaders analyzing data to make decisions (McCray, 2014). In regard to resistance by teachers and staff, Fullan (2010) outlined how

educational leaders, like principals, must concurrently build accountability and buy-in through the establishment of horizontal change (i.e., teacher, staff, and educational leader driven reform) and capacity building in their skills and abilities as educators. In addition, previous research and this study's findings suggested that educational leaders, like principals, were vital stakeholders to model and establish data-driven cultures in schools (Fullan, 2010; Mandinach, 2012; Wu, 2009). Therefore, educational leaders who can best prioritize and balance their leadership responsibilities, establish buy-in from teachers and have the ability to model the capacity building regarding data use can impact how data teachers utilize data in their classroom to improve instruction and drive school improvement.

Lastly, the results of this study indicated that the most used and important types of data described by educational leaders relate to current school funding mechanisms in California. For example, student attendance, enrollment by gender, minority enrollment, and Special Education enrollment are among the top five most used forms of data by educational leaders. Concurrently, student attendance, parent, staff, and student satisfaction surveys, and free and reduced lunch were rated within the top five most important data types by educational leaders. Therefore, among the most used and important data types rated by educational leaders within this sample from California, school funding and funding accountability mechanisms from state and federal revenue sources like Averaged Daily Attendance (ADA), Local Control Funding Formula (LCFF), Local Control Accountability Plan (LCAP), Federal Title 1 Funding (Title 1), and Special Education funds were associated with each of these data types outlined above. As a result, educational leaders employ data types most associated with funding mechanisms within schools and districts in California. Conversely, the most available data type, reading, and mathematics assessment data, was not rated within the top five used data types utilized by

educational leaders. Thus, in this instance, educational leaders employ and deem important data types utilized for funding and accountability mechanisms over other types of data collected in schools and districts.

Recommendations for Further Research

Several recommendations can be made regarding how to further research this topic. The findings drawn from this study included three relationships existing between the variables of data use, data use confidence, and educational leadership efficacy. In addition, the qualitative findings suggested that educational leaders need to take full responsibility to implement data-driven cultures and utilize data practices in their positions as leaders to improve instruction and school improvement. Therefore, as the body of research continues to grow for the self-efficacy in regard to data use and DDDM by educational leaders in K-12 schools and districts, future research should focus on the following areas: (a) assessing the competency of educational leaders in terms of their ability to access data and conduct statistical analysis to make data-driven decisions, (b) determining how to build the capacity in utilizing data practices (i.e., new curriculum in administrative/teacher preparation programs vs. school/district professional development), and (c) expanding the scope of the study to include a larger sample size, which could include sampling a population of educational leaders from multiple states across the U.S. Fourth, researchers can begin evaluating and developing training educational leaders on how to collect, transform, analyze, and make decisions using data in K-12 educational settings.

Primarily, future studies should focus on developing assessments measuring the competency of educational leaders in their ability to access data and conduct statistical analysis to make data-driven decisions. Ultimately, research needs to focus on determining the data literacy of educational leaders across California as well as the nation to assess what skills and

competencies need to be developed through university preparation programs and school/district professional development.

Second, research in the future needs to focus on how to create the environment within schools and districts to allow for educational leaders to build their capacity in utilizing data practices. From the findings this study produced as well as studies like McCray (2014), there were a number of environmental and institutional barriers in place hindering this development. For example, McCray (2014) noted a lack of knowledge/training to use data, time constraints, and resistance by faculty to utilize data were some of the main barriers in place to fostering this environment. This goes hand in hand with the U.S. Department of Education's (2010) recommendations towards facilitating the capacity building of school administrators in employing data to make decisions as well as establishing data-driven cultures at their respective schools and districts.

Third, studies in the future can expand on the scope of this study for research questions one through three and seven and eight. For example, researchers can sample populations of participants from different states across the U.S. This would allow for researchers to determine how educational leaders across the U.S. are employing data in their capacity as leaders as well as how they are establishing and participating in data-driven cultures at schools and districts. In addition, researchers can analyze whether specific policies and funding utilized by various State Departments of Education are either encouraging or discouraging data use by educational leaders in schools and districts across different states.

Fourth, researchers can evaluate administrative and teacher training programs (i.e., university credential programs and professional development programs at the district and school level) regarding whether the curriculum in place teaches them how to collect, transform, analyze,

and make decisions using data. Specifically, the research can focus on what types of pertinent data and data practices can be taught to educational leaders due to the increasing accessibility to data and advances in the user accessibility to more data collected in K-12 settings, data analysis software, and data warehouses. Furthermore, researchers can also determine how to incorporate these skills and practices into administrative and teacher training programs and curriculum as well as professional development that teaches them to improve future educational leaders and teachers' data literacy. Through this future research, researchers can begin to determine how educational leaders and teachers can best be trained to better employ data and data practices to make data-driven decisions in K-12 educational settings.

Limitations

Throughout this study, there were several limitations that may have affected its findings. These included the scope of the study and generalizable nature of the study's sample size, the reliance on surveys to collect data, and the accuracy of Bandura's self-efficacy theory in relation to the variables of educational leadership efficacy, data use, and data use confidence utilized in this study.

First, the scope of this study only spanned K-12 schools and districts within the state of California. As a result, some of the results and variables found in this study, most notably in relation to the student achievement variable (i.e., English Language Arts and mathematics CAASPP scores), are only pertinent to this study's scope, which took place only in California K-12 schools and districts. Furthermore, the student achievement variable used in this study may not be generalizable across differing cross sections of samples collected from different states outside of California. This is due to states across the United States using differing assessments to measure student achievement within their K-12 education systems. In addition, it must be

noted that student achievement embodies many extraneous variables in play, regardless of what state the data was collected from the sampling population, such as student socioeconomics and demographics in addition to the quality of teachers and the school's students attend. These extraneous variables are among many others are influencing student achievement. Therefore, the findings regarding research questions four through six may have been influenced by extraneous variables outside the researcher's control.

Due to this study's sample size, the generalizability of this study must further be discussed. The generalizability of the study was limited because the sample size included only 111 participants. While this study did cover various geographical locations, school districts, and schools throughout California, there is a need for more participants to improve the generalizability of this study's conclusions. For future studies, more participants and a stratified sample is needed for more generalizable findings and conclusions.

Second, surveys were utilized to collect data for this study. Furthermore, the honesty and truthfulness of the participant responses on the survey were outside of the researcher's control. Since the researcher sent this study's survey to K-12 educational leaders in school and districts throughout the state of California, the researcher did not have control over whether the recruited participants within the population the sample was derived from would respond to the survey request or not. Therefore, the number of responses collected by the researcher for this study were outside of the researcher's control.

Third, the variables of educational leadership efficacy, data use, and data use confidence utilized for this study were predicated on instruments in the form of survey scales measuring these phenomena. Ultimately, instruments utilized in this study for measuring an individual's self-efficacy were derived originally from Bandura's self-efficacy theory and then modified by

subsequent researchers like Tschannen-Moran and Hoy (2001), Schneider (2007), Moak (2010), and McCray (2014). As a result, this theory provides us with a fundamental theoretical framework to work with, which is assumed to be accurate by Bandura and subsequent researchers within the body of the literature which further developed and modified Bandura's self-efficacy instruments to be used to measure the variables utilized in this study. Overall, the self-efficacy framework employed in this study was critical in evaluating how educational leaders rate their ability to use data, implement data practices, and lead in their capacity as leaders in K-12 schools and districts. It must be concurrently noted that Bandura's foundational measuring instruments were not specific to measuring self-efficacy for the variables utilized for this study. Therefore, while the measuring instruments for this study were appropriate, the instruments were inefficient in fully understanding these phenomena.

Delimitations

This study had several delimitations that were strategically placed by the researcher. These delimitations included the decision to incorporate a wide variety of participants under the all-encompassing term "educational leaders" to participate in this study, to not include additional states within the United States as possible avenues to increase the study's sample size, and the survey scale modifications conducted by the researcher were all ways the researcher delimited this study. Furthermore, the researcher used the term "educational leader(s)" as a label to encompass a wide range of participants who have leadership responsibilities in their job capacities within K-12 schools and districts. Ultimately, this delimitation allowed for a larger sample size of leaders in education, outside of principals, as in previous studies like Moak (2010) and McCray (2014), to participate in this study. Next, this study had the opportunity to recruit participants from outside of the state of California. However, due to the possible extraneous

variables regarding the student achievement variable, the researcher decided only to use California to recruit participants to participate in this study. Finally, the researcher modified the survey scales by subtracting a number of questions that the researcher felt were not pertinent to the participants of this study. Also, the researcher also modified the survey scales by adding two free-response questions within two sections of the survey to collect qualitative data for this mixed-methods study. Therefore, the researcher ultimately replicated and then modified the research designs within Moak (2010) and McCray (2014) to develop and conduct this mixed-method research study.

Summary

In this chapter, a summary regarding the study's eight research questions was presented along with the study's conclusions. Also, there was a discussion about how these conclusions aligned with several findings within the body of literature. The researcher then described the implications of the study's findings and conclusions and how K-12 educational leaders can further utilize this research. Then, recommendations for future research were provided by the researcher to build on this current study's findings and conclusions. Lastly, the limitations and delimitations of this study were outlined and discussed.

REFERENCES

Abousaleh, Y., & Alsip, D. (2015). K-12 student information systems: A brief overview. *The Escape Data Conference*, 1-9. Retrieved from http://www2.rmcil.edu/dataanalytics/v2015/papers/K_12_Student_Information_Systems_a_Brief_Overview.pdf

Allinder, R. M. (1994). The Relationship between efficacy and the instructional practices of Special Education teachers and consultants. *Teacher Education and Special Education, 17*, 86- 95.

Altun, A., & Askar, P. (2015). Modeling students' academic performance based on their interactions in an online learning environment. *Modeling of academic performance of students according to interaction data in online learning environment, 14*, 815-824. http://dx.doi.org/10.17051/io.2015.03160

Anthony, A. B. (2012). Activity theory as a framework for investigating district-classroom system interactions and their influences on technology integration. *Journal of Research on Technology in Education, 44*, 335–356.

Argyris, C., & Schoen, D. A. (1978). *Organizational learning: A theory of action perspective.* Reading, MA: Addison Wesley.

Bala, M. (2012). Study of applications of data mining techniques in education. *International J Res Sci Technol, 1*(1), 1-10. http://dx.doi.org/https://doi.org/10.1002/widm.1075

Bandura, A. (1977). Self efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*, 122–147.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. *4*, pp. 71–81). New York, NY: Academic Press.

Bandura, A. (1996). *Self-efficacy: The exercise of control*. New York, NY: W. H.

Bandura, A. (2006). *Going global with social cognitive theory: From prospect to paydirt.* In S. I. Donaldson, D. E. Berger, & K. Pezdek (Eds.), The rise of applied psychology: New frontiers and rewarding careers (pp. 53–79). Mahwah, NJ: Erlbaum.

Bernhardt, V. L. (2000). *Designing and using databases for school improvement*. Larchmont, NY: Eye on Education.

Blakesley, S. (2011). Defining educational leadership in Canada's Yukon Territory: "Hmmm, that's a good question". *Canadian Journal of Education. 34*(1), 4-36.

Brooks, W. (2012). South Carolina middle school principal's use of data-driven decision making. (Doctoral dissertation). Retrieved from https://scholarcommons.sc.edu/etd/950

California Department of Education. (2010). Timeline of California standards-based reform. *California Department of Education.* Retrieved from https://www.cde.ca.gov/nr/re/hd/yr96-10tl.asp

California's smarter balanced assessments: A primer. (2015). *Edsource*. Retrieved from https://edsource.org/2015/california-smarter-balanced-math-english-results-common-core-faq/86181

Coenen, F. (2011). Data mining: Past, present, and future. *The Knowledge Engineering Review*, *26*, 25-29. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.185.1202&rep=rep1&type=pdf

Chemers, M.M., Watson, C.B, & May, S.T. (2000), Dispositional affect and leadership effectiveness: A comparison of self-esteem, optimism, and efficacy. *Personality and Social Psychology Bulletin*, 26, 267-77.

Choppin, J. (2002). Data use in practice: Examples from the school level. *Paper presented at the annual meeting of the American Educational Research Association*, New Orleans, LA.

Cohen, D. K., & Hill, H. C. (2001). *Learning policy: When state education reform works.* New Haven, CT: Yale University Press.

Creighton, T. B. (2000). *Schools and data: The educator's guide for using data to improve decision-making.* Thousand Oaks, CA: Corwin Press.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Los Angeles: SAGE Publications.

Crum, K. S., Sherman, W. H., & Myran, S. (2009). Best practices of successful elementary school leaders. *Journal on Educational Administration, 48*, 48-63. http://dx.doi.org/10.1108/09578231011015412

Datnow, A., Park, V., & Wohlstetter, P. (2007). *Achieving with data: how high performing districts use data to improve instruction for elementary school students.* Los Angeles, CA: Center on Educational Governance, UC Rossier School of Education.

Davis, B., Sumara, D. (2006). *Complexity and education: Inquiries into learning, teaching, and research*. Mahwah, NJ: Lawrence Erlbaum.

Decision-Making. (2017). *Merriam-Webster.* Retrieved from https://www.merriam-webster.com/dictionary/decision-making

Deming, W.E (1986). *Out of the crisis.* Cambridge, MA: MIT Press.

Demographics summary. (2013). *Kidsdata.org*. Retrieved July 21, 2018, from https://www.kidsdata.org/topic/7/demographics/summary

Desimone, L. M., Smith, T. M., & Ueno, K. (2006). Are teachers who need sustained, content focused professional development getting it? An administrator's dilemma. *Educational Administration Quarterly*, *42*(2), 179–215.

Dillard, R. C. (2014). Self-efficacy beliefs of principals in economically disadvantaged high schools with high African American male graduation rates. *Dissertation Abstracts International Section A*, 74.

Dimmock, C. and Hattie, J. (1996), "School principal's self-efficacy and its measurement in the context of restructuring," *School Effectiveness and School Improvement*, *7*(1), 62-75.

Earl, L. & Fullan, M., (2010). Using data in leadership for learning. *Cambridge Journal of Education*, *33*(3), 383-394. doi: 10.1080/0305764032000122023

Earl, L. M. & Katz, S. (2006). *Leading schools in a data-rich world*. Thousand Oaks, CA: Corwin Press.

Eberle, W. I. (2012). Teacher self-efficacy and student achievement as measured by North Carolina reading and math end-of-grade tests. *Dissertation Abstracts International Section A, 72*, 3119

Fischer, B. E. (2011). Using data to increase student achievement: A case study of success in a sanctioned school. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (873812798)

Fleet, A., Madden, L., Semann, A., & Soper, R. (2015). The role of the educational leader: Perceptions and expectations in a period of change. *Australasian Journal of Early Childhood*, *40*(3), 29-37.

Fraenkel, R. J., & Wallen, E. N. (2000). *How to design and evaluate research in education* (4th ed.). San Francisco, CA: McGraw-Hill.

Friedman, I.A. (1997), "High and low burnout principals: what makes a difference?" *Paper presented at the Annual Meeting of the American Educational Research Association,* (ERIC Document No. 410 685) April, Chicago, IL.

Fullan, M., Senge, P. M., & Corwin Press. (2010). *All systems go: The change imperative for whole system reform*. Thousand Oaks: Corwin.

Fullan, M. (2010). *All systems go: The change imperative for whole system reform*. Thousand Oaks, CA: Corwin.

Fullan, M. (2005). *Leadership & sustainability. System thinkers in action*. Thousand Oaks, CA: Corwin Press.

Fulton, B. A. (2016.). The Relationship Between Test Anxiety and Standardized Test Scores, *Walden Dissertations and Doctoral Studies*. Retrieved from https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=3361&context=dissertations

Gall, M.D. & Gall, J. (2007). *Educational Research* (8th ed). New York, NY: Pearson.

Gawthrop, J. (2014). Measuring student achievement: A study of standardized testing & its effect on student learning. *Jessup University.* Retrieved from http://my.jessup.edu/publicpolicy/wp-content/uploads/sites/39/2014/04/Gawthrop_Jeremiah_Final.pdf

Gay, L., Mills, G., and Airasian, P. (2009). *Educational research: Competencies for analysis and applications* (9th ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Gray, J. (1996). Data management: Past, present, and future. *Microsoft Corporation*. Retrieved from https://arxiv.org/ftp/cs/papers/0701/0701156.pdf

Gibson, J. L. (2011). *Organizations: behavior, structure, processes* (14 ed.). Dubuque, IA: McGraw-Hill.

Graham, J.W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology, 60*, 549-579.

Gulistan, M., Hussain, M. A., & Mushtaq, M. (2017). Relationship between Mathematics Teachers Self Efficacy and Students Academic Achievement at Secondary Level. *Bulletin of Education & Research*, *39*(3), 171–182.

G2Crowd. (2018). Best education software. *G2crowd.com*. Retrieved April 23, 2018 from https://www.g2crowd.com/categories/education

Harrison, C., & Killion, J. (2007). Ten roles for teacher leaders. *Educational Leadership, 65*(1), 74.

Hillman, S. (1986), "Measuring self-efficacy: preliminary steps in the development of a multi-dimensional instrument." *Paper presented at the Annual Meeting of the American Educational Research Association*, (ERIC Document No. 271 505) April, San Francisco, CA.

Hoy, A. W. & Spero, R. B. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and teacher Education, 21*, 343-356.

Hoy, W. K., Woolfolk, A. E. (1993). Teachers' sense of efficacy and the organizational health of schools. *The Elementary School Journal, 93*, 355-372.

Huang, X., Liu, M., & Shiomi, K. (2007). An Analysis of the Relationship between Teachers'-efficacy, teachers' self-esteem and Orientations to Seeking help. *Social behavior and Personality, 35*(5), 707-716

Ikemoto, G. S., & Marsh, J. A. (2007). Cutting through the "data driven" mantra: Different conceptions of data-driven decision making. In P.A. Moss (Ed.), *Evidence and decision-making* (National Society for the Study of Education Yearbook, Vol. *106*, Issue 1, pp. 1050131). Chicago: National Society for the Study of Education.

Kaplan, R. S., & Miyake, D. N. (2010). The balanced scorecard. The School Administrator, *2*(7), 10-15.

Khan, S. A. (2012). The Relationship between Teachers' Self-Efficacy and Students Academic Achievement at Secondary Level. *Language In India*, *12*(10), 436-449

Kopcha, T. J. (2010). A systems-based approach to technology integration using mentoring and communities of practice. *Educational Technology Research & Development, 58*, 175–190.

Leithwood, K. & Jantzi, D. (2008). Linking leadership to student learning: The contributions of leader efficacy. *Educational Administration Quarterly, 44*, 496 - 528.

League of Women Voters. (2011). The history of the federal government in public education: Where have we been and how did we get here? *League of Women Voters*. Retrieved from https://lwv.corvallis.or.us/newsletters-archive/2011_National_Education_Study4.pdf

Levin, B. B., & Schrum, L. (2013). Using Systems Thinking to Leverage Technology for School Improvement: Lessons Learned from Award-Winning Secondary Schools/Districts. *Journal of Research on Technology in Education, 46*(1), 29–51.

Lockard, S. A. (2013). An analysis of the relationship between elementary principal self-efficacy and 5th grade reading achievement. Retrieved from http://drum.lib.umd.edu/handle/1903/13987

Long, L., Rivas, L., Light, D., & Mandinach, E. B. (2008). The evolution of a homegrown data warehouse: TUSDStats. In E. B. Mandinach & M. Honey (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 209–232). New York, NY: Teachers College Press.

Lunenburg, F. & Irby, B. (2008). *Writing a successful thesis or dissertation: Tips and strategies for students in the social and behavioral sciences.* Thousand Oaks, CA: Corwin Press.

Luthans, F. and Peterson, S.J. (2002), "Employee engagement and manager self-efficacy: implications for managerial effectiveness and development." *Journal of Management Development, 21,* 376-86.

Lyons, C.A. & Murphy, M.J. (1994). Principal self-efficacy and the use of power. *Paper presented at the Annual Meeting of the American Educational Research Association* (ERIC Document No. 373 421) April, New Orleans, Louisiana.

Martinez, G. (2010). Investigating school principal's personal variables related to the use of data: Implications for professional development. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (734420206)).

Maden, M. (2001). *Success against the odds - five years on: Revisiting effective schools in disadvantaged areas* (ed.). London: Routledge Falmer.

Mandinach, E. B. & Honey, M. (2008). Data-driven decision-making: An introduction. In E. B. Mandinach & M. Honey (Eds.), Data-driven school improvement: Linking data and learning (pp. 1-12). New York, NY: Teachers College Press.

Mandinach, E. B. (2012). A perfect time for data use: Using data-driven decision making to inform practice. *Educational psychologist, 47*(2), 71-85.

Mandinach, E. B., & Gummer, E. S. (2013). A systemic view of implementing data literacy in educator preparation. *Educational Researcher, 42*(1), 30–37. http://dx.doi.org/10.3102/0013189X12459803

Marquez-Vera, C., Cano, A., Romero, C., Fardoun, H., & Ventura, H. (2016). Early drop out predicting using data mining: a case study with high school students. *Expert Systems, 33*(1), 107-124. http://dx.doi.org/https://doi.org/10.1111/exsy.12135

McCray, M. (2014). Data driven decision-making and principal's perceptions. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (3665490)).

McCormick, M.J. (2001). Self-efficacy and leadership effectiveness: applying social cognitive theory to leadership. *Journal of Leadership Studies, 8*(1), 22-33.

McLeod, S. (2005). *DDDM competencies for teachers and administrators (DRAFT) Develop in conjunction with the Chicago (IL) Public Schools.* Retrieved April 25, 2018, from http://ww.scottmcleod.net/storage/2005_DDDM_Competencies_for_CPS_Educat ors_DRAFT_3.pdf.

Miller, J. K. (2007). The use of data to inform decisions by elementary building principals. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (304841876))

Means, B., Gallagher, L., & Padilla, C. (2007). Teacher' use of student data systems to improve instruction. *US Department of Education, 1*(1), 1-18. Retrieved from https://www2.ed.gov/rschstat/eval/tech/teachers-data-use/teachers-data-use.pdf

Moak, J. (2010). *The self-perception of leadership efficacy of elementary principals and the effects on student achievement* (Doctoral dissertation). University of Missouri Columbia,

United States – Missouri. Retrieved May 1, 2018, from https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/8325/research.pdf?sequence=3

Osterman, K. and Sullivan, S. (1996). New principals in an urban bureaucracy: A sense of efficacy. *Journal of School Leadership, 6*, 661-90.

Paglis, L. & Green, S.G. (2002). Leadership self-efficacy and managers' motivation for leading change. *Journal of Organizational Behavior, 23*, 215-35.

Pajares, F. (1997). Current directions in Self-efficacy research. In Maehr & P. R.

Parry, M. (2012). Big data on campus. *New York Times*. Retrieved from http://www.nytimes.com/2012/07/22/education/edlife/colleges-awakening-to-the-opportunities-of-data-mining.html

Ritt, M. (2016). The impact of high-stakes testing on the learning environment. *Master of Social Work Clinical Research Papers*. Paper 658. Retrieved from http://sophia.stkate.edu/msw_papers/658

Rogers, M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Romero, C. & Ventura, S. (2013). Data mining in education. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, *3*(1), 12-27.

Romero, C., Zafra, A., Maria Luna, J., & Ventura, S. (2012). Association rule mining using genetic programming to provide feedback to instructors from multiple choice quiz data. *Expert Systems*, *30*(2), 162-172. http://dx.doi.org/10.1111/j.1468-0394.2012.00627.x

Ross Collin. (2018) Weak humanism and the economic mission of English education. *Changing English 25*:1, 97-106.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80,* 1-28.

Rotter, J. B. (1975). Some problems and misconceptions related to the construct of internal versus external control of reinforcement. *Journal of Consulting and Clinical Psychology, 43*, 56-67**.**

Schildkamp, K., Karbautzki, L., & Vanhoof, J. (2014). Exploring data use practices around Europe: identifying enablers and barriers. *Studies in Educational Evaluation, 42*, 15–24. https://doi.org/10.1016/j.stueduc.2013.10.007

Schneider, K. (2007) Data-driven decision making in North Carolina's public schools: The Principal's Perspective. (Doctoral dissertation). Western Carolina University, Cullowhee, North Carolina. Retrieved December 21, 2010, from Dissertations & Theses: Full Text. (Publication No. AAT 3273622)

Schwarzer, R., B€aßler, J., Kwiatek, P., Schroder, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology: An International Review, 46,* 69–88. doi:10.1111/j.1464-0597.1997. tb01096.x

Shen, J., Cooley, V. E., Reeves, P., Burt, W. L., Ryan, L., Rainey, M. J. & Yuan, W. (2010). Using data for decision making: Perspectives from 16 principals in Michigan, USA. *International Review of Education*, *56*(4), 435–456.

Senge, P., Cambron-McCabe, N., Lucas, T., Smith, B. Dutton, J., & Kleiner, A. (2000). *Schools that learn.* New York: Doubleday/Currency.

Soslau, D. M. (2009). School principal's use of student performance data and the effects on student achievement. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (305135650)).

Spillane, J. P. (2005). Distributed leadership. *The Educational Forum, 69*, 143–150.

Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A distributed perspective. *Educational Researcher, 30*(3), 23–28.

Student eligibility to receive free or reduced price school meals. (2015). *Kidsdata.org*. Retrieved July 21, 2018, from https://www.kidsdata.org/topic/518/free-school-meals-eligible/table#fmt=675&loc=2,127,347,1763,331,348,336,171,321,345,357,332,324,369,358,362,360,337,327,364,356,217,353,328,354,323,352,320,339,334,365,343,330,367,344,355,366,368,265,349,361,4,273,59,370,326,333,322,341,338,350,342,329,325,359,351,363,340,335&tf=84

Stack, M., Coulter, D., Grosjean, G., Mazawi, A., & Smith, G. (2006). Fostering tomorrows educational leaders. *Management in Education.* Retrieved from http://edst-educ.sites.olt.ubc.ca/files/2013/07/slc.educ_.ubc_.ca-Stack.pdf

Staman, L., Visscher, A. J., & Luyten, H. (2013). The effects of professional development on the attitudes, knowledge and skills for data driven decision making. *Studies in Educational Evaluation*. http://dx.doi.org/10.1016/j.stueduc.2013.11.002

Streifer, P., & Schumann, J. (2005). Using data mining to identify actionable el information: Breaking new ground in data-driven decision-making. *Journal of Education for Students Placed at Risk, 10,* 281-293.

Stringer, P. (2013). *Capacity building for school improvement*. Rotterdam: Sense Publishers.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change, 7*, 221-258. http://dx.doi.org/10.1007/s10833-006-0001-8

Sun, J., Johnson, B., & Pryzbylski (2016). Leading with data: An increasingly important feature of school leadership. *International Studies in Educational Administration*, *44*(3), 93-128.

Timperley, H., Parr, J. (2009) Chain of influence from policy to practice in the New Zealand literacy strategy, *Research Papers in Education, 24:2*, 135-154, doi: 10.1080/02671520902867077

Togneri, W., & Anderson, S. E. (2003). *Beyond islands of excellence: What districts can do to improve instruction and achievement in all schools.* Washington, DC: Learning First Alliance. Retrieved from http://learningfirst.org/publications/districts/

Tschannen-Moran, M., & Hoy, A. W. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*, 202-248.

Tschannen-Moran, M., & Hoy, W, A. (2001). Teacher efficacy: Capturing and elusive construct. *Teaching and Teacher Education, 17*, 783-805.

Tschannen-Moran, M. & Gareis, C. (2004). Principal's sense of efficacy: Assessing a promising construct. *Journal of Educational Administration, 42*, 573-585.

U.S. Department of Education. (2010). *Use of education data at the local level: From accountability to instructional improvement.* Office of Planning, Evaluation, and Policy Development. Washington, DC: U.S. Retrieved from https://www2.ed.gov/rschstat/eval/tech/use-of-education-data/use-of-education-data.pdf

U.S. Government Accountability Office. (2009). *Schools use multiple strategies to help students meet academic standards, especially schools with higher proportions of low-income and*

minority students (GAO Publication No. 10-18). Retrieved from http://www.gao.gov/products/GAO-10-18

US Legal, I. (2014). Standardized test [Education] law & legal definition. Retrieved from US Legal Definitions: http://definitions.uslegal.com/s/standardizedtest-education

Wayman, J. C. (2007). Student data systems for school improvement: The state of the field. Educational Technology Research Symposium, 1, 156-162. Lancaster, PA: ProActive.

What is smarter balanced?: History. (2017). *SmarterBalanced*. Retrieved from http://www.smarterbalanced.org/about/history

Waddock, S., C. Bodwell. (2004). Managing responsibility: What can be learned from the quality movement. *California Management Review 47*(1), 25–37.

Ward, C., Fisher, D., Frey, N., & Lapp, D. (2013). *Using data to focus instructional improvement.* Alexandria, VA: Corwin.

Wayman, J. C. (2013). Leading data use: Pre-service courses for principals and superintendents. *Journal of Educational Research and Policy*, *13*(2), 29-38.

Wayman, J. C., & Jimerson, J. B. (2014). Teacher needs data-related professional learning. *Studies in Educational Evaluation*, *42*(1), 25-34.

Wayman, J. C., Cho, V., Jimerson, J. B. & Spikes, D. D. (2012). District-wide effects on data use in the classroom. Education Policy Analysis Archives, *20*(25).

Williams, J. (2011). A comparison of secondary principal's use of data systems to increase student achievement in mathematics as measured by standardized assessments. Doctoral dissertation (retrieved from ProQuest Dissertations and Theses. (867800169))

Williams, B. & Hummelbrunner, R. (2011). *Systems concepts in action: A practitioner's toolkit*. Stanford, CA: Stanford University Press.

Windschitl, M. & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture. *American Educational Research Journal*, *39*, 165–205.

Wood, R. & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361-84.

Woolfolk, A. E. (1998). *Educational Psychology* (7th Ed.). Englewood Cliffs, NJ: Prentice Hall.

Wu, P. (2009). Do we really understand what we are talking about? A study examining the data literacy capacities and needs of school leaders (Doctoral dissertation).

Rossier School of Education, University of Southern California, Los Angeles, CA.

Van Geel, M., Keuning, T., Visscher, A., & Fox, J.-P. (2017). Changes in educators' data literacy during a data-based decision-making intervention. *Teaching and Teacher Education*, *64*, 187–198. https://doi.org/10.1016/j.tate.2017.02.015

Vanhoof, J., Vanlommel, K., Thijs, S., & Vanderlocht, H. (2014). Data use by Flemish school principals: Impact of attitude, self-efficacy and external expectations. *Educational Studies*, *40*(1), 48–62.

Yost, R. (2002). "I think I can": Mentoring as a means of enhancing teacher efficacy. *The Clearing House*, *75*(4), 195-197.

Zhao, Y., & Frank, K. A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal*, *40*(4), 807–840. doi:10.3102/00028312040004807

Zieleniak, J. (2013). Jumping through hoops: Student achievement and the California high school exit exam. *UC San Diego School of Economics*. Retrieved from http://econweb.ucsd.edu/~jzieleni/pdfs/Zieleniak.J-job market paper.pdf

APPENDIX A

Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale & Educational Leader's Data Use Self-Appraisal Scale

Survey 1: Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale

This survey questionnaire asks educational leaders (i.e., principals, assistant principals, coordinators, and superintendents) to provide information regarding (1) the types of data available to educational leaders; (2) the types of data-based decisions being made as well as how data is used to make those decisions; and (3) the resources/supports needed in utilizing data at a school site and/or school district.

Section 1: Demographic Information

1. NCES School or NCES School District Number (i.e., School or School District Identifier number). Note: If you are not assigned a specific school site, please use the NCES School District identifier code. The link to find your NCES number is found on the survey email.

   _____

2. What type of educational leader are you?
   a. O Principal
   b. O Assistant Principal
   c. O Superintendent
   d. O Coordinator (Technology, ELD, SPED, ELA, Math, Science Curriculum, etc.)
   e. O Teacher Leader (Department head, content leader, or grade level leader, etc.)
   f. Other:_____ (Specify title)

3. Years of service as an educational leader (i.e., principals, assistant principals, coordinators, and superintendents), including this school year (2018-2019), as an educational leader?
   a. O First Year
   b. O 1-4 Years
   c. O 5-9 Years
   d. O 10+ Years

4. My highest educational degree?
   a. O Masters
   b. O Ed. S
   c. O Ed.D/Ph.D.
   d. Other:____ (Specify)

5. What is your gender?
   a. O Male
   b. O Female
   c. O N/A

Section 2: Data Use - Types of Data Educational Leaders Use

Which of the following data are important, available, and/or utilized by you to your school? Data may be from school, district, state or national sources. Please check all columns that apply for each item. Leave items that do not apply blank.

Type of Data	___Available (1)	___Used (1)	___Important (1)
1. Student attendance	___Available (1)	___Used (1)	___Important (1)
2. Student grades	___Available (1)	___Used (1)	___Important (1)
3. Discipline data	___Available (1)	___Used (1)	___Important (1)
4. Minority enrollment	___Available (1)	___Used (1)	___Important (1)
5. Special education enrollment	___Available (1)	___Used (1)	___Important (1)
6. Enrollment by gender	___Available (1)	___Used (1)	___Important (1)
7. English Language Learner enrollment	___Available (1)	___Used (1)	___Important (1)
8. Free/reduced lunch	___Available (1)	___Used (1)	___Important (1)
9. State Testing Scores (i.e., Math and Reading)	___Available (1)	___Used (1)	___Important (1)
10. Reading and Math Scores (i.e., Lexile, Star, DRA, etc.).	___Available (1)	___Used (1)	___Important (1)
11. Student schedules	___Available (1)	___Used (1)	___Important (1)
12. Student climate survey data	___Available (1)	___Used (1)	___Important (1)
13. Retentions	___Available (1)	___Used (1)	___Important (1)
14. Transportation data	___Available (1)	___Used (1)	___Important (1)
15. Budget/financial information	___Available (1)	___Used (1)	___Important (1)
16. School safety data	___Available (1)	___Used (1)	___Important (1)
17. Teacher turnover rates	___Available (1)	___Used (1)	___Important (1)
18. Student movement (i.e., transfers)	___Available (1)	___Used (1)	___Important (1)
19. Parent, staff, and student satisfaction surveys	___Available (1)	___Used (1)	___Important (1)
20. Parent satisfaction surveys	___Available (1)	___Used (1)	___Important (1)

Section 3: Educational Leader Efficacy Survey (Likert Scale)

Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create challenges for educational leaders in their school and/or district activities.

Please indicate your opinion about each of the questions below by marking one of the nine responses in the columns on the right side. The scale of responses ranges from "None at all" (1) to "A Great Deal" (9), with "Some Degree" (5) representing the mid-point between these low and high extremes. You may choose any of the nine possible responses since each represents a degree on the continuum. Your answers are confidential. Please respond to each of the questions by considering the combination of your current ability, resources, and opportunity to do each of the following in your present position.

"In your current role as an educational leader, to what extent can you…"

Question #	Question	None at all (1)	(2)	Very Little (3)	(4)	Some Degree (5)	(6)	Quite a bit (7)	(8)	A Great deal (9)
1	Facilitate student learning in your school/district?	1	2	3	4	5	6	7	8	9
2	Generate enthusiasm for a shared Vision for the school/district?	1	2	3	4	5	6	7	8	9
3	Handle the time demands of the job?	1	2	3	4	5	6	7	8	9
4	Manage change in your school/district?	1	2	3	4	5	6	7	8	9
5	Create a positive learning environment in your school/district?	1	2	3	4	5	6	7	8	9
6	Raise student achievement on standardized tests?	1	2	3	4	5	6	7	8	9

7	Motivate teachers?	1	2	3	4	5	6	7	8	9
8	Promote the prevailing values of the community in your school/district?	1	2	3	4	5	6	7	8	9
9	Maintain control of your own daily schedule?	1	2	3	4	5	6	7	8	9
10	Shape the operational policies and procedures that are necessary to manage your school/district?	1	2	3	4	5	6	7	8	9
11	Handle the paperwork required of the job?	1	2	3	4	5	6	7	8	9
12	Promote ethical behavior among school /district personnel?	1	2	3	4	5	6	7	8	9
13	Cope with the stress of the job?	1	2	3	4	5	6	7	8	9
14	Prioritize among competing demands of the job?	1	2	3	4	5	6	7	8	9
15	Promote acceptable behavior among students you serve?	1	2	3	4	5	6	7	8	9

What do you believe to be your responsibility as a leader in terms of creating a data-driven culture at your school site? _____

Section 4: Data Use for an Educational Leader to Make Data-Driven Decisions

Directions: To what extent, if at all, how did you use data in your position as an educational leader to make decisions? Rate the following items regarding their importance in your position as an educational leader to make decisions by effectively using data? Please choose the best response to each item.

1= Don't know/No opinion, 2= Of no Importance at All, 3= Not Very Important, 4= Somewhat important, 5= Very Important, 6= Extremely Important

Question #	Question	(1) Don't Know / No Opinion	(2) Of no Importance at All	(3) Not Very Important	(4) Somewhat Important	(5) Very Important	(6) Extremely Important
1	Staff development in data analysis	1	2	3	4	5	6
2	school/district personnel trained in data analysis	1	2	3	4	5	6
3	Public understanding of correct use of data	1	2	3	4	5	6
4	Data analysis coursework as part of administrative preparation programs	1	2	3	4	5	6
5	Training in data analysis software (e.g., excel,	1	2	3	4	5	6

	SPSS, etc.)						
6	School-level personnel able to create spreadsheets and databases	1	2	3	4	5	6
7	Training in creating effective school level and/or district level surveys	1	2	3	4	5	6
8	Access to professional literature regarding decision making	1	2	3	4	5	6
9	Staff believe that data analysis is important	1	2	3	4	5	6
10	Help school improvement team in data analysis	1	2	3	4	5	6
11	Sufficient time for data analysis process	1	2	3	4	5	6
12	Staff development in data analysis process	1	2	3	4	5	6
13	Analyzing data (score, enrollments etc.) overtime	1	2	3	4	5	6

What do you believe to be the most important data-driven practices that you employ as a part of your leadership?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Survey 2: Educational Leader's Data Use Self-Appraisal Survey

Data Use Self-Appraisal Questionnaire

Directions: This survey questionnaire is designed to help us gain a better understanding of the kinds of obstacles that create difficulties for educational leaders in using data in their role as a leader. A number of situations will be described below can make it difficult to effectively use multiple forms of data, organize data, analyze data, and make decisions. Please rate in each of the blanks in the column how to certain you are that you can, as of right now, do the things discussed below in writing the appropriate number. Your numbers will be kept strictly confidential and you will not be identified by name. To familiar yourself with the rating form please complete the practice item first.

If I were to ask you to lift an objective of different weights right now, how certain are you that you can lift each of the weights described below.

Sample 1

Rate your degree of confidence by recording a number 0 to 100 using the scale given below.

0	10	20	30	40	50	60	70	80	90	100

Cannot do at all Can moderately do Highly certain can do

Physical Strength	Confidence (0-100)
Lift a 10-pound object.	
Lift a 20-pound object,	
Lift a 50-pound object.	
Lift a 80-pound object.	

Data Use Self-Appraisal Survey

Rate your degree of confidence by recording a number 0 to 100 using the scale given below.

0	10	20	30	40	50	60	70	80	90	100

Cannot do at all Can moderately do Highly certain can do

Question #	Data Use	Confidence (0-100)
1	Spend sufficient time analyzing data	_____
2	Identify pertinent data to answer questions regarding student achievement	_____
3	Access pertinent data to answer questions regarding student achievement	_____
4	Identify pertinent data to answer questions regarding teacher effectiveness	_____
5	Access pertinent data to answer questions regarding teacher effectiveness.	_____
6	Identify appropriate statistical strategies to analyze and select data.	_____
7	Analyze data to identify student achievement problems	_____
8	Analyze data to identify teacher effectiveness problems	_____
9	Propose solution to problems based on the result of data analysis	_____
10	Utilize descriptive statistics as a means to analyze data	_____
11	Conduct correlation analysis to determine the relationships among variables	_____
12	Interpret the results from multiple statistical analyses	_____
13	Explain the results of the statistical analysis of data to teachers	_____
14	Explain findings of data analysis to parents of different educational levels	_____
15	Create graphs to report statistical findings	_____
16	Analyze data to detect trends and patterns	_____
17	Find district personnel who are able to provide professional development to you in data analysis	_____
18	Foster a school climate where data analysis is viewed as	_____

	essential	
19	Rate your overall confidence in your ability to use data effectively in your position as an educational leader	_____
20	Rate your confidence in other educational leader's ability you work with in their ability to use data effectively	_____
21	Rate your level of confidence that data use will improve student achievement	_____

APPENDIX B

Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale & Educational Leader's Data Use Self-Appraisal Scale Codebook

Survey 1: Educational Leader's Perspectives of DDDM: The Educational Leader's Perspective Scale

Section 1: Demographic Information

Question Number	Variable Name	Description	Number of Digits	Data Level	Categories
1	LEAD	Type of educational leader	1	CAT	Principal, Assistant Principal, Superintendent, Coordinator, Teacher Leader
2	YEARS	Years of service as an educational leader	2	INT	
3	DEGREE	Highest educational degree	1	CAT	Masters, Ed.S, and/or Ed.D/Ph.D
4	DISTRICT	District name	0	NO	
5	SCHOOL	School name	0	NO	

Section 2: Data Use - Types of Data Educational Leaders Use

Question Number	Variable Name	Description	Number of Digits	Data Level	Categories

1	ATTENDANCE	Student attendance	1	CAT	Available, Used, Important
2	GRADES	Student grades	1	CAT	Available, Used, Important
3	DISCIPLINE	Discipline data	1	CAT	Available, Used, Important
4	MINORITY	Minority enrollment	1	CAT	Available, Used, Important
5	SPED	Special education enrollment	1	CAT	Available, Used, Important
6	ENGEND	Enrollment by gender	1	CAT	Available, Used, Important
7	ENELL	English language learner enrollment	1	CAT	Available, Used, Important
8	FREELUNCH	Free/reduced lunch	1	CAT	Available, Used, Important
9	STATTEST	State testing Scores	1	CAT	Available, Used, Important
10	READMATH	Reading and math scores	1	CAT	Available, Used, Important
11	STSCHEDULE	Student schedules	1	CAT	Available, Used, Important

12	CLIMATESURVEY	Student climate survey data	1	CAT	Available, Used, Important
13	RETENT	Retentions	1	CAT	Available, Used, Important
14	TRANSPORT	Transportation data	1	CAT	Available, Used, Important
15	BUDGET	Budget/financing information	1	CAT	Available, Used, Important
16	SAFETY	School safety data	1	CAT	Available, Used, Important
17	TURNOVER	Teacher turnover rates	1	CAT	Available, Used, Important
18	MOVEMENT	Student schedules	1	CAT	Available, Used, Important
19	SURVEY	Parent, staff, and student satisfaction surveys	1	CAT	Available, Used, Important
20	PARENT	Parent satisfaction surveys	1	CAT	Available, Used, Important

Section 3: Educational Leader Efficacy Survey

Question Number	Variable Name	Description	Number of Digits	Data Level	Categories

1	FACILATELEARN	Facilitate student learning in your school/district?	1	INT
2	GENENTHUS	Generate enthusiasm for a shared Vision for the school/district?	1	INT
3	HANDLETIME	Handle the time demands of the job?	1	INT
4	MANAGECHANGE	Manage change in your school/district?	1	INT
5	POSLEARN	Create a positive learning environment in your school/district	1	INT
6	UPACHIEVEMENT	Raise student achievement on standardized tests?	1	INT
7	MOTIVATETEACH	Motivate teachers?	1	INT
8	PROMOVALUES	Promote the prevailing values of the community in your school/district?	1	INT

9	CONTROLSCHEDULE	Maintain control of your own daily schedule?	1	INT
10	SHAPEOPERATIONS	Shape the operational policies and procedures that are necessary to manage your school/district?	1	INT
11	PAPERWORK	Handle the paperwork required of the job?	1	INT
12	PROMETHICS	Promote ethical behavior among school /district personnel?	1	INT
13	COPESTRESS	Cope with the stress of the job?	1	INT
14	PRIORCOMP	Prioritize among competing demands of the job?	1	INT
15	ACCEPTBEHAVE	Promote acceptable behavior among	1	INT

		students you serve?			
16 Open-Response Question	DATADRIVENCULTURE	What do you believe to be your responsibility as a leader in terms of creating a data-driven culture at your school site?	0	NO	

Section 4: Data Use for an Educational Leader to Make Data-Driven Decisions

Question Number	Variable Name	Description	Number of Digits	Data Level	Categories
1	STAFFDEVDATA	Staff development in data analysis	1	INT	
2	SCHOOLTRAINDATA	School/district personnel trained in data analysis	1	INT	
3	PUBLICUNDER	Public understanding of correct use of data	1	INT	
4	DATACOURSE	Data analysis coursework as part of administrative preparation programs	1	INT	

5	TRAINDATAANAL	Training in data analysis software (e.g., excel, SPSS, etc.)	1	INT
6	CREATESPREAD	School-level personnel able to create spreadsheets and databases	1	INT
7	TRAININGSURVEY	Training in creating effective school level and/or district level surveys	1	INT
8	ACCESSLIT	Access to professional literature regarding decision making	1	INT
9	BELIEVEDATA	Staff believe that data analysis is important	1	INT
10	HELPIMPROV	Help school improvement team in data analysis	1	INT
11	SUFFTIME	Sufficient time for data analysis process	1	INT
12	STAFFDEV	Staff development	1	INT

		in data analysis process			
13	ANALDATA	Analyzing data (score, enrollments etc.) overtime	1	INT	
14 Open-Response Question	DATAPRACTICES	What do you believe to be the most important data-driven practices that you employ as a part of your leadership?	0	NO	

Survey 2: Educational Leader's Data Use Self-Appraisal Survey

Question Number	Variable Name	Description	Number of Digits	Data Level	Categories
1	TIMEDATAANAL	Spend sufficient time analyzing data	2	INT	
2	PERTDATA	Identify pertinent data to answer questions regarding student achievement	2	INT	
3	PERTDATAACHIEVE	Access pertinent data	2	INT	

		to answer questions regarding student achievement		
4	PERTTEACHEFFECT	Identify pertinent data to answer questions regarding teacher effectiveness	2	INT
5	PERTQUESTION	Access pertinent data to answer questions regarding teacher effectiveness.	2	INT
6	STATSTRAT	Identify appropriate statistical strategies to analyze and select data.	2	INT
7	ANALACHPROB	Analyze data to identify student achievement problems	2	INT
8	TEACHEFFECTPROB	Analyze data to identify teacher effectiveness problems	2	INT
9	PROPSOLUTION	Propose solution to	2	INT

		problems based on the result of data analysis		
10	DESCRIPTSTATS	Utilize descriptive statistics as a means to analyze data	2	INT
11	CORRELATION	Conduct correlation analysis to determine the relationships among variables	2	INT
12	INTERPRETSTATS	Interpret the results from multiple statistical analyses	2	INT
13	EXPLAINDATATEACH	Explain the results of the statistical analysis of data to teachers	2	INT
14	EXPLAINDATAPAR	Explain findings of data analysis to parents of different educational levels	2	INT
15	GRAPHS	Create graphs to report	2	INT

		statistical findings		
16	DATATRENDS	Analyze data to detect trends and patterns	2	INT
17	PROFESSIONDEVELOP	Find district personnel who are able to provide professional development to you in data analysis	2	INT
18	DATACLIMATE	Foster a school climate where data analysis is viewed as essential	2	INT
19	YOURCONFIDENCE	Rate your overall confidence in your ability to use data effectively in your position as an educational leader	2	INT
20	OTHERCONFIDENCE	Rate your confidence in other educational leader's ability you work with in	2	INT

		their ability to use data effectively		
21	DATAUSEACHIEVE	Rate your level of confidence that data use will improve student achievement	2	INT

APPENDIX C

Qualitative Data: Open Codes, Intercoder Agreements, and Axial Codes for Research Questions 7 and 8

Research Question 7: What are the perceptions of school leaders regarding their responsibilities to create a data-driven culture at their school site and/or district?

Open Codes

Code	Code Number
Data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans)	1
Leaders as role models that set culture	2
Time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, process takes time)	3
Responsibility and obligation to implement/mandate the use of data in schools and districts	4
School/district leaders responsibility to build capacity of staff to use data	5
Resistance from various leaders and teachers*	6
Leaders must use data in context to provide it to teachers	7
Leaders do not have an in-depth understanding of how to use data and implement data-driven cultures	8
Lack of support from leaders to implement data-driven cultures in schools and districts	9
Viewing data as important and a high priority	10
No direction or plan from various districts, which resulted in no accountability from school site leaders and teachers	11
Lack of resources to implement data-driven cultures	12
Other	13

Intercoder Agreement

Revised Coding Categories - Intercoder Agreement			Legend	
Coding Description	Code Number		Matt Rhoads Codes	
			Dr. Buell's Codes	
Data used for instructional development and school in	1		New Code	
Leaders as role models that set culture	2		Both	
Time restaints/limits on leaders and teachers to use c	3			
Responsibility and obligation to implement/mandate th	4			
School/district leaders responsibility to build capacity	5			
Resistence from various leaders and teachers*	6			
Leaders must use data in context to provide it to teacl	7			
Leaders do not have an in-depth understanding of hov	8			
Lack of support from leaders to implement data-drive	9			
Viewing data as important and a high priority	10			
No direction or plan from various districts, which resu	11			
Lack of resources to implement data-driven cultures	12			
Other	13			

Axial Codes

Code	Code Number
Responsibility and obligation to implement/mandate the use of data in schools and districts	1
Leaders as role models that set culture	2
Data used for instructional development and school improvement (i.e., professional development, coaching, creating school plans)	3
Leaders do not have an in-depth understanding of how to use data and implement data-driven cultures	4
Resistance from various leaders and teachers	5
Lack of resources to implement data-driven cultures	6
Viewing data as important and a high priority	7
No direction or plan from various districts, which resulted in no accountability from school site leaders and teachers	8
Leaders must use data in context to provide it to teachers	9
Other	10
Lack of support from leaders to implement data-driven cultures in schools and districts	11
Time restraints/limits on leaders and teachers to use data (i.e., need to collaborate, disaggregate data, process takes time)	12
School/district leader's responsibility to build capacity of staff to use data	13

Research Question 8: What are the perceptions of school leaders regarding data-driven practices they employ to create a data-driven culture at their school site and/or district?

Open Codes

Code	Code Number
Time constraints/restraints get in the way of utilizing data practices	1
Data practices drive decisions and instruction	2
Lack of knowledge/training to use data by school/district leaders	3
Data practices are used for setting and monitoring goals	4
Lack of accountability by school/district leaders to use data practices	5
Lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.)	6
Leaders need to promote data practices with a purpose to encourage teacher participation in using data (i.e., professional development)	7
Responsibility of Leaders to know and share data practices	8
Schools/districts need in-house experts to refine/teach leaders data practices	9
Other	10
Resistance (Open vs. passive)	11

Intercoder Agreement

Revised Coding Categories - Intercoder Agreement			Legend	
Coding Description	Code Number		Matt Rhoads Codes	
			Dr. Buell's Codes	
Time constraints/restraints get in the way of	1		New Code	
Data practices drive decisions and instructio	2		Both	
Lack of knowledge/training to use data by scl	3			
Data practices are used for setting and monit	4			
Lack of accountability by schoo/district leade	5			
Lack of data articulation and knowhow by sta	6			
Leaders need to promote data practices with	7			
Responsibility of Leaders to know and share	8			
Schools/districts need in-house experts to re	9			
Resistance (Open vs. Passive)	10			
Other	11			

Axial Codes

Code	Code Number
Data practices drive decisions and instruction	1
Lack of knowledge/training to use data by school/district leaders	2
Time constraints/restraints get in the way of utilizing data practices	3
Resistence (Open vs. Passive)	4
Data practices are used for setting and monitoring goals	5
Responsibilities of Leaders to know and share data practices	6

Leaders need to promote data practices with a purpose to encourage teacher participation in using data (i.e., professional development)	7
Lack of data articulation and knowhow by stakeholders (i.e., community, school board, parents, etc.)	8
Lack of accountability by school/district leaders to use data practices	9
Other	10
Schools/districts need in-house experts to refine/teach leaders data practices	11

APPENDIX D

Concordia University IRB Approval

INSTITUTIONAL REVIEW BOARD DECISION

Review Date	12/01/2018
IRB#	4722
Review Category	☐ Exempt 45 CFR 46.101 ☑ Expedited 45 CFR 46.110 ☐ Full Board 45 CFR 46.102
Title of Project	EDUCATIONAL LEADERSHIP EFFICACY: THE RELATIONSHIP BETWEEN DATA USE, DATA USE CONFIDENCE, LEADERSHIP EFFICACY, AND SCHOOL PERFORMANCE
Name Principal Investigator's (PI)	Matthew Rhoads
PI's Email (use CUI email, if applicable)	matthew.rhoads1@eagles.cui.edu

☑ **Approval as submitted**

Effective duration of the IRB Approval: 12 /01 /2018 to 11 /30 /2019
Comments:

Please note the following requirements in the CUI IRB Handbook.

a. The IRB's approval is only for the project protocol named above. Any changes are subject to review and approval by the IRB.
b. An annual report or report upon completion is required for each project. If the project is to continue beyond a twelve month period, a request for continuation of approval should be made in writing. Any deviations from the approved protocol should be noted.

☐ **Approval with revision**

Comments:

☐ **Referral for revision and resubmission**

Comments:

☐ **Disapproval**

Comments:

Signature of IRB Member: Digitally signed by Blanca Quiroz Date: 2018.12.01 08:32:22 -08'00' Date: 12/01/2018

Printed Name of IRB Member: Blanca Quiroz