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TECHNOLOGY SUPPORTED DATA-DRIVEN DECISION-MAKING IN AN OKLAHOMA ELEMENTARY SCHOOL

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IN AN OKLAHOMA ELEMENTARY SCHOOL

A Dissertation APPROVED FOR THE
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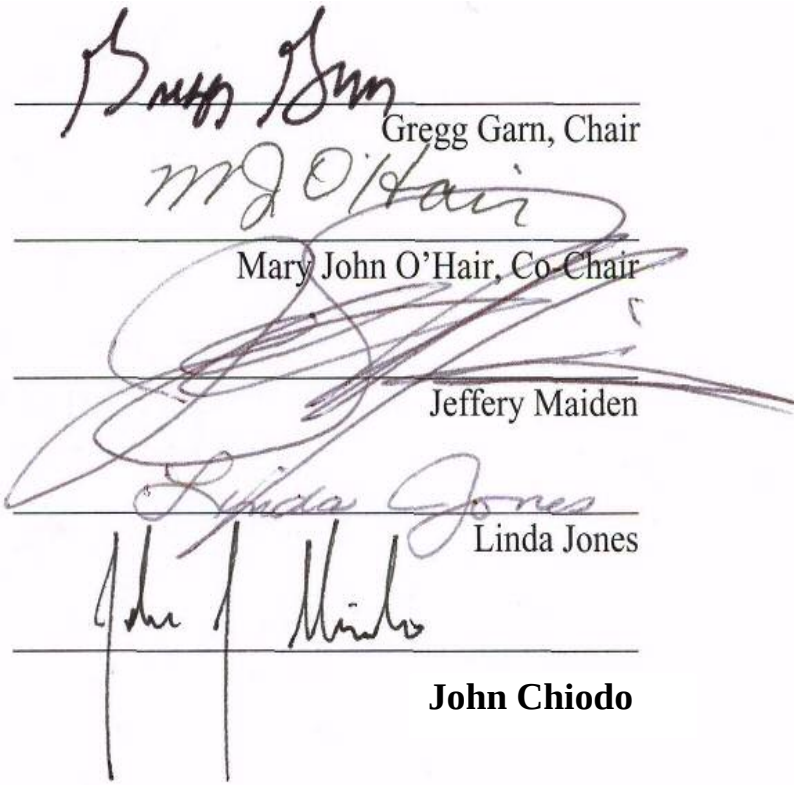
BY



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ABSTRACT

Public school educators need to know how to use data that support informed decision making in order to improve educational processes. Theoretical models provide scant explanations of how public school educators actually apply data-driven decisions leaving educators with many unanswered questions about the practice.

The researcher collected and examined descriptions of the data-driven decision-making process from six elementary educators. The data were examined to three data-driven decision-making categories found in literature: (1) purpose of data-driven decisions, (2) processes of data-driven decision-making, and (3) contextual characteristics of data-driven decision-making.

The researcher found that a blend of external and internal forces contributed to data-driven decision-making implementation at this study's site. Other findings involve the similarities or differences between the practitioners' actual data-driven decision-making processes and data-driven decision-makingprocesses presented in literature. A major factor that influenced instructional decisions in order to address various students' learning needs came from computer-generated data that the practitioners reviewed.

Inquiry into technology-assisted data analysis and decision-making may provide a clearer understanding between data-driven decision-making and school improvement plans. Also, investigating how educational practitioners completed data-driven decision making processes as compared to literature-based data-driven decision-making processes may provide additional information to school practitioners in order to assist them in making informed school improvement decisions at a more competent level.

CHAPTER 1

Introduction

A byproduct of the current Information Age is a deluge of data. Transforming oceans of data into useful information may be likened to the ancient mariner's dilemma who observed, "Water, water, everywhere, nor any drop to drink" (Coleridge, 1798). Certainly, this presents educational leaders who gather and use information with an incredible challenge and opportunity, and results in a slightly altered verse—"Data, data, everywhere." American public educators are among those who are engulfed in the ocean of data, but their greater dilemma may be," What data do we really need and what do we do with it?"

A variety of data are routinely collected in most American public schools. Administrators may tally average daily attendance (ADA) rates as well as maintain transcript/letter grade data, including students' course enrollments and grade levels. As a condition for receiving funds, state and/or federal regulations require school administrators to collect information on students such as their family income. Title I and Free and Reduced Lunches are two examples of federal programs that require accurate data collection as a prerequisite in order for the local school to receive reimbursement funding. Thus, school districts and schools collect a wide array of data.

No Child Left Behind (NCLB), a federal legislation passed in 2001, requires school and district administrators to collect information on student learning. NCLB mandates that all American public schools provide a quality educational program to all students. To enforce this national school improvement initiative, student learning is assessed using a State approved assessment instrument. Each state is required to develop

procedures for reporting the student learning data results. The procedures must then be submitted and approved by the United States Department of Education. Typically, educators do not systematically collect data about student learning in order to identify learning strengths and weaknesses. Also, educators have not typically developed improvement strategies from existing data (Levesque, Bradby, & Rossi, 1996). However, NCLB requires educators to collect and report data about student learning as well as to identify and correct any unsatisfactory student achievement performances. NCLB mandates present two dilemmas: How will schools meet the NCLB requirements to collect data on student learning in order to improve student achievement? How will schools use the data to make informed decisions concerning school improvement?

With the increase of state and federal requirements for educational accountability, public school educators are mandated to make school improvement decisions. Access to current and relevant data are needed in order for effective decision-making processes to occur. Without relevant school data, principals and the staff are left to base their decision-making on good intentions, intuition, or hunches. Bernhardt (1998) stated that the success of school improvement efforts depends on the extent to which principals make or lead decisions based on relevant data. According to Johnson(1997), educators do not effectively use data. He also noted data disaggregation often reveals patterns in curriculum areas that need improvement.

Streifer (1999) stated the use of computer technology and information-management software applications should assist school educators in their decision-making process. There are few empirical studies that address the use of computer technology in assisting educators with their decision-making.

This study examined how elementary educators used data to influence their instructional practices and how elementary educators gather and analyze data. This study specifically investigated the purpose and processes of data-driven decision-making in an Oklahoma elementary public school. Although data have been used for accountability and funding reimbursement purposes in the past, data use to improve instructional practices is an emerging practice in today's schools. The investigation examined how data were collected and analyzed as well as how data impacted instructional decision-making.

Background

Recent research has demonstrated that American schools are failing to meet the public, business, and community expectations in achieving acceptable results on standardized assessments (Elmore & Fuhrman, 1994; Hargreaves & Fink, 2000; Schmoker, 1996). The standardized assessments are developed and used to measure a student's level of learning. As a result, school accountability is the most prominent issue found in the federal legislation of the No Child Left Behind Act (NCLB) of 2001. The NCLB act requires all publicly funded schools to make adequate annual progress toward demonstrating that all students are testing at proficient levels on statewide exams. Schools that fail to do so face severe consequences, including loss of funds, reconstitution, state takeover, or closure.

The crux of the NCLB accountability requirements relies on educational standards or goals that identify what students are expected to know and be able to do. Benchmarks are established to assist educators in measuring how well students are making progress in meeting these educational standards. The present purpose of standards is to force

continuous school improvement for all children (Nelson, 1994; Tachney, 1999). One way to ensure continuous school improvement is through collaborative decision-making (Leithwood, 1994).

Information to make informed decisions that affect student performance in positive ways can assist educators to meet current accountability requirements (Texas Education Agency, 1998). Data-driven decision-making is a contributing factor in improveing teaching and learning in schools (Bernhardt, 1999). Schools that gather and use data as part of the school improvement efforts make the desired changes and get increased student learning (Schmoker, 1996). Conversely, schools that do not use data often abandon their school improvement initiatives before they have a chance to know if what they are doing is actually working. As a result, many school improvements efforts stop prematurely because student achievement benchmarks have not been systematically evaluated or reevaluated with relevant data to determine if the school improvement efforts were effective. Therefore, the lack of ongoing data usage and analysis thwarts school improvement decisions by failing to produce evidence of what works or does not work.

Streifer (1999) stated that educational data-driven decision-making can be defined as the process of selecting, gathering and analyzing data to address problems and then using the data to act on these problems. He also noted that when information is acted upon through decision-making processes, it becomes critical information for school improvement (Streifer, 1998). Root causes of problems in student learning are discovered when data are gathered, analyzed, and disaggregated. For example, the following conclusions were revealed when a third grade reading assessment from River

Road Elementary was disaggregated by gender, English language learners, and mobility: (1) reading problems were greater among boys than girls, (2) reading problems were greater among English language learners, (3) students who had been at the school longer were doing better in reading (Bernhardt et al., 2000). Because the River Road staff paid attention to the data on student achievement and were committed to continuous improvement, their reading scores improved as a result of implementing the following practices: (1) regular alternative reading assessments were given and entered into a database, (2) grade level meetings were held on a quarterly basis to examine data, and (3) the principal and teachers had database access to view individual student reading progress (Bernhardt et al., 2000).

River Road Elementary is an example of how data-driven decision-making is used as a tool to increase student achievement. Without data, the principal and staff can only act on hunches and assumptions. However, with data the principal and teachers can understand the results they are getting, based on their efforts. Teachers are able through the use of data to chart their progress as well as make every effort to make more progress. When teaching decisions are based on solid data and not assumptions, teachers are able to make instructional adjustments early on and to avoid the pitfall of remediation (Waters, Burger, & Burger, 1995).

There are many educators who recognize the value of data-driven decision-making in improving student achievement. For example, Ron Edmonds (1979) found that principals of successful schools monitor student achievement progress. Henry Levin (1990) called for school improvement that uses "data, on students …qualitative and quantitative information … disaggregated test scores and other measures of student

performance" (p.14). Michael Fullan emphasized that in order for change to take place in schools data must be gathered, evaluated, and monitored for progress and results (Fullan & Stiegelbauer, 1991). Carl Glickman (1993) asked: "What data or information about effectiveness are currently collected? How complete are the data? How does the school community share the data and use them for setting priorities and determining actions?" (p.51). Jacqueline and Martin Brooks (1993) wrote that "school-based study groups must begin systematically collecting, analyzing, and using data to inform classroom practices" (p.125). The common theme of these educators' viewpoints suggested that data are vital to school improvement efforts.

Technologies in the early part of the twentieth century were an essential factor in the development of the industrial revolution age. Today, technology has again assisted in the development of the information age, changing how, when, and where business is conducted. Technology allows us to sort and organize the ocean of information in which schools are swimming. Technology in the informational age is supported by inexpensive personal computers, advanced informational systems, high-speed communication networks, and world wide information access and sharing through Internet usage (Bumham, 1981). Not only has recent technology changed the traditional business world, is has impacted educational changes. For example, once the classrooms were the students' world, now it is possible for the world to be the students' classroom through computer lesson integration.

Although educators have gathered data for 150 years, until recently they have rarely used data except for compliance purposes (Doyle, 2002). Historically, there are two reasons why school administrators collect data. The first is for compliance; rules and

regulations needed to be fulfilled in order for schools to receive local, state, and federal funding. For example, the principal collected data on student attendance in order to receive funds based on the number days the students were in school. Often data were held in cardboard file boxes, hidden away, and most of the time unused, except for mandated compliance reporting. There were very few incentives for school administrators to use the data wisely and well because many administrators believed the data would come back to embarrass them (Doyle, 2002).

The second reason school administrators collect data is for accountability and/or diagnostic purposes. For example, disaggregating test scores by identifiable groups can provide information to improve instruction to the group(s) failing to score at proficient learning levels. Data have not always been used for diagnostic or prescriptive purposes. However, NCLB now requires that all publicly funded schools use data to change academic outcomes. Schools are required to use data as a resource to report, measure, assess, communicate, and guide instructional effectiveness (Bernhardt, 1999).

Information on attendance, demographics, test scores, teacher characteristics, and school expenditures are a few examples of data that can be used for both compliance and prescriptive purposes. The caveat of collecting data in these areas lies in the fact that data-driven decision-making is no guarantee that student achievement will improve. To leave no child behind is both a moral and a political decision, not a purely data-driven decision in itself. Data become important as a useful tool only *after* the decision is made to leave no child behind. The data collected on standardized tests may reveal which children have been left behind, or even which children are at risk of being left behind.

However, data do not in and of themselves tell an administrator, teacher, or parent what to do; professional judgment will guide the decision-making process.

Many school improvement plans have been made with hit-or-miss trials, but with the aid of data school improvement decisions can be made with far more precision and clarity (Bernhardt, 1999). Data help measure school improvement results so that decisions are no longer based on deficient or subjective information. For example, if a principal wanted to know if a particular math program is effective, he/she might focus on a specific grade level and collect data to see how many students are at levels of proficiency or excellence in math. Also, the principal could use data to target those who are showing the least improvement in the math program and provide them with extra learning avenues.

Thus, if principals are going to know whether children are learning or teachers are using sound and effective instructional practices or the community is pleased with the quality of the school, data collection and data -informed decisions are unavoidable. Principals have the responsibility to lead the school in attaining its purpose and vision as well as lead in school improvement efforts, so they must have data-driven decision-making structures as the cornerstone of school improvement (Bernhardt, 1999). For many principals, data are confusing and intimidating. Principals and teachers need to know the how and why of data-driven decision-making(Bernhardt, 1998) .

Statement of the Problem

Principals and teachers in K-12 public schools are able to make better informed decisions when relevant, accurate, and timely data are accessible (McLean, 1995). Public school educators often lack information needed to make informed decisions

because they lack the training they need to effectively use computer technology for decision-making support (Crouse, 1994). A limited amount of research has been done on the use of technology to support educational functions such as data-driven decision-making. Telem (1993) surveyed journals, books, and the Educational Resources Information Center (ERIC) database and found few studies that investigated how educators used informational technology to make data-driven decisions. Current literature lacks information on the subject of how educators rely on computer technology to gather and use data in their decision-making process to improve instructional practices.

The underlying assumption for school improvement efforts is that student learning can and should improve on a continuous basis. Students attend school to learn, to find exciting challenges and new understandings. If schools are not providing learning environments that are meaningful and engaging, then school administrators must engage the staff in efforts to make them better educators. Empirical studies are needed to inform school administrators how to use data to make informed school improvement decisions (Streifer, 1999).

Effective school improvement processes are cyclical and continuous (Rinehart, 1993). Research provides significant indications that data-driven decision-making should be incorporated into the school improvement cycle (Bernstien, 1998; Schmoker, 1996; Streifer, 2002b). In spite of good intentions to improve schools, not every intervention will be successful for every child. The school improvement endeavors may not lead to the results desired or anticipated. For this reason, data must be collected continually and analyzed periodically to reveal patterns of strengths and weaknesses in the system and provide direction on where and with whom to improve. With rigorous measurement of

student learning (data), informed decisions, and willingness to change the school improvement process can be successful. When interventions are evaluated, such as using a new teaching technique to improve student learning, knowledge is gained on what is working and for whom. With these data, teaching practices may be adjusted; and action plans may be monitored and/or renewed. Then, the school improvement cycle may begin again by developing an improvement plan, implementing the plan, evaluating the impact, and finally adjusting strategies to achieve the goal(s).

The need to use data effectively rather than only intuition, philosophy, or retrospect to guide school improvement decisions is becoming increasingly important (Schmoker, 1996). Philip A. Streifer, a former superintendent and now associate professor of educational leadership the University of Connecticut said, "superintendents have told me they didn't think data-driven decision-making would work for them because it looked too complicated or they feared the principals couldn't handle it" (Streifer, 2002a). Unfortunately, many school administrators lack experience in using data systematically to inform school improvement decisions (Bernhardt, 1999). Further inquiry as to how educators incorporate data into their continuous school improvement process using informational technology may provide a clearer understanding of the relationship between data-driven decision-making and school improvement initiatives. Also, the investigation of how elementary educators actually use data in their schools to make improvement decisions may clarify and simplify the process for other public school educators who might otherwise fear the practice of data-driven decision-making.

Currently, only minimal research exists relative to the use of computer technology in the data-driven decision-making process. Most researchers have centered their

educational computer studies of school administrators on topics such as computer competency skills, attitudes toward computer use, and applications used by school administrators. The research of Coffin (1985), Izat (1997), MacDonald (1995), Riggs (1993), and (Witten, 1990) investigated computer use by school administrators and identified attitude about technology's usefulness, availability of technology, and adequate training as factors that can impact the use of computers by school administrators. The studies also relied on surveys which limited the responses to a few choices that may not have been the accurate perspective of the participant. Responses to an open-ended interview question as this study sought to gather may produce knowledge about the data-driven decision process that was not revealed through survey type questions.

Purpose of the Study

This purpose of this study was to investigate and describe how data-driven decision-making processes influenced instructional practices in one Oklahoma elementary school. This study attempted to identify the purpose of implementing data-driven decision-making actions as well as to describe the data-driven decision-making procedures. Contextual characteristics related to this study' site such as improvements needed in the decision-making process, staff characteristics, and results of data-driven decisions were examined. Also, this study sought to identify the decision support system and resources that contributed to the decision-makingprocesses .

A goal for this study was to investigate the findings with the purpose of contributing to the limited existing literature on the use of informational technologies that support school improvement decisions. Information obtained from this study will be useful to school-based administrators by (a) describing how data-driven decision-makig

processes are accomplished in order to change instructional practices, (b) identifying decision support systems that assist school educators in the decision-making process, and (c) providing a data-driven decision model that schools have successfully used. The findings from this study may also assist educational preparation programs for school administrators and teachers. Study findings may reveal possible discrepancies between the objectives of educational preparation programs and the actual skills needed as described by practicing educators (Creigton, 2001). For example, McNamara (1996) suggested that a move toward more practical and relevant use of statistics with educational real-world data are needed in administrator and teacher preparation programs. Discrepancies discovered can provide a springboard from which change may come about in adding curriculum components to the preparation program. Such curricular enhancements could be aimed at providing experiences for the aspiring administrator and teacher in order to foster data-driven decision-making skills deemed as beneficial by the findings of this research.

Research Questions

The following research questions were used to guide this study:

1. How do educators from an Oklahoma elementary school describe the data-driven decision-making processes that influence instructional practices?
2. What do elementary educators identify and describe as their decision support system?

Significance of the Study

Schools are required by federal law to have evidence that students are learning. If students are not learning, school improvement plans and strategies need to be developed. These plans and strategies will need to be closely monitored with data to track the impact they are having on student learning. Data then become evidence whether or not the school improvement decisions made were effective or ineffective. The cycle of continuously monitoring data as evidence to support student learning is vital to any successful school improvement effort. School personnel need skills to make data-driven decisions in order lead, monitor, and sustain school improvement initiatives.

According to Hoy and Miskel (1991), research must meet three criteria in order to be significant: (1) add to the knowledge base; (2) have an impact on practice; and (3) clarify or add to existing theory. This descriptive case study addresses these three criteria.

Research

Although there have been several research studies on educational data-driven decision-making, the author has found none that focus specifically on how elementary

educators use data to influence instructional practices. Models for data-driven decision-making using an automated support system to improve instructional practices have not been examined within a real-life context. This descriptive study is designed to add to the knowledge base by exploring an actual setting where successful data-driven decision-making supported with technology has been implemented in order to produce change in an instructional practice. Streifer (2002a) voiced that school administrators need contextual examples of how data-driven decision-making occurs using the support of technology.

Practice

Fullan (1991) stated, "What the principal should do specifically to manage change at the school level is a complex affair for which the principal has little preparation" (p.77). This study may provide additional insights to current and future school reform movements. Hopefully, the insights from this study along with other studies on data-driven decision-making can be used to form a database for future comparison purposes as well as theory building. This study sought to describe how elementary educators collect and analyze data using technology to adjust instruction practices or curricula in order to gain measurable improvements in student learning. This description provided real-life contextual implications that may serve to guide others in analyzing and using data wisely. It is hoped that the research implications will serve as guides in planning principal preparation programs to better address data-driven decision making.

Theory

This study examined participants' data-driven decision-making processes related to data-driven decision-making frameworks found in literature. The frameworks

examined included: (1) data categories (Bernhardt, 1998; Streifer, 2002b); (2) assessment level (North Central Regional Educational Laboratory, 2000); (3) level of data analysis (Bernhardt, 1998); (4) purpose of data use (Bangser, 2000); (5) data driven school culture characteristics (Allen & Calhoun, 1998; Eaker, Dufour, & Burnette, 2002; Lambert, 1998); (6) processes, and (7) decision support systems (Ligon, 2000). This study also examined to what extent technology was used within the decision-making support system. Data-driven decision-making may contribute insights to organizational effectiveness theory. Also, conclusions from this case study may contribute to existing data-driven decision-making pedagogy.

Definitions of Terms

For the purpose of this study the researcher used the following operational definitions:

Accountability – A process by which educators are held responsible for performance or outcomes.

Data – Factual information (such as measurements or statistics) used as a basis for reasoning, discussion or calculation. Data can be qualitative or quantitative. Good data must be both reliable and valid.

Data Analysis – A method of disaggregating data that may focus on smaller subsets of data for the purpose of identifying student learning strengths and weaknesses.

Data Dissagregation – Breaking data down by specific student subgroups such as current grade, race, previous achievements, gender, socioeconomic status, etc.

Data-Driven Decision-Making - The process within an organization by which data are collected, analyzed, and interpreted by educators in order to make informed decisions.

Decision Support System - A support system within an organization by which information is made available on which to base a decision.

School Principal – The building administrator who carries out the supervision and administrative duties of a public school containing a combination of grade levels that may include Preschool through 12th grade.

Assumptions

For the purposes of this study, the researcher assumed that the responses to each interview question were answered truthfully. The researcher also assumed that the respondents were not answering the interview questions based on socially or professionally desirable responses. The researcher assumed that an elementary school administrator and teachers viewed data-driven decisions important to the school improvement process in order to enhance instructional practices in an effort to increase student learning. The researcher assumed that the principal and teachers were the best source of data for this particular study. The researcher also assumed data-driven decision-making played an important role in the school improvement process. It is also assumed that the participants were able to describe their data-driven decision-making processes in detail enough so that collective data present as rich a context as possible.

Limitations

This study was limited by the following factors:

1. Data obtained were dependent on the truthfulness and perceptions of the respondents regarding descriptions of their data-driven decision-making process. The information represented the respondents' perceptions. No formal standardized assessments or testing instruments was used to measure the respondents' actual knowledge of data-driven decision-making.
2. Individual computer skill competencies among participants may vary. The respondents had significantly different opportunities to know and use technology.
3. The study was limited to one Oklahoma elementary school site and the administrator and teachers who were involved in the data-driven decision-making process.

4. This study was limited by the case investigated; generalizing the results to other contexts should be exercised with caution.

5. The researcher in this study served as the primary instrument of data collection and analysis. All efforts were made on the part of the researcher to collect, analyze, and produce meaningful and accurate information. However, the researcher as the human investigator is limited by being human; mistakes are made, opportunities are missed, and personal biases interfere even with the best intentions of purism (Merriam, 1975).

6. Current technology is continually changing and new technology is constantly being generated. The technology under investigation of this study may be quickly outdated due to emerging new technology.

7. Due to the lack of previous research addressing data-driven decisions to change instructional practices within the elementary school, contextual factors investigated in this study may be limited to this site. Therefore, caution should be taken when comparing this study's results to other research findings.

Researcher Perspective and Personal Rationale

My interests in technology began with a childhood curiosity and fascination with electronic devices. At a very early age, I remember my sister receiving a portable record player as a Christmas present. I was fascinated with this new technology in our home. I wanted to know what made the round, black record spin and how a big booming sound could come out of such a small box. It was not long before I took her record player apart to satisfy my curiosity. Luckily, the record player worked after my scrutinizing investigation and botched surgical procedures. Also, I remember early in my childhood my dad giving me a reel-to-reel tape recorder. I had more fun with that machine than

anything. After a day's play in a nearby sand pit, I would go home and record my mom yelling at me for tracking sand into her nice, well-kept "Mrs. Cleaver's' image" home. My family and I laughed as we listened to the recording of my mom's reprimands. Then there were transistor radios, cassette recorders and walkie-talkies that I had to have for entertainment and communication purposes. When I was sixteen, I got my first job. With my first paycheck I bought a stereo system with an 8-track cartridge player. I was a self-proclaimed technology guru at an early age.

My interest in technology gadgets carried over to my teaching career. In the early 1990s, I was fortunate enough to land a job in a computer technology enriched school. I coordinated my sixth grade social study lessons with interactive computer lessons available in the computer lab. My students worked one day a week on a multimedia computer-assisted social study lesson. My students benefited academically as well as motivationally from the computer lessons. It was at this school that I became addicted to how computer technology could assist me in teaching and my students in learning.

After my first year in this school, I took another teaching position at a not-so-technologically-enriched school. The Apple II computers were outdated and little software was available for effective instructional purposes. I missed the newer multimedia computers that I had in the school where I taught previously. Lack of opportunity did not stop me, however. I contacted my principal, superintendent, PTA members, local business leaders, and interested teachers and gathered them together in the school cafeteria and showed them what multimedia computers could do for educational instruction. With help from my wife and colleagues, we held an Easter bunny photo shoot for children at the local Wal-Mart and raised $1200. The community

foundation of Wal-Mart matched the money we raised at their store. With the grant money raised, I was the first teacher to have a multimedia computer in our district. Since then, the community has supported bond issues to make the district one of the nation's leading school districts in technology advancement. During my tenure as a teacher in this district, it received a Smithsonian Award for its technology mission and plan. Bill Gates also recognized what this Oklahoma school district had done with technology and dedicated four pages describing their technology success in his book, *Business at the Speed of Light*.

As a former principal, computer technology was a tool I used for communicating, managing large amounts of school community data, managing school funds, planning, and generating state reports. The computer was absolutely vital to me on a daily basis. Computer technology allowed me to accomplish administrative tasks such as assessing student learning, communicating with the school community, collecting data for informed decision-making in a more effective and efficient manner. I worked hard as a school administrator just as other school administrators do, but the computer helped me to work smarter by managing budgets, retrieving and storing student data, communicating with staff on school improvement issues, and by allowing me to be readily accessible by way of email to parents, staff, and students. The computer was my friend and its use was interwoven seamlessly within my job functions as a principal. I would not want to attempt to be a school administrator without available computer technology or without personal competence in technology skills, each of which would assist me as effective tools for communication, information, and accessibility purposes.

For two years I assisted the district in implementing the hardware and infrastructure components of the district's technology plan. Also, I trained 250 teachers in district computer operational skills as well as technology skills related to word-processing, spreadsheets, presentation software, student record-keeping, and generating computer reports. I have not had any formal technology training. My technology skills are developed from trial and error and from self-taught determination. I feel that technology helped me as a teacher and as an administrator to do my job effectively and efficiently. As an elementary school administrator, I found that many teachers relied on me to assist and support them with their own technology needs in formal and informal teaching/learning settings.

My recent position as an OK-ACTS Phase II technology director at the University of Oklahoma deepened my passion for technology usage in schools. In OK-ACTS Phase I program, Oklahoma school administrators make a year-long commitment to receive leadership training on the Ten Practices of High Achieving Schools and how technology will assist them to embed these practices into their schools' culture. One of the Ten Practices of High Achieving Schools deals specifically with data-driven decision-making. It is this practice in which I took a personal interest and endeavored to share from my background with educators across the state of Oklahoma. The combination of the OK-ACTS Phase I leadership training and my interest in computer technology led me to further inquire how school administrators use technology to make data-driven decision-making and inquire as to what affect it has on school improvement endeavors. I also provided Excel (spreadsheet) training for one of the leadership seminar breakout sessions and demonstrate how this software application is capable of data collection. I have

witnessed firsthand the frustration level of many administrators for not having the technology competence to complete the spreadsheet training successfully and seen them walk away discouraged. I have also witnessed the excitement of many school administrators who have had a functional technology competency level and were able to benefit from the training. Upon leaving the training session, administrators have commented about how they were going to incorporate the skill into their job responsibilities.

One of my career goals involves assisting school administrators and teachers to use the power of computer technologies that will enable them to make data-driven decisions for school improvement initiatives with ease and confidence. Our children deserve a good education and there must be evidence to support that they are learning. Using data competently and wisely may assist administrators and teachers in deciding what instructional practices to change in order to get different results.

Summary

The purpose of this study was to describe how elementary educators collect and analyze data using technology to make decisions that affect their instructional practices. Most existing data-driven decision-making studies that involve computer technology have focused on computer competency skills, attitudes toward technology use, and/or software applications usage. This study investigated the data-driven process and the decision-making support system used to make informed decisions. The descriptions were derived from real-life contextual settings and perspectives of an elementary school principal and her teachers.

In Chapter 2, a review of the literature on the processes of educational data-driven decision-making to improve student achievement is presented. Information is also reviewed and presented on the purpose and benefits of data-driven decision-making procedures. Chapter 2 concludes with a review of literature on data-driven school characteristics as well technology used to support data analysis and data-driven decision-making processes.

CHAPTER II

Review of Related Literature

The literature summarized in this review presents a context from which data-driven decision-making can be further studied as it relates to the use of technology. This study focused on how a practicing administrator and her teachers collect and analyze data using technology so adjustments can be made to the instructional practices or curricula for the purpose of making improvements in student learning. However, scant research has been examined on informational technology to support educational functions such as data-driven decision-making (Telem, 1993). Most research has centered on computer studies of educators with regard to competency skills, attitudes toward computer use, and applications (e.g., Coffin, 1985; Izat, 1997; MacDonald, 1995). Therefore, the review of the research herein provides a broad framework for the study of data-driven decision making. Four areas of research are reviewed. The first consists of an overview on data-driven decision making. The second presents the links among data, decisions, and school improvement. The third section provides a general description of data-driven characteristics within the school culture. Finally, the fourth section includes descriptions and discussions of informational systems being used in schools during the data-driven decision-making process. The fourth section will describe the research on computer-based information systems and its relationship to decision-making.

Data-Driven Decision-Making: A Conceptual Framework

Data contain the information needed to make good decisions, work intelligently and effectively, and change things to work better as well. However, data alone are not information (Bernhardt, 1999; 2002). Eaker, Dufour, and Burnett (2002) reported that relevant information has not been provided to educators that can give them insights to what is working and what is not. Without information, decisions are made on good intentions, hunches, habits, and levels of comfort. Collecting data on student achievement alone does not ensure gains in student learning. Data not only have to be collected but must be used to make changes in curriculum and instruction in order to improve student learning.

In order to be useful, data must go through a series of stages. Tang (1991) explained that "data must be transformed into information and information into knowledge" (p.10). Educators who analyze and utilize information are able to understand their students' learning needs as well as make informed decisions to change instructional practices that meet the students' learning needs (Bernhardt, 1998). Performing data analysis creates information. Insight is gained through knowledge and understanding the information. The relationships of data, information, and knowledge are represented in Figure 1.

Information results from data being processed followed by specific data items being analyzed. Bodenstab (1997) recognized that knowledge is organized information that enables decision makers to effectively generalize and predict. He also acknowledged that general conclusions are a result of data collection and that knowledge exists when information starts to impact truths.

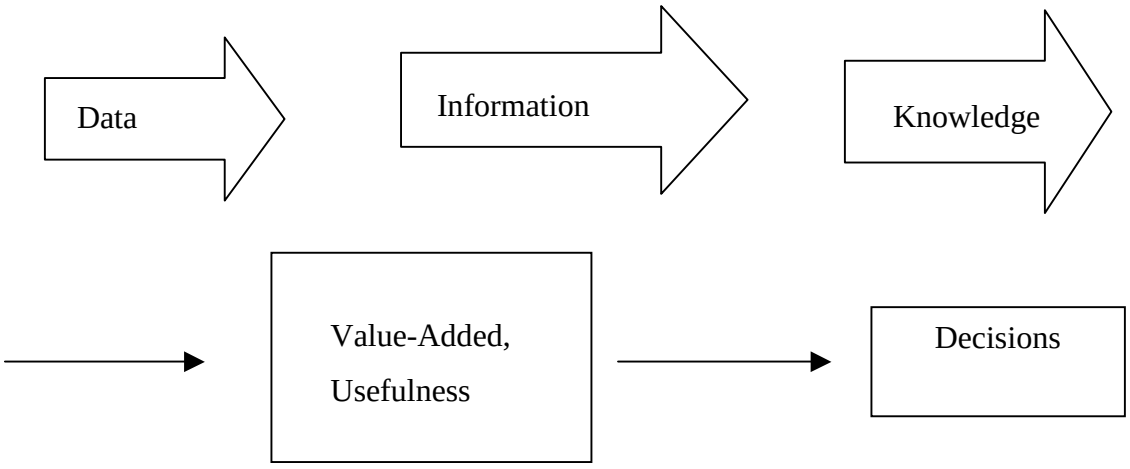

Figure 1. Representation of data relationships from the data stage to the decision stage. (Adapted from Tang, 1991)

Tang (1991) found that the "way managers choose to apply knowledge and exercise information had profound implications on the ultimate effectiveness of their organization" (p.11). Effective decision-making is supported with data, information and useful knowledge.

The Decision-Making Process

Today's educational personnel must learn to change data into information, then transform information into knowledge, and finally use knowledge in his or her decision-making process (Doyle, 2002). Principals play an important part in helping teachers increase student learning by assisting them to establish appropriate academic standards for students then collect and interpret data about student learning in relation to these standards (Fullan, 1993; Haney, 1991).

Data-driven decision-making can be defined as the process of selecting, gathering, and analyzing data to address problems and then using this information to act on these problems (Streifer, 1999). Analyzed data can be useful information in taking action to increase student learning. When knowledge from data analysis is acted upon through

decision-making processes, it becomes critical information for school improvement (Streifer, 1998). Effective school leaders base their decisions on data that are gathered and analyzed scientifically and are relevant to teaching and learning (Tachney, 1999; Zmuda & Tomaino, 1999). Principals have a significant role in improving student learning by understanding and identifying the learning needs of the students (Leithwood, 1994; Tachney, 1999). In educational settings, data analysis is an attempt to identify the issues or problems that shroud student learning.

Diagnosing and resolving problems or issues are part of the decision-making process. Smith (1998) stated diagnosis is the "process of observing an environment relative to some issue of importance, collecting data to enable one to detect potentially significant changes, current or future, to identify the likely causes, and to define the issue in proper relationship to the environment" (p. 6). In the resolution process, solutions to problems can be selected and implemented in rank order according to their likelihood in resolving the identified problem.

Bernhardt (1998) posited that the use of data makes a positive difference in school reform efforts by improving school process and student learning. One positive difference that data-driven decisions can make involves replacing hunches, speculations, and hypotheses about what changes are needed with facts supported by data-based evidence. Data can also be used by educators to identify root causes of problems instead of the symptoms of the root problem. Educators can use data to assess needs and target services on important issues. Data can provide the evidence whether monitored goals are being accomplished or not. Furthermore, data can be used by educators to assist them in

understanding the impact of efforts, processes, and progress of the learning organization (Bernhardt, 1998).

Dufour (2002) stated that school effectiveness should be assessed on the basis of data, not intentions. Principals have the responsibility of analyzing the existing levels of student achievement in their schools (Eaker, 2002). In order to have knowledge and understanding of student learning levels, data must be collected and analyzed.

According to Streifer (2002b), the process of data driven decision making involves (1) understanding the problem, (2) analyzing the problem into logical components, (3) gathering appropriate data, (4) analyzing the data, (5) generating possible solutions, and (6) implementing a course of action. If data do not exist, but the problem is important to solve, a data plan should be considered. The data plan shifts from identifying data to determining if the cost/benefits of attaining the data are worthwhile. If it is determined to be beneficial to attain the data, then a plan to make the data available should be implemented.

Data warehouses, informational technologies, and computer software applications play an important part in the data-driven decision-making process. The use of computers and their associated technologies can greatly aid administrators in their leading the school toward long-term goals and their strategic planning for school improvement (Poe, 1997; Riedl, Smith, Ware, Wark, & Yount, 1998). Not all school administrators have the technology available or the skills needed to take advantage of today's technological advances in accessing information. There are many problems that can be solved without sophisticated technologies. However, Bozeman and Spuck (1991) suggested that all

administrators should learn to apply the power of technology in their day-to-day decision making and strategic planning to increase student learning.

Bluhm (1987) stated, “if information is power, then those who acquisition it have an edge” (p.19). Gustafson (1985) clarified this point further when he said “the administrator who understands the situation, has more data available, or knows more options, has the authority to respond appropriately when needs arise” (p.66). Humans have limitations on the amount of data that can be processed in a fixed time period. However, computers can aid humans to process, compile, and organize large amounts of information for decision-making purposes (Coll, Coll, & Rein, 1989). The computer is capable of compiling and organizing data in a brief time so the decision-maker can synthesize the pieces of data into powerful and usable information (Bozeman 1991). Computers give an administrator the edge to query and analyze large amounts of data as desired that otherwise might be humanly impossible to achieve in order to make sound educational decisions.

The decision-making process to improve student achievement involves gathering and analyzing data. Data analysis can provide useful information regarding the problems of student learning. Solutions to improve student learning require professional judgment and wisdom. The new solutions require additional data collection and analysis to ensure the school improvement efforts are successful. The use of computer technology can aid school educators to synthesize large amounts of data into usable information during the decision-making process.

Categorical Data for Decision-Making and Improvement

Streifer (2002) noted that there are three data categories in which to conduct school improvement analyses. The first category is input data. Input variables include data from student demographics, behavioral characteristics, and any additional variables of which the school has no control. The second data category includes instructional processes such as curriculum scope and sequence, student/teacher ratio, professional development opportunities and programs. The third category includes outcome data such as test results, class grades, dropout rates, graduation rates, and the post-secondary education enrollment rates of students. Schools have access to these three kinds of data categories in order to conduct a school improvement analysis. Figure 2 shows the relationship of these three categories of data.

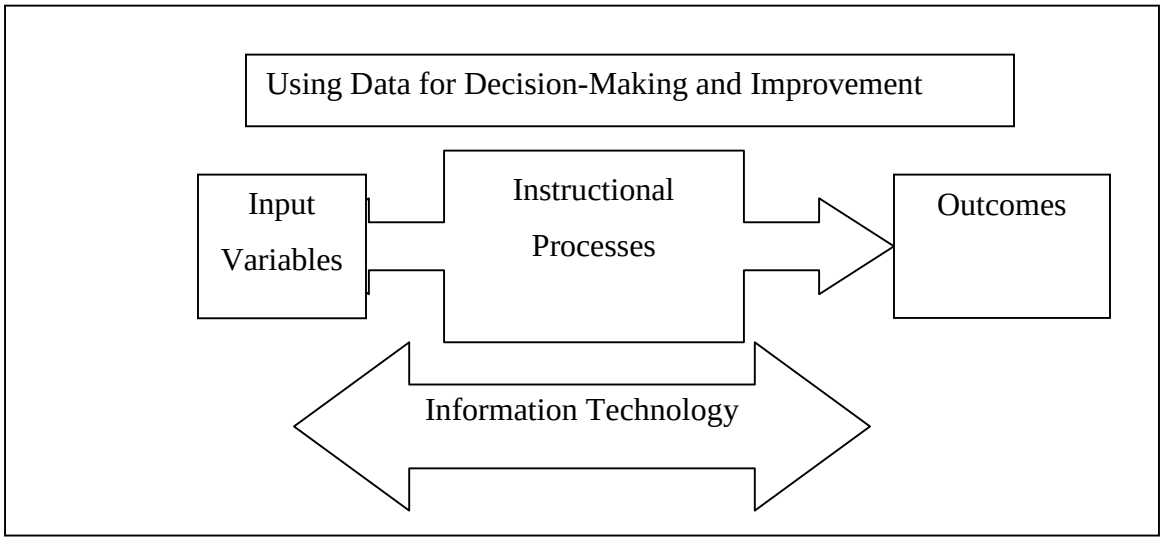

Figure 2. A model of the relationship between three data categories and technology. (Adapted from Streifer, 2002)

Valuable data can guide decision makers in developing school improvement goals that benefit all students. Bernhardt (1998) asserted that there are four types of categorical data areas from which to gather descriptive information in order to improve classroom instruction and student learning. They are assessment, student, program, and perception, each of which gives insight into questions concerning school improvement issues. The type of school improvement question determines the categorical data area in which to gather information. For example, the question, "How well do students perform in reading on standardized state tests?" could be answered by gathering data from the assessment data category. The question, "What is the mobility rate of our students?" could be answered from data collected about students.

Gaining information from the four categorical data areas can provide a picture to help understand the school's impact on student achievement (Bernhardt, 1998). The data from assessment, student, program, and perception categories can offer schools the information needed to get improved results. Richer information may be gleaned when data from various combinations of categories are analyzed rather than from just one category. For example, just asking how students have performed at a certain level in reading in the past three years may not produce the information needed to make effective decisions concerning curriculum and instructional changes since only the category of assessment data are being analyzed. In order to obtain richer information to guide curriculum and instruction changes for the purpose of increasing student learning, multiple measures from categorical data areas may be more effective (Bernhardt, 1998). An example of combining categorical data areas in order to obtain richer information for decision-making purposes would be asking, "What are the characteristics of the students

who are performing below grade level in 3rd grade reading?" In the latter question, the data categories of assessment and student are combined so that solutions may be brainstormed in order to address what the problem really is. In Figure 3, the four major categories are shown as overlapping circles. The overlapping circles represent the enhanced levels of data analyses when information is gathered and combined with other data categories.

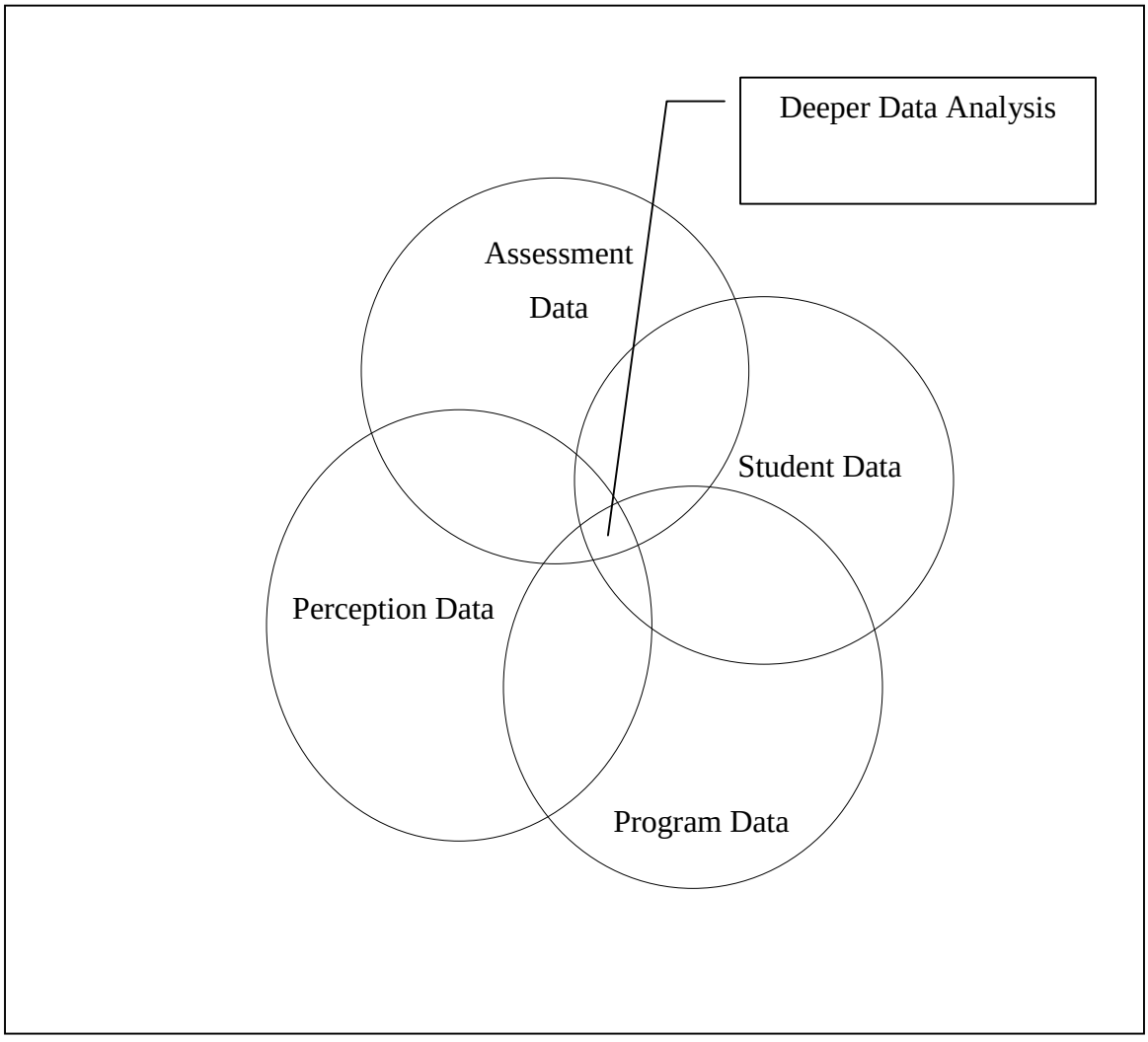

Figure 3. Representation of four major data categories intermingled for deeper levels of data analyses.

(Adapted from Bernhardt, 1998)

The four categorical data areas provide important information to improve instructional strategies and student learning, as well as identifying a school's needs. The four categorical data areas aid decision-makers in identifying possible school improvement targets so appropriate decisions can be applied to problematic issues. The categorical data areas are defined as follows:

Student Data

Demographic data on students provide descriptive information about the school community—enrollment, attendance, grade level, ethnicity, gender, and native language. Schools have little control over the demographical characteristics surrounding the community they serve. The goal of collecting student data are to thoroughly know the school population in order to clarify problems and needs then make improvements (North Central Regional Educational Laboratory 2000). From demographic data, school administrators and staff can observe and learn from trends for future planning purposes.

Perception Data

Perceptions from students, parents, teachers, and other stakeholders can provide information on what others think about the learning environment of a school. Perceptional data can be gathered through surveys, questionnaires, interviews, and observations. The information gathered from perceptional data tells how well school personnel are doing *in the eyes of the stakeholders* and helps target possible areas to improve upon. An example of a question that would solicit perception data is, "How satisfied are parents, students, and/or teachers with the learning environment?"

Program Data

This category involves examining program processes, instructional strategies, and classroom practices for information. Bernhardt (1998) reports that this category is most difficult for educators to describe because they are too busy in carrying out their programs to systematically document and reflect on the processes. The program categorical area defines what teachers are doing to get the results they are getting. To change school results, processes must be documented and aligned to the school's vision (Berhhardt, 1998, Streifer, 2002). A guiding example question for collecting program data is, "How successful are our programs in bringing about the academic excellence articulated in the standards?" Collected data from this category can inform future decision making about programs, curricula, and instructional practices.

Student Learning Data

North Central Regional Educational Laboratory (2000) contended that when school improvement is the goal, the most important type of data to focus on is student assessment data. Bernhardt (1998) described student learning data as the results of the educational system in terms of standardized test results, grade point averages, and standard and authentic assessments. When a comprehensive view of student learning data is analyzed, an ongoing dialogue of what needs to change to get different results should follow. Analyzing student learning data offers the possibility of understanding new ways to improve learning as well as ways to gain insights on who is not learning.

Three Tiers of Assessment Data

The most important type of data to focus on is student learning data when considering school improvement goals. Student learning assessment data can be gathered from three

tiers (North Central Regional Educational Laboratory, 2000). These tiers vary according to the purpose, rate, and type of feedback they provide. Table 1 outlines the assessment data tiers. Following the table is a summary of the three tiers.

Table 1

Three Assessment Tiers

	Tier	Assessment Purpose	Rate of Feedback	Feedback	Primary Target of Feedback
Comprehensive Assessment Plan	III	Annual Large-scale	Infrequent	General Broad	General Accountability Audience: Policymakers Community Administrators
	II	Periodic Grade level/subject area			Administrators Teachers
	I	Ongoing classroom	Frequent	Specific Narrow	Teachers Students

(Adapted from NCREL, 2000)

Tier III: Annual Assessment Data

Examples of Tier III data involve annual state assessments and national standardized tests such as the SAT 9 or the ISTB, etc. Tier III data can be useful to administrators who use the information to evaluate the general effectiveness of the curriculum and school community members such as teachers and students. Tier III assessments have limited use because they are designed to sample broad domains of student knowledge. They are usually administered once a year but can also be administered on a pre- and a post-evaluative schedule. While Tier III assessments can provide useful information about a school's general success, they are not helpful when evaluating student progress, nor do they provide data during the school year. There are several reasons why Tier III data are limited in providing helpful information in school improvement decisions. First,

Tier III data cannot help a teacher adjust lesson plans during the school year. Secondly, Tier III assessments cannot help decision makers make placement or program decisions during the school year. Thirdly, Tier III assessments fail to provide detailed information about the student's skill attainment toward the standard. Tier III data are most useful when decisions are needed to be made that have relationship to the school's general effectiveness of curriculum and instruction.

Tier II Periodic Assessment Data

Periodic assessments provide results of student performance on standard-based skills in a content area and grade level. Throughout the school year Tier II assessments may be given to students at least three or four times. These assessments can become embedded with classroom instruction. They also can provide information on what does and does not work instructionally so that adjustments can be made. When results from Tier II assessments are studied, information may be produced to make informed decisions about teaching and learning. The strengths of Tier II assessment data include: (1) identifying the strengths and weaknesses in a particular content area, (2) creating groupings of students based on their changing skill needs, and (3) identifying which students need enrichment or which students need special assistance at any point during the school year. An example of a Tier II assessment would begin by questioning which students in second grade are not progressing on grade level in reading. A leveled reading assessment could be administered four times a year in order to identify second graders not reading on grade level and those who are making progress to read on grade level. Decisions to provide extra reading instructional support to students who need it would be based on the results of the reading assessment.

Tier I: Ongoing Classroom Assessment Data

Tier I data comes from daily assessments that provide information on who is excelling and who needs help on a particular standard. Tier I data are kept in grade books, often charted and displayed with students, or organized in portfolios or electronic systems. Tier I assesses the depth of students' conceptual understanding as well as knowledge and skills on specific subject content.

Every lesson and unit plan should be based on assessment data (Bernhardt, 1998). Assessments are meaningless unless their results are used to make decisions to increase student learning and/or direct instructional practices (Schmoker, 1999). All decisions regarding extra tutorial help, enrollment in course sequence, materials to use, groupings of students should be based on what the data reveal about the student learning. A variety of assessment methods from all three tiers offer a more complete account of student knowledge than relying only on one type of data.

Data Analysis

Sagor (1997) posited that the best way to improve teaching and learning is with data. Data analysis has the potential to reveal the results of teaching and learning within a school. Streifer (2002b) argued that schools rarely analyze instruction processes with any precision or regularity. Data analysis begins with identifying what is to be measured (Bernhardt, 1998). Data analysis requires clarity of purpose, time, and the desire to seek and understand student achievement. One of the purposes of data analysis is to help educators determine the effect that polices, procedures, and processes have on student achievement and if each is achieving its intended impact (Johnson, 1997).

To maximize efficiency, data analysis should be done electronically (Streifer, 2002a). For example, if class grades were compared to standardized test scores, it would be more efficient to put the data in an electronic spreadsheet than it would be to use a paper and pencil spreadsheet. The electronic spreadsheet has an advantage over the paper spreadsheet because it is designed to reanalyze data in different ways without the need to re-enter the data. Additionally, an electronic spreadsheet has the capability of merging new data with existing data. In some cases, data can be imported directly into a spreadsheet for processing without any additional data entry, thus saving time. This can be accomplished by downloading data from a student information system or importing data received from a testing company into an electronic spreadsheet or database. Data must be organized either by hand or electronically in order prepare the data for analyses (Streifer, 2002a).

Streifer (2002b) described a three-step process of collecting data and putting it into an electronic database. Data must go through an extraction, transformation, and loading process before an electronic data analysis can commence. Extracting data is the process of gathering specific data that is to be analyzed. The transformation process is accomplished when the data are prepared in a format that the software application can recognize and read. In the third step, the data are loaded or imported into the software application and ready to be manipulated.

After data have been collected and organized, they are then ready to be studied for the purpose of finding problems. Data analysis is not a problem-solving strategy. It is a problem-finding strategy (Bernhardt, 1998; Schmoker, 1996; Streifer, 2002b). In order to improve schools and learning, educators must first identify their problems. Data analysis

helps educators focus on their own particular school-related problems so that appropriate goals and actions can be established as well as assessed in order to determine the progress made toward improvement. This is important because improvement efforts that respond to a school's particular problems are more likely to have teacher buy-in and sustainability (Berman & McLaughlin, 1977).

Data analysis helps schools focus their improvement efforts on the right problem. The right problem is defined as one which the school has control over, that is clearly and narrowly defined, and that has high potential for affecting student effort and learning (Killion and Bellamy, 2000). Too often, school improvement efforts do not come to fruition because the right problem or the right course of action is not properly identified. Data analysis is the attempt to identify the right problem so that the appropriate course of action can be implemented and monitored for the desired results.

The data analysis is often used to stimulate conversation about teaching and learning in the school (Glickman, 1993). The data analysis frames the school improvement topic(s) to be discussed. Professional discourse on the data analysis leads to what actions need to take place to improve instructional strategies and student learning (Eaker et al., 2002). Professional discourse on understanding the data analysis is more likely to solve problems, identify appropriate interventions to solve those problems, and monitor the progress of reaching goals (Killion & Bellamy, 2000). Data analysis is the foundation to effective school improvement initiatives because the information gleaned from the data support knowledge on the strengths and weaknesses of student learning. The information from data analysis then can be used to set goals, as well as provide a means to measure and evaluate any proposed school improvement changes (Sagor, 1997).

Interpreting data should involve a collaborative effort among administrators, teachers, staff, parents, students, and community stakeholders (Bernhardt, 1998; Eaker et al., 2002; North Central Educational Laboratory, 2000). A team is best suited for data analysis for several reasons. First, data collection and analysis take a lot of work and the tasks can be divided among the team members. Secondly, different perspectives from various representatives ensure that a variety of data sources are not overlooked. Thirdly, the discussions are richer and more diverse with numerous points of view and insights in the data interpretation process. Fourthly, members will have a vested interest in sustaining continuous school improvement efforts. These teams are sometimes called "improvement team," "learning team," "advisory committee," "leadership team," or "school renewal committee." NCREL (2000) observed that teams of 15 or fewer people can be enough to effectively to analyze data. Each team member should have collaboration skills and a commitment to use relevant data to guide decision making to improve student learning (Doyle, 2002).

Bernhardt (1998) described ten levels of analysis among four data categories (student, program, perception, and student learning). Each level reveals additional knowledge on student learning by analyzing data from different angles. The lower levels of data analysis provide snapshot information that represents a student's or a group of students' knowledge at a specific point in time. Lower levels of data analysis also offer a "big picture" of student performance that can be quickly assessed. The higher levels of data analysis can be likened to a series of snapshots that reveal changes of the subject over time and may reveal additional information and details about the subject. Similarly, when multiple categories of data are measured together they provide more

comprehensive information than a single measure of data taken one time. Quality information can be obtained by digging deeper into the data through different levels of analysis in which one type of measure is analyzed with other measures over time (Bernhardt, 1998). A brief description of Bernhardt's ten levels of data analysis will follow.

1. *Level One* –This level of analysis examines data in each of the four categorical data areas independent of each other. The analysis is on the most current data available. An example question at level one analysis is: How many students are enrolled during this school year?
2. *Level Two* – The second level of analysis examines collected historical data within in each of the four categorical data areas. An example of a level two analysis question is: How has the enrollment changed over the last three years?
3. *Level Three* – The third level of analysis seeks to answer questions that have two or more variables within each categorical data area. An example of a level three analysis question is: What percentage of students currently at the school are fluent speakers of languages other than English, and are there equal numbers of males and females?
4. *Level Four* – Level four is similar to level three with the difference of collecting and gathering data over a long period time. An example of a level four analysis question is: How do teachers' assigned grades and standardized tests scores compare over the past three years?

5. *Level Five* – The fifth level begins the higher levels of data analysis. It blends two categorical data areas in order to answer questions. Level five analysis can answer questions such as: Do students who attend school every day get better grades (student demographics, student learning)?
6. *Level Six* – Level six examines data blended from two categorical data areas over time. Historical data provides information on trends and patterns. An example question that a level six analysis can answer is: How have the standardized test scores of students from different ethnicities changed in the past three years (student learning, demographics)?
7. *Level Seven* – Level seven examines data blended from three categorical data areas. A level seven analysis can answer questions such as: Do students of different ethnicities perceive the learning environment differently, and do they score differently on standardized achievement tests consistent with these perceptions (demographics, student learning, perceptions)?
8. *Level Eight* – This level examines data blended from three categorical data areas over time. A level eight analysis can answer questions such as: What programs do all types of students like the most every year (demographics, student learning, processes)?
9. *Level Nine* – This level examines data blended from four categorical data areas. A level nine analysis can answer questions such as: Are there differences in achievement scores for 8th grade girls and boys who report

that they like school by the type of program and grade level in which they are enrolled (student learning, demographics, perceptions, processes)?

10. *Level Ten* – Level ten examines data blended from four categorical data areas over time. At this level, the analysis can provide information on whether or not the school is achieving its purpose and meeting the needs of all students. A level ten analysis can answer the ultimate question of: Are we achieving the purpose of our school, in all respects, for all students (processes, perceptions, student learning, demographics)?

Data analysis begins by attempting to answer questions that administrators and/or teachers ask about the school's purpose. The data are measurements of the extent to which a school is achieving its purpose. Schools cannot rely only on student achievement measures in order to increase student leaning (Bernhardt, 1998). The school context must be included in the data analysis if teachers are going to progress in meeting the learning needs of all students. If different results are desired, then the system that created the current results has to change (Fullan & Stiegelbauer, 1991).

Data, Decisions, and School Improvement Links

A review of the literature supports a strong link between data, decisions and school improvement (Bernhardt, 1998; Langford, 1999; Sargent & Smejkal, 2000). McLean (1995) contended "that implementation of a complete program of data collection and use can lead to the improvement of education as has no other educational innovation of the last century" (p.89). The goal of data collection is to collect accurate information on students so that decisions can be made to make adjustments in programs, teaching

styles or curricula in order to gain measurable improvements. With continuous data collection and analysis, students' needs can be identified and addressed.

The Palisades School District in Upper Bucks County, Pennsylvania serves 2,200 students in three elementary schools, a middle school and a high school. Superintendent Francis Barnes and his team developed a data-driven decision-making model to find out why students received good grades on report cards but performed poorly on standardized tests. Primarily from state tests and standardized national tests quantitative data were collected and analyzed. Other assessment tests were developed and administered to fill in the data gaps not provided from the state and national tests. The data were analyzed at the building level thereby enabling faculty to assess whether students are learning what is expected. The data were used to make necessary changes in curriculum and instruction. The data indicated that students needed to work on writing conventions, reading analysis and interpretation, and math problem solving. Decisions were made to focus on writing the first year, math problem solving the second year, and reading analysis and interpretation the third year. The focus was defined by providing training and time to teachers to work in implementing changes in their instruction based on what they learned from their data analysis.

The district efforts produced impressive results. In 1998, Palisades High School scored an average of 1270 on the Pennsylvania System of School Assessment reading test and 1250 on the mathematics test. The state's proficiency score at that time was 1300. By 2001, the students' average scores increased to 1380 on both tests. In 1998, 33 percent of the high school students scored at or above the state proficient level on reading analysis and interpretation. In 2001, the figure was 64 percent. For mathematics

problem solving, the number of high school students scoring at or above the standard increased from 18 percent to 43 percent (American Association of School Administrators, 2002). Palisades School District represents an example of how data were used to make decisions to change curriculum and instruction methods which resulted in increased student learning.

In Gwinnett County Public Schools, the effectiveness of a truancy intervention pilot program was studied. Reports were analyzed by examining clusters and histories of attendance, specific truancy patterns of students, and how the pilot program affected those patterns. Data analysis demonstrated program's effectiveness in lowering the truancy rates. The program was then implemented district-wide (Deck, 2003). Truancy for this school district was one factor that contributed to low student achievement scores. Had the district focused only on student learning data the truancy problem may never have been addressed and improved. This school district is an example of how data other than student learning data were used to make school improvements.

Data-Driven School Characteristics

A data-driven school culture according to the National Study of School Evaluation (NSSE) 1998, involves four procedures. The first is mining the data: collecting and managing relevant information. The second is analyzing the data: analyzing and synthesizing the data to create useful knowledge. The third procedure is communicating the data: reporting data, information, and knowledge to support organizational learning. The fourth is using the data: maximizing the role of data in school improvement planning (NSSE, 1998). These procedures are what separate

schools that successfully manage student achievement data from those who are less effective with their use of data.

School improvement efforts are accomplished by people who believe that they can improve teaching and learning. In schools that are making headway in the use of data for improvement, data are a powerful tool moving people toward meaningful action; data results convince teachers that they were making a difference. Positive data results build a sense of efficacy in teachers (Schmoker, 1996). If teachers have a strong sense of efficacy, they can use data to determine to continue with what they are doing or try something else in order to produce different results. A data-driven school culture begins with the belief system that educators and the community can improve teaching and learning by using data effectively to support that effort to improve (Eaker, Dufour, Burnette 2002).

Common goals and beliefs in a school serve as a basis for decision-making because they form the basis for school improvement planning, budget, and staff development. Discussions and decisions should focus on the fundamental question, "How will this help our school become the school we want?" (Eaker et al., 2002). Shared values and common purposes are translated into what actually happens in the classroom through the development of core learning principles. Core learning principles focus on teaching and learning and what teaching and learning should look like in the classroom, and consequently guide decisions about instruction, student learning, and school practices (Glickman, 1993).

Another characteristic of a data-driven school culture includes having a clear statement of purpose for data collection and analysis. Many schools initially tend to

collect huge volumes and varieties of data—standardized test scores, teacher-developed test scores, portfolios of student work, attendance data, discipline reports, survey information, library records, and running records. They begin collecting data without first articulating a clear purpose and defining a plan. Such collection is often done in response to outside mandates or funding requirements. Many other schools however, seem comfortable with the approach of spending hours in data analysis then allowing important issues and questions to arise from their analysis. The information from the data analysis can lead to a review and/or a change in the school. For example, after schools have analyzed discipline or attendance data, changes in supervision polices, teaching social skills, or initiating contracts with parents to emphasize the importance of attendance might be implemented.

While important answers and unanticipated questions do often grow of looking at data, according to Eaker et al. (2002) more emphasis should be placed on having a purpose and developing a plan for data analysis. Bernhardt (1998) realized that not all schools involved in data gathering know their purpose for the collection. She also noticed that sometimes there seemed to be a disconnect between the questions that were being asked and the kind of data being collected. Herman and Winters (1992) suggested in order to avoid getting mired in the data and losing sight of the information that is needed, data analysis should begin by relating to a particular question.

The importance of purpose was also identified by the Bay Area School Reform Collaborative (BASRC), as a significant characteristic to effective school data cultures (BASRC, 1998). BASRC believes that by formulating key questions about school goals, collecting data based on those questions, using the data to adjust work, and then revising

and refining the questions over time schools come closer to improvement. Having a purpose helps people narrow their focus and leads to greater involvement and commitment. When faculty, parents, community, and students hold a common purpose, Dufour (2002) said it is easer for them to buy into the school improvement process.

Purpose also helps educators refine their questions and integrate multiple sources of data in search of answers to important concerns. Bernhardt (1998) stressed the importance of using multiple sources of data as well as being attentive to integrate those different sources of data. Schools for the most part have only looked at individual data categories such as student achievement, attendance, or drop-out rates as if they make sense isolated from other data categories. Little data integration is taking place in schools (Streifer, 2002b). As a consequence, it is nearly impossible to have a truly systemic discussion—one driven by data—about what is happening, why, and what might be better for schools.

Developing a purpose for data collection helps alleviate the sense of being overwhelmed (Streifer, 2002b). Analyzing all possible data can be a burdensome task for schools to achieve. However, when identifying what data are important to collect and will be helpful in reforming, the school reduces the busy work which cannot be used to institute school change. Often data collection approaches are time-consuming and intrusive. To curb this feeling of intrusion, teachers need to feel that they are going to produce specific information that will be helpful in teaching and learning. Therefore, having a purpose for data collection addresses this issue (Bernhardt, 1998).

Another characteristic of a data-driven school cultures involves finding resources to help with planning, coordination, collection, interpretation, and reporting of data.

Outside support is very helpful when schools are taking on new data-collection approaches. From Allen's and Calhoun's (1998) work with the League of Professional Schools, the schools that were most successful in their school improvement efforts where the ones who received assistance from the outside. Typically, such support has been provided by consultants from universities, state departments of education, or educational support groups. Schools are quite good at collecting data but sometimes limited by their inability to organize the information and present it graphically. As schools engage in the cycle of inquiry and look closely at student learning, those outside the school—in offices of evaluation and assessment, in regional laboratories, in colleges and universities—have valuable support to offer schools. Schools may also be able to serve as "critical friends" for one another in the data evaluation process (Allen & Calhoun, 1998).

A data-driven school culture recognizes the need to engage the larger school community in the ongoing cycle of inquiry. Increasingly, community members are becoming active school leaders, accepting more and more responsibility for effective teaching and learning at the school (Lambert, 1998). There is value in multiple perspectives which in turn bring multiple resources, information, and questions to data interpretation. Schools need both internal and external viewpoints. Without internal viewpoints, the ability to really understand what data are saying is lacking. Without external viewpoints, the ability to see important interpretations and questions from the outsiders' perspectives is lacking. Both viewpoints should not presuppose over the other, but both should be considered when information is interpreted. By developing partnerships with parents and other community members, structures for ongoing dialogue

and inquiry can engage the community in the work of school reform efforts. Multiple voices and perspectives can help develop better schools for all children (Lambert, 1998).

Another characteristic of a data-driven school culture includes using a variety of tools to analyze data. A wide variety of tools are used by schools to track teaching and learning success. Data analysis can be conducted using software tools such as a common spreadsheet and database computer programs (Streifer 2002b). Larger schools may use a management information system to access data in order to inform their decision making process. Creighton (2001) reported that some schools are using statistical computer software programs such as Statistical Package for the Social Sciences (SPSS) and GB-STAT to analyze data. Kangshem (1999) infered that for most schools data access and analysis remains a paper-pencil activity. Streifer (2002b) noted that due to complexity of data gathering and analysis, those involved spend 90 percent of the time for these two activities while only 10 percent of their time is spent generating solutions and improvement implementations. However, with the use of new advanced technology, Streifer (2002b) predicted that the time ratio will be reversed so that more time can be spent on solutions and improvement implementation and less time on gathering and analyzing data. A more detailed account of the present technology tools available to accomplish data gathering and analysis will be addressed later in this chapter.

Four researchers reported that the data-driven decision process consists of the following practices: (1) Identifying significant questions, issues, or goals, (2) Selecting appropriate indicators of success, (3) Collecting and analyzing supporting data, (4) Disseminating and discussing data, (5) Planning and implementing actions, (6) Monitoring and documenting progress, and (7) Improving continuously (Bangser,

2000; Bernhardt, 1998; Love, 2000; Streifer, 2002b). The data-driven decision process is about learning continuously and applying what is learned to improve continuously (Doyle & Primentel, 1999). Thoughtful, effective data-driven decision processes serve the needs of all school community members. Teachers understand the connections between what they do daily in the classroom and what their students are learning. Administrators use accurate and reliable evidence to make decisions that best meet the needs of students and teachers. Finally, citizens have access to information that enables them to evaluate effectively how well their schools are performing.

Barriers to Data-Driven School Cultures

East (1997) emphasized that educational organizations have unique characteristics that form constraints when making data-driven decisions. These constraints that hinder data-driven decision-making include time, accessible information, policies, and finances. Bernhardt (1998) identified eight barriers to why all schools do not engage in data-driven decision-making. The school culture is not focused on data collection, analysis, or its use. Few school educators are trained to gather and analyze data. The staff does not think it is part of their job. Data analysis is not a school priority. Computer systems are inadequate or unavailable for data processing. Staff members have negative past experiences with how data were used. The school staff perceives that data analysis is for someone else's purpose. The final barrier Bernhardt identified as to why schools do not engage in data-driven decision-making is that there are few good examples of schools benefiting from data-driven decisions from which to model.

Purpose and Benefits of Data-Driven Decisions

The appropriate and effective use of data enables educators to make good decisions, work intelligently and efficiently, change and improve processes, document and comprehend the impact of actions, and prepare for successful futures. Bangser (2000) identified that policymakers and school personnel tend to use data for six primary purposes: (1) discovering issues, (2) diagnosing situations, (3) forecasting future conditions, (4) improving policies and practices, (5) evaluating effectiveness, and (6) promoting accountability. Several examples, classified by these six primary purposes, are presented in Table 2.

Numerous benefits occur when school personnel engage in conversations about the purposes and uses of data prior to adapting or adopting any data-driven decision process. According to Love (2000), school personnel who understand their students' needs and use data about their school communities may reap a variety of benefits. Educators become prepared better to make informed decisions. The school staff is in a better position to remain focused throughout school improvement implementation. Educators are able to recognize whether their efforts are effective. Finally, the staff members become more capable of institutionalizing change and implementing continuous improvements. Students deserve the best possible education, one based upon sound data and well-informed decision-making.

Table 2

Common Uses of Data.

Common Uses of Data	
Discover Issues	Reveal issues and problems that may otherwise remain hidden. Ascertain the needs of students, educators, parents and other community members. Ensure that no students fall through the cracks. Identify grade-level and schoolwide strengths and weaknesses.
Diagnose Situations	Understand the root causes of problems. Comprehend why some students are not performing well. Determine eligibility for special programs. Target specific areas for improvement. Provide criteria for focusing on high priority goals.
Forecast Future Conditions	Predict the needs of future students, educators, parents and community members. Suggest possible local, regional, state or national trends that will affect the school and the programs offered. Surmise types of programs required. Infer types of expertise needed.
Improve Policy & Practice	Reform teaching and learning. Enhance instruction and assessment. Guide curriculum development, revision and alignment. Build a culture of inquiry and continuous improvement. Guide the allocation of resources. Avoid quick fixes and one-size-fits-all solutions.
Evaluate Effectiveness	Understand and describe high-quality performance. Provide feedback to students, teachers and administrators about their performance. Measure program effectiveness. Identify practices that produce desired results. Convince stakeholders of the need for change. Highlight successes.
Promote Accountability	Monitor and document progress toward achieving goals. Inform internal and external stakeholders of progress. Confirm or discredit assumptions about students and school practices. Develop meaningful responses to criticism. Meet state and federal reporting requirements. Ensure that all personnel are focused on student learning.

Adapted from "Education Commission of the States" (2000)

Information Systems

Probably the greatest demand on a school administrator's time involves the management of a tremendous amount of data and the need to process and report the data (ERIC Clearinghouse on Management, 1983; Kearsley, 1990; Sharp, 1998). Therefore, student database systems (student information systems) are a critical application of computers in the management of schools (Picciano, 1998). Picciano (1998) reported that beginning in the 1950s on large mainframe computers, database management systems were one of the first uses of computers in the educational setting. He also added that collecting data manually can be very expensive and prone to problems of inaccuracy and inconsistency.

The entire student information system is underpinned by data processing, the process by which data from the school is collected, assigned meaning, communicated to the school stakeholders (administrators, teachers, counselors, parents, students), then stored for future use. Data processing involves three stages. The input stage is the process by which information is entered into the system. The processing stage involves the computer performing certain functions such as classifying, sorting, calculating, comparing, and summarizing data. The output stage is the process by which records and reports are produced that contain meaningful information for the user (Bluhm, 1987).

Networked student information systems offer the greatest benefit to school administrators. In a networked system data only has to be entered once, therefore, tasks can be distributed among different offices within a school, thus allowing for increased efficiency for the school. Once entered, the data can be pulled from any location on the network and used as necessary (Picciano, 1998).

According to Witten (1990), well designed student information systems have several integrated modules, such as a student data base, grade reporting, attendance, and class scheduling. Student data that could be stored on such a system include schedules, assigned teachers, grades, attendance, discipline, test scores, and a multitude of personal information about students, such as the home address, parent/guardian information, health conditions, or special program involvement. The use of student information systems is vital to the school administrator. Picciano (1998) added that:

> ….given the extensive reporting requirements of various governmental agencies at all levels, school administrators need to be able to demonstrate that they have access to and can provide critical data about their schools. Failure to do so can jeopardize budget requests, grant applications, and overall credibility with governmental officials. (p. 59)

In the state of Oklahoma, the Oklahoma Accountability Reports are generated from school data for every school in the state and distributed to parents, guardians, and adult students and made available to the general community, upon request on a yearly basis. These reports have been distributed to the public and have been used to compare schools statistically. A second area of required reporting in Oklahoma is for the purpose of school funding. In Oklahoma, the amount of money districts receive is determined by student enrollment and attendance at certain points during the school year. The average attendance over a window of time, the number students enrolled in special programs, and the level of service they are provided are the types of data necessary for school funding reporting requirements. Without complete, accurate data schools would not receive their due funding. Mandatory reporting has required that schools be able to report data on a

regular basis in a standard format, and the only way that could be possible is through effective utilization of a powerful database system that meets state reporting requirements.

School administrators must understand that the computer is not a device to be used merely for giving simple answers to incomplete questions. Rather, the computer should support the human element of heuristic learning in which one answer gives rise to additional questions that require additional answers and so on (Bozeman & Spuck, 1991). Whether or not computers are used to the previously proposed level of complexity, computers are very powerful tools to assist school personnel in the decision-making process. Bluhm (1987) reported "educators who used the computer reported they have become more analytical and now asked better questions to get better answers" (p. 19).

Beginning technology users often view computers as a threat and as a silent criticism of their human abilities rather than as an avenue to simplify their job tasks (Coll et al., 1989). This idea is supported by the research of Witten (1990) who found a majority of rural secondary principals in Kentucky were not using computers to assist them in managing schools. Similarly, Streatfield and Thompson (1983) found that only 3% of their respondents considered computer-aided decision-making a high priority. However, as stated by the Alabama University College of Education report (1982): "Today's administrator is facing a crushing burden in terms of managing student and administrative information" (p. 2). Therefore, the school administrator must become actively involved with computer technology in a positive way (Gustafson, 1985).

Information technologies have progressed during the last three decades. Electronic Data Processing (EDP) was the first stage which facilitated increased office

efficiency by automating routine tasks. Management Information Systems (MIS) was the second stage and acted as a support mechanism for managers by providing data on current conditions. The most recent developmental stage of information technology has been the Decision Support System (DSS) which has focused on data-driven decision-making for the purposes of strategic planning (Bluhm, 1987; Omidi, 1989). DSS systems have progressed most recently into the area of data warehousing a process for keeping large storehouses of data related to specific businesses (i.e., personnel, payroll, account information for the banking industry). Information can be pulled from any given area within the data warehouse and used by the manager to plan an appropriate course of action.

Newer student information systems are known today as relational databases that function in a manner similar to data warehousing. The relational databases allow queries to be performed that provide access to almost any combination of data available through the system (Kearsley, 1990). The ability to inter-relate student data and teacher data through a relational database offers the administrator a tremendously powerful tool in determining the needs and areas of concern for the school, thus the computer can be used as a decision support tool, as proposed by Bozeman, and Spuck (1991). Businesses have been using computers for the purposes of planning, forecasting and project monitoring for the last two decades (ERIC Clearinghouse on Management, 1983). The time has come for school administrators to harness the power of the computer for this type of activity as well (Streifer, 2002b).

Other tools, beyond the student information system, are available to assist the administrator in making decisions. With their ability to manipulate numbers,

spreadsheets can be used for planning, modeling, and performing what-if-simulations, in addition to doing simple tables and summary totals (Picciano, 1998; Sianjina, 1997). Statistical software packages can also be used for planning or evaluation in the school environment. According to Picciano (1998), statistical packages "provide inexpensive, easy-to-use programs for doing all types of statistical analysis" (p. 72).

Lastly, the Internet has emerged as one of the most important new tools in administrative computing due to its ability to function as a reference tool (George, 1998). Online databases can provide educators with access to the most current information about problems related to the educational setting, thereby providing the opportunity both to alleviate mistakes and to have access to multiple solution options (Gustafson, 1985). According to Kearsley (1990), there are "literally thousands of online databases available providing information ranging from journal abstracts to economic statistics" (p. 38). Picciano (1998) concluded that access to informational databases provides educators with an important research tool allowing them to keep up-to-date on many aspects in the field of education. Additionally, the Internet's ability to function as a communication tool for educators has opened up the possibility of communicating with other educational experts located throughout the world to gain additional insight into educational issues(Aguilera & Hendricks, 1998).

In summary, the student information system, spreadsheets, resources available through the Internet, and possibly statistical software, would comprise a complete information system. The need for such an information system was summarized well by Bluhm (1987):

> An assumption made about decision making is that the decisions made are no better than the information upon which they are based. If an information system is lacking, an administrator is forced to rely upon incomplete data or the opinions of his/her subordinates and associates. If the information shared is biased, poor decisions may result. The implication is that if the goal of administrators is to make sound decisions in managing schools, then a total information system should be established. (p. 6)

Decision Support Systems

Ligon (2000) defined three types of decision support systems. The first type of decision support system can be defined broadly to include the process within an organization by which information is made available on which to base a decision. Secondly, a data-based decision support system can be defined as the process within an organization by which data are collected, analyzed, and interpreted into information that is made available on which to base a decision. Lastly, an automated, data-based decision support system can be defined as the process within an organization by which data are collected, analyzed, and interpreted by a computerized system into information that is made available on which to base a decision. A decision support system does not have to be automated, technical, web-based, or sophisticated. However, Ligon (2000) suggested that in the information age, a DSS should be an automated, computerized system that collects data into a database where they reside until the moment they are brought out in a timely, valid, and understandable report.

Data support systems can be used to provide information for routine operational decisions, problem-solving decisions, and innovative strategic decisions. These systems exist to provide information, but they also allow the user to learn and explore. The user can manipulate the input

data to produce different projected results. A DSS allows the user to be actively involved in developing and implementing the analysis (Fisher, Semrau, & Truban, 1990). The user can also test different inputs to determine what is needed to reach a desired goal. The personal computer makes it possible for individual decision makers to do a one-time analysis to determine the impact of a particular issue on personnel, students, and programs. Decision makers can quickly make changes to the model and receive immediate feedback of the results.

DSSs help users to access, organize and present their data for making decisions. These systems "have utility if they (the developers of the DSS) provide effective and efficient support that improves the results expected from a decision process" (Smith, 1998, p. 45). Additionally, DSSs provide decision makers the choice of analyzing results at different points of aggregation and disaggregation. For example, a principal might prefer test results by schools within the district, whereas a superintendent might prefer to compare district information with other districts (Sauter & Mandell, 1990). Computer technology makes this task possible in a timely and efficient manner.

According to Ligon (2000), there are several other functions that DSSs provide which include: (1) inform decision makers of the best option based upon the best available information, (2) support staff in their work , (3) capture and represent a decision/problem and model the decision/problem so everyone understands it, (4) locate and retrieve data to use the in the decision process, and (5) present the information in an easily understood manner to the user(s). These additional functions are sometimes beneficial and useful to decision-makers.

Despite the potential value of DSSs, the possibility of them not working also exists. Kearsley (1992) indicated that many of the automated decision support systems have failed because they require a variety of complex information which is not always available. Another

problem is that decision makers do not always have the knowledge required to use complex systems, and they often lack the time to acquire the skills needed to use the system. The usefulness of DSSs is also limited because they have not traditionally been designed to support the needs of the user. Instead, decision makers have had to learn and adapt to the system rather than vice versa. Although personal computers exist on almost every desktop, and network connectivity has been simplified, the software to support quality decision making is limited (Smith, 1998).

Decision support systems can be as complex as one wants to make them. As computer systems have grown in their capabilities, these systems have become more sophisticated. DSSs have moved from being simplistic data warehouses with rigid rules for reporting data to multi-level storehouses with artificial intelligence (Ligon, 2000). A future direction for decision support systems in education is to go beyond numbers to meaningful text. Meaningful text means not only the capability to search narrative, but also to search for the meaning of the narrative. This will move education into the arena of having a knowledgebase in contrast to current databases. A knowledgebase offers the ability to search and find ideas, conclusions, trends, and commonalities (Ligon, 2000).

Technology is important in leading the school through effective decision-making. Administrators need tools that assist them in identifying and monitoring significant educational trends and vital information so that critical issues and problems they are facing can be addressed with the best possible solutions. School personnel must also possess the skills required by the appropriate technologies and "be trained to be effective managers of technology within their schools" (Bozeman & Spuck, 1991, p. 525). According to Kearsley (1988), the extent of computer use is dependent upon the principal's level of computer

understanding. Similarly, Trotter (1997) stated, "experts say there is a link between administrators' ability to make informed technology decisions and their personal use of technology" (p. 2). Therefore, developing technology skills in school personnel are appropriate measures to ensure that technology is being used to achieve its fullest benefit to support effective decision making in educational settings.

Summary

This study examined how elementary educators collect and analyze data. The study also examined the support system used to make instructional practice decisions. The literature supports the belief that decision makers need more than just data collection to make effective decisions. Data must be analyzed as well as be transformed into useful information and then that information must be transformed into useful knowledge for effective decision-making. Although computers and software applications can assist in the data analysis, the human element of wisdom and experience must be integrated with the technology in the decision-making process.

Chapter 3 will outline the procedures taken to address this study's research questions. Also, descriptions of the processes used to collect and analyze data are included. Validity and reliability issues concerning this study are also presented in Chapter 3.

CHAPTER III

Research Design and Methodology

The federal No Child Left Behind (NCLB) mandate contains directives for reform and improvement in all schools across the United States. It is now required by NCLB that any school improvement plans must be evidence-based in order to receive federal appropriations. Tyack and Cuban (1995), and Fullan (1997) suggested, that despite the focus on school improvement, the overall structure and process of the American educational system remains much the same as it has for decades. Tyack and Cuban (1995) posited that schooling has remained stable and little actual change has taken place in the major constructs of schools such as communication, team building, data gathering and analyzing, student learning, and school improvement initiatives. Perhaps it is possible that data-driven decision-making could assist public school educators in accomplishing the school reform and/or improvement initiatives presently required by federal law.

The purpose of this study was to collect, describe, and examine data-driven decision-making processes that influence instructional change within an elementary public school setting. The data were gathered from three sources: interviews, documents, and field notes. A principal and teachers from an Oklahoma elementary public school were interviewed. Documents were examined and observations were made which contributed to the findings of this study. An elementary principal was asked to describe how she used data-driven decision-making processes to influence instructional practices.

Elementary teachers were interviewed and asked to describe the process used to influence change in their instructional practice. The data-driven decision-making process descriptions were examined to see how the participants' descriptions align with the data-driven decision-making literature-based frameworks. The relationship between the data-driven decision-making frameworks found in literature and the data-driven decision-making process as described by educational practitioners was examined for possible emergent theory concepts. Also, the data-driven decision-making process descriptions presented in this study may illustrate a model for other educators who strive to make informed decisions related to instructional practices.

Research Questions

In this study, an attempt was made to gain an understanding into the data-driven decision-making process used by elementary educators to implement change in instructional practices. Also, an attempt was made to identify whether a relationship existed between the educators' data-driven decision-making process and existing data-driven decision-making concept literature-based frameworks. The following research questions guided this study:

1. How do educators from an Oklahoma elementary school describe the data-driven decision-making processes that influence instructional practices?
2. What do elementary educators identify and describe as their decision support system?

Research Design and Rationale

To examine how elementary educators made data-driven decisions, the researcher developed a descriptive case study using a qualitative method. Both research questions lend themselves more to the qualitative methodology approach. The principal investigator of this study wanted to make an effort to understand how data-driven decision-making was being used among with the participants (elementary administrator and teachers) in their particular setting (elementary public school). The researcher interviewed six elementary educators who participated in a specific event (data-driven decision-making). As stated in Lincoln and Guba (1985):

> The naturalist elects qualitative methods over quantitative (although not exclusively) because they are more adaptable to dealing with multiple (and less aggregatable) realities; because such methods expose more directly the nature of the transaction between investigator and respondent (or object) and hence make easier an assessment of the extent to which the phenomenon is described in terms of (is biased by) the investigator's own posture; and because qualitative methods are more sensitive to and adaptable to the many mutually shaping influences and value patterns that may be encountered. (p. 40)

Case study methods involve systematically gathering enough information about a particular person, social setting, event, or group to permit the researcher to

effectively understand how it operates or functions (Berg 2001). Case studies may focus on an individual, a group, or an entire community and may utilize a number of data technologies such as life histories, documents, oral histories, in-depth interviews, and participant observation (Hagan, 1993; Yin, 1994).

Descriptive case studies in education are useful in presenting basic information about areas of education where little research has been conducted. Innovative programs and practices are often the focus of descriptive case studies in education. Such studies often form a database for future comparison and theory building. For example, Moore (1986) conducted case studies of high school interns to find out how newcomers in organizations learn. He developed case studies of interns in such diverse settings as a furniture-making shop, an animal protection league, a hospital speech clinic, a food cooperative, a museum, and a labor union. With these descriptive studies he later devised a conceptual framework about learning in non-school settings.

A descriptive case study seemed the most appropriate research method to investigate this study's research questions. The description focused on individuals who have participated in a particular event in order to understand how their participation in the event benefited them professionally or benefited the students of the school.

In qualitative research, data are usually collected through interviews (Merriam 1998). The most common form of interview is the person-to-person encounter in which one person asks questions and records the information from another person. A person-to-person interview may be defined as a conversation—

but a "conversation with a purpose" (Dexter, 1970, p. 136). The main purpose of an interview is to obtain a special kind of information. The researcher wanted to find out what was "in and on someone else's mind" (Patton, 1990, p. 278). Patton explained:

> We interview people to find out from them those things we cannot directly observe. . . . We cannot observe feelings, thoughts, and intentions. We cannot observe behaviors that took place at some previous point in time. We cannot observe situations that preclude the presence of an observer. We cannot observe how people have organized the world and the meanings they attach to what goes on in the world. We have to ask people questions about those things. The purpose of interviewing, then, is to allow us to enter into the other person's perspective. (p. 196)

When researchers cannot observe behavior, feelings, or how people interpret the world around them, then interviewing becomes necessary. According to Merriam (1998), it is also necessary to interview when investigators are interested in past events that are impossible to replicate. For example, a curriculum director might be interested in the attitudes of the participants after they attended a professional training seminar. Interviewing is also the best technique to use when conducting intensive case studies of a few selected individuals, as Bateson (1990) did in interviewing five women for her book, *Composing A Life*. The decision to use interviewing as the primary mode of data collection should be based on the kind of information needed and whether interviewing is the best way to get it. Dexter

(1970) summarized when to use interviewing. "Interviewing is the preferred tactic of data collection when ... it will get better data or more data or data at less cost than other tactics" (p. 11). Sometimes interviewing is the only way to get data.

The participants' responses to person-to-person interview questions provided a primary source of data for this study. The researcher used interviewing six participants as a means to get needed information in order to understand how data-driven decision-making processes were practiced in an elementary school.

Directly observing the results from data-driven decision-making may provide meaningful data. An observation can be useful in case studies when it "(1) serves a formulated research purpose, (2) is planned deliberately, (3) is recorded systematically, and (4) is subjected to checks and controls on validity and reliability" (Kidder, 1981, p. 264).

Data-gathering techniques are in danger of being invalid due to the highly subjective and unreliable nature of human perception. Human perception can be very selective. Consider a bank robbery. For each witness to the robbery there will be a different, perhaps even contradictory, account of what happened. However, the witnesses were not planning to systematically observe the robbery, nor were they trained in observational techniques. These factors differentiate everyday observation from research-related observation. Research-observation is a data collection method where the relevant behaviors or happenings are recorded from the researcher's perspectives and perceptions. Patton (1990) contended that comparing untrained observers with researchers is like comparing what "an amateur community talent show" can do compared with "professional performers" (p. 202).

Training and mental preparation are as important for researchers "to do their best" as they are for artists (p. 201). Wolcott (1992) also noted that the difference between "mere mortals" and qualitative researchers is that:

> qualitative researchers, like others whose roles demand selective attentiveness—artists and novelists, detectives and spies, guards and thieves, to name a few—pay special attention to a few things to which others ordinarily give only passing attention. Observers of any ilk do no more: We all attend to certain things, and nobody attends to them all. (pp. 22-23)

An observer becomes skilled by "learning how to write descriptively; practicing the disciplined recording of field notes; knowing how to separate detail from trivia . . . and using rigorous methods to validate observations" (Patton, 1990, p. 201). A novice researcher can practice observing in any number of ways—by being a complete observer in a public place, by being a participant observer in his or her work or social settings, or by watching films or videotapes. One can also apprentice oneself to an experienced field researcher, comparing his or her observations with oneself. Additionally, other people's accounts of the experience may validate the researcher’s perspectives of the observations.

There are several reasons why an investigator might want to gather data through observation. First, as an outsider an observer will notice things that have become routine to the participants themselves, things that may lead to understanding the context. Second, observations will provide some knowledge of the context or provide specific incidents, behaviors, and so on that can be used as

reference points for subsequent interviews. Third, observations may provide a venue to obtain information when people may not feel free to talk about or may not want to discuss all topics (Merriam 1998). Observations are conducted to triangulate emerging findings as well; that is, they are used in conjunction with interviewing and document analysis (Merriam 1998).

Observation is a particularly helpful strategy for understanding vague phenomena. For example, in a study of respiratory therapists' critical thinking, Mishoe (1995) observed therapists as they worked in the clinical setting, and shortly thereafter she interviewed them. She was thus able to ask them what they were thinking with regard to specific behaviors she had witnessed on-site.

Observation makes it possible to record behavior as it is taking place. Observation is the best technique to use when an activity, event, or situation can be observed firsthand. Finally, observation is utilized best when a fresh perspective is desired, or when participants are not able or willing to discuss the topic under study (Merriam 1998).

Nine observations for this study involved visiting classrooms while teachers were instructing, attending grade level meetings, listening to informal conversations, interaction with the principal, and visiting the school frequently in the fall of 2004. The researcher’s thoughts and interpretations of the events, people, actions, and conversations observed were recorded in a reflective journal. The journal was comprised of field notes from the various observations made by the principal investigator. The field notes recorded from observations provided the second set of data for this study.

Investigating and examining documents are not much different from using interview or observation data. Merriam (1998) perceived that "tracking down leads, being open to new insights, and being sensitive to the data are the same whether the researcher is interviewing, observing, or analyzing documents" (p.120). Since the researcher is responsible for data collection he or she must rely on his or her skills and intuition to find and interpret data from the documents.

Finding relevant materials was the first step used by the researcher. Documents relevant to this study included email, computer-generated reports, graphs made by software applications, public accountability reports, newsletters, presentation artifacts, school profiles and minutes recorded from meetings. The researcher asked the six participants of this study for documents that contain information, evidence, or insights that were relevant to the research questions. Documents provided a third source of data for this study.

Methodology

This case study was exploratory and descriptive in nature using qualitative inquiry methods. These methods modeled the naturalistic criteria described by Lincoln and Guba (1985) who pointed out that the characteristics of naturalistic inquiry are related to studying events in their natural environment and efforts to comprehend the significance that humans apply to those events. Naturalistic inquiry suggests the use of emergent design and the use of people as primary data collection instruments. This investigation was naturalistic as it specifically sought descriptions and explanations of the data-driven decision-making process from elementary educators—people as the primary data source.

The word naturalistic is derived from ecological approaches in biology. According to Bogdan and Biklen (1992), naturalistic qualitative research has actual settings as the direct source of data, and the researcher is the key instrument. Naturalistic researchers spend a great deal of time in schools, families, and neighborhoods learning about educational concerns. The researcher of this study collected data on site; learning and understanding the phenomenon of data-driven decision-making were enhanced from the data being collected at the school.

Bogdan and Biklen (1992) suggested that qualitative researchers go to the location of the study because they are interested in the context. The researchers believed that "action can best be understood when it is observed in the setting in which it occurs" (p.5). Understanding of the settings is important in the historical context of the institutions in which they are a part. Qualitative researchers are interested in information that is produced by human subjects and their interest in that information is driven by their need to know where, how and under what circumstances the information cam into being. Qualitative researchers believe that to divorce the act, word or gesture from its context is to lose sight of significance. One anthropologist described it thus:

> If anthropological interpretation is constructing a reading of what happens, then to divorce it from what happens—from what in this time or that place specific people say, what they do, what is done to them, from the whole vast business of the world—is to divorce it from its application and render it vacant. A good interpretation of anything—a poem, a person, a history, a ritual, an institution, and a

society—takes us to the heart of that of which is the interpretation. (Geertz, 1973, p. 18)

The purpose of descriptive research is to examine events or phenomena. Descriptive research was sought for this study in order to describe and explain data-driven decision-making processes, rather than making a prediction based on cause and effect. This descriptive research was limited to characterizing the data-driven decision-making process in an elementary school. The researcher did not intend to use descriptive research for this study to suggest causal relationships between better instructional practices and data-driven decision-making processes.

The findings of this study were characterized by collected data in the form of words from the participants. The written results of this research contained quotations from the six participants to illustrate and substantiate the information concerning data-driven decision-making practices in an elementary school. Specific descriptive data for this study included field notes, transcripts, and relevant information from documents. The researcher searched for understanding by analyzing the data, with all its richness, as closely as possible to the form in which the researcher recorded or transcribed the information from interviews, observations, and/or documents. Permission was obtained from the University of Oklahoma Institutional Review Board to conduct this research project (see Appendix A).

Site and Site Selection Procedures

The aim of this study was to investigate data-driven decision-making processes from elementary educators' perspectives. The data were obtained from one principal and five teachers at one school site where they had made data driven decisions. Respondents,

undergoing a common experience at a single site, created a bounded unit. An elementary site was chosen because of the researcher's background in elementary school and interest in this level of education.

The section of the site was determined by: (1) the potential of the site participants to generate data for answering the research questions, (2) the researcher's access to the site, and (3) the willingness and approval of the site principal to allow the researcher to conduct interviews, make observations, and collect information from documents. The site chosen for this study was an urban elementary school located in Oklahoma. The site was selected because the elementary school was involved in a partnership with a university-based network. The university network offered data-driven decision-making as part of its professional development training to its partnered schools. Three co-directors from the university network recommended the site to the researcher of this study. The university network co-directors shared personal knowledge of the school staff's experiences with data-driven decision-making with the researcher. The researcher contacted the principal of the school by phone and briefly explained to the principal the research study (see Appendix B). A copy of the research proposal and Internal Review Board documents were provided to the principal before the final agreement was made. After receiving a copy of the research proposal, the researcher requested permission from the principal to conduct the research at her site. Permission from the principal to access the study site was granted over the telephone under the condition that the district's curriculum board would also approve the researcher's study.

A request to do research at a school located within this district was also made by telephone to the district's curriculum director. The researcher explained the study to the

curriculum director. The curriculum director required the researcher to compete a written research proposal. The researcher completed the district's research proposal form and returned it to the district's curriculum director. The curriculum director notified the researcher six weeks later by telephone to give notice that the research proposal was approved by the curriculum board. The final decision to allow the study to be conducted at the school site was a combination of the principal's discretion and the district curriculum board's approval. This study's researcher scheduled site visitations in advance with the study's site school principal either by telephone or by email.

Site Description

The pseudonym of Crimson Creek Elementary School was given to the site of this case study. Crimson Creek was one of 16 elementary schools located within a middle-to-upper middle class suburban` school district in Oklahoma. In the 2002-2003 school year, the school's student population was composed of 81% white students compared to the state's average of 60%. The non-white student population distribution included the following ethnic groups for this study's site with the state averages in parentheses: African American 3% (13%), American Indian 4% (16%), Asian 6% (1%), Hispanic 5% (9%) and, Pacific Islander 1% (1%). The ethnic makeup of student population percentages for Crimson Creek Elementary was overall lower when compared to the state's ethnic student population percentages.

The student enrollment of Crimson Creek Elementary was 620 in the 2002-2003 school year. The attendance rate was 95.9% at Crimson Creek Elementary. The student per teacher ratio was 20:4. The school was located in an affluent residential area with houses ranging from $175,000 to $300,000 and in close proximity to a state university.

The school's poverty rate as measured by the percentage of students on free or reduced lunch for 2003 was 13% compared to the state's 56%.

Crimson Creek Elementary had 39 faculty members in 2003. Four faculty members received national board certification. Two faculty members were in the process of completing their national board certification. Eight faculty members were interested in the process of becoming nationally certified. At least half of the teachers had more than 20 years of teaching experience. Six teachers had less than five years of teaching experience. Fifteen faculty members had been at Crimson Creek Elementary less than five years. At least half of the staff has been at Crimson Creek from nine to thirteen years.

Oklahoma used the Oklahoma Core Curriculum Tests (OCCT) to test elementary students in third and fifth grade. The OCCT for fifth grade students was a criterion referenced based test. Third graders took a norm-referenced test. The statewide test measured how well students mastered specific skills in the content areas such as: math, reading, writing, science, U.S. government, U.S. history, and geography. Attendance rates and student performance results on the statewide Oklahoma Core Curriculum Tests determined an elementary site's academic performance index (API) score. All Oklahoma schools received an academic performance index score. Third and Fifth grade were the only elementary grade levels tested with the Oklahoma Core Curriculum Tests in elementary schools in the 2002-2003 school year. Third and fifth grade test scores were the only scores at the elementary level that determined the elementary site's API score. Only the academic performance of third and fifth grade students in the content areas of

math and reading from the Oklahoma Core Curriculum tests, contributed to the Oklahoma elementary site's API score.

In 2002-2003 school year, the state average academic performance index score was 1000. The academic performance index score for Crimson Creek Elementary was 1232 in 2002-2003. The Crimson Creek Elementary API score was above the state average API score in the 02-03 school year. In the area of reading, 92% of the regular education fifth grade students at Crimson Creek Elementary passed the OCCT compared to the state passing average of 72%. In the area of math, 86% of the regular fifth grade student population at Crimson Creek Elementary passed the OCCT compared to the state passing average of 72%.

Participants and Selection Process

A good respondent or informant is one who both understands the school culture and is able to reflect and articulate what is occurring for the researcher (Merriam, 1998). Elite interviews can be conducted with any person who has relevant information; that is, the interviewer is interested in that particular person's perspective of the situation. "In the final analysis, a good informant is a person who can express thoughts, feelings, opinions, and his or her perspective on the topic being studied" (Merriam, 1998, p. 85). In survey research, the number and representation of the sample are major considerations. For this case study, the crucial factor was not the number of respondents, but the potential of each participant to contribute to the development and insight of the data-driven decision-making phenomenon. According to Merriam (1998), the most common type of non-probability sampling strategy in qualitative research is purposeful. "Purposeful

sampling is based on the assumption that one wants to discover, understand and gain insight; therefore, one needs to select a sample from which one can learn the most" (p. 61).

The researcher of this study used a purposeful sampling for participant selection. A purposeful sampling was used in order to discover, understand, and gain insight into how elementary practitioners did data-driven decision making. The researcher, with input from the site principal, selected five elementary educators based on participant selection criteria developed by the researcher.

The criteria for participant selection were communicated to the principal by the researcher. The selected participants of this study were elementary educators who met the following criteria: (1) they were directly involved in the data-driven decision making process, (2) they had at least five years of teaching experience at the selected site, (3) they were recommended by the site principal for their ability to communicate effectively to others and, (4) they were willing to participate in the study. The principal's input provided guidance to assure that selected participants understood the data-driven decision-making process and had the ability to provide meaningful descriptive insights about their personal experiences with data-driven decision-making.

The participants were first asked to take part in this study by their principal, followed by an email from the investigator requesting their participation in the study. Interview times with each participant were scheduled through email. Prior to interview sessions, the selected participants completed a demographic data form (see Appendix C: Demographic Data Form) that provided information on educational

background, employment position, technology skills and experience, as well as number of years employed at the school site. The elementary educators were asked in person-to-person interviews to describe their experience and perspectives on data-driven decision-making processes at their school.

The principal and five classroom teachers from Crimson Creek Elementary School were interviewed by the investigator of this study. The participants' years of experience in education ranged from 16 to 28 years. Five of the respondents have been employed at Crimson Creek since its opening in 1990. None of the participants were hired by the present principal. Two participants acknowledged that they had technology-related college hours. Three participants considered themselves to be self-taught in technology skills. Each respondent was given a letter of the alphabet as a pseudonym name. Table 3 summarized the participants' demographics.

The principal, Participant A, was a 43 year-old white female. She held a doctorate degree from a local university. She had been at this school for three years. She received most of her computer training through district professional development opportunities. She also had been an elementary principal in another mid-western state. She considered herself to be self-taught in computer related skills.

Participant B was a 55 year-old white female. She obtained a Master's degree in Reading from a local university. She was an early childhood teacher. She had been at Crimson Creek Elementary since the school opened fourteen years ago. She received her technology-skill training from district professional development opportunities. She had

10 years of technology experience. She did not consider her technology skills to be self-taught.

Table 3

Background of Data of Participants

Name	Position	Gender	Age	Race	Highest Degree Held
Participant A	Principal	F	43	W	
Participant B	Teacher	F	55	W	
Participant C	r	F	57	W	
Participant D	r	F	53	W	
Participant E	r	M	49	W	
Participant F	r	F	48	W	

Name	Years in Education	Years of Tech Experience	Tech-related College Hours	Self-Taught in Technology
Participant A	21	21	3	Yes
Participant B	28	10	0	No
Participant C	23	5	0	Yes
Participant D	22	8	0	Yes
Participant E	16	22	16	No
Participant F	27	10	0	No

Participant C was a 57 year-old white female. She obtained a Master's degree in Elementary Education from a local university. She was an early childhood teacher. She had been at Crimson Creek Elementary since the school opened. She received her technology-skill training from district professional development opportunities. She had five years of technology experience. She did not consider her technology skills to be self-taught.

Participant D was a 53 year-old white female. She obtained a Bachelor of Science degree from a state university. She was an early childhood teacher. She had been at Crimson Creek Elementary since the school opened. She received her technology-skill training from district professional development opportunities. She had

five years of technology experience. She considered herself to be self-taught in technology.

Participant E was a 49 year-old white male. He obtained a Master's of Education in Administration degree from a local university. He was an intermediate elementary teacher. He had been at Crimson Creek Elementary since the school opened. He received his technology-skill training from university classes, district professional development opportunities, and technology-related conferences. He had 22 years of technology experience. He did not consider himself to be self-taught in technology.

Participant F was a 48 year-old white female. She obtained a Master's of Education in Administration degree from an out-of-state university. She was an intermediate elementary teacher. She had been at Crimson Creek Elementary since the school opened. She received her technology-skill training from district professional development opportunities. She had 10 years of technology experience. She did not considered herself to be self-taught in technology.

Process Guiding the Interviews

The principal and teachers selected for this study participated in a sixty minute interview. All interviews were audio-taped. The interviews were transcribed for data analysis. A journal was maintained for reflection, interpretations, and verification of the data collected. Taylor and Bogdan (1984) listed five criteria that need to be addressed at the beginning of every interview. These criteria involve identifying the investigator's motives and intentions and the inquiry's purpose. The protection of the respondents through the use of pseudonyms should be put into practice. The interviewer should decide who has

final say over the study's content and if any payments are to be made. The interview logistics should be decided upon with regard to time, place and number of interviews to be scheduled. The interview suggestions as explained by Taylor and Bogdam were addressed in the consent form that each participant was given to read prior to interviewing (see Appendix A).

Taylor and Bogdan identified strategies for maximizing the time spent in gathering information from the informant. As an example, slow starting interviews can be improved by gathering information regarding the informants' information about themselves, the event, or the study. Prior to all interview sessions, respondents were emailed a demographic data form that solicited information their educational background and employment history, including their technology skills. The demographic form was collected by the researcher from each participant at the beginning of the person-to-person interview.

The value of the interview is related to the interviewer's knowledge about the subject. It is important that he or she know enough about the topic to generate meaningful questions in language easily understood by the informant. Therefore, the researcher of this study conducted a practice interview with one elementary principal and two elementary teachers in the spring 2004 and prior to any actual interviews used for this study. These three elementary educators were not part of this study’s data collection. The purpose of the mock interviews was to critique 21 questions and to enhance the interviewer's skills in accessing the desired information. Also, the practice interviews produced suggestions and/or modifications to the 21 questions in order to solicit the richest information

possible from the actual subjects of this study. After the mock interview and soliciting recommendation from the three elementary educators, 14 of 21 questions remained adequate in order to gather data related for the purpose of this study.

Participants were interviewed after signing a consent form describing the research process (see Appendix A). Each participant was informed that confidentiality would be maintained and pseudonyms would be assigned to protect the individual's true identity.

This study used a semistructured interview process. Some questions were designed in attempt to solicit specific information from all the respondents. The largest part of the interview used more open-ended type questions. The semistructured format for interviewing the subjects was selected by the researcher because it allows the researcher to respond: (1) to the situation at hand, (2) to the perspectives of the respondent, and (3) to any new ideas on data-driven decision-making processes.

According to Merriam (1998), there are characteristics guiding the quality of a good interviewer. A good interviewer refrains from arguing, is sensitive to both the verbal and nonverbal messages, and is a good reflective listener. Merriam noted, the research interviewer listens more than he or she responds, and listens with a sympathetic and lively interest. During the interview the researcher finds it necessary to rephrase back to the respondent what he or she appears to be saying and monitors understanding by summarizing the respondents' remarks. In addition to checking the interviewer's understanding of the respondent, "a successful

interview is based on the researcher modeling a nonjudgmental stance and being sensitive and respectful of the respondent" (p. 166). Probe questions (see Appendix E) were used by the researcher of this study to verify or to gain deeper understanding of the participants' responses to the interview questions.

This study's researcher, a doctoral student with an educational background in elementary and secondary instruction as well as elementary school and central office administration, conducted the interviews. The researcher's background has afforded him opportunities in active and reflective listening and interviewing. The researcher accommodated the informants by conducting their interviews at a time and place convenient for the participants.

All interviews in this study were conducted with elementary educators at this study's site during school hours. All interviews were held in the 2004-2005 school year. The dates when the participants were interviewed for this study are shown in Table 4 in calendar format.

A person-to-person interview was conducted with each participant. The interviews began with the researcher describing this study's purpose and explaining the interview norms. The interview questions were open-ended and semi-structured. The interviews were designed to seek data that describe the data-driven decision-making processes and the resources and/or support that the elementary educators used in their decision-making practices.

Table 4

Schedule of Participant Interviews

Participant	**Interview Date**

Participant A	September 23, 2004
Participant B	October 6, 2004
Participant C	October 12, 2004
Participant D	October 12, 2004
Participant E	October 14, 2004
Participant F	October 14, 2004

The person-to-person interviews served as the primary source of data for this study. The researcher of this study transcribed the participants' responses verbatim from the audio tape. Each transcribed interview was read entirely in order to gain an insight of the overall content of the participants' responses.

The interview transcriptions, researcher's notes from documents and observations were imported into NVivo, a qualitative data analysis software program, for coding purposes. Once coding was accomplished with NVivo software, the researcher explored and checked the descriptive codes for associated concepts, categories, and ideas. The collected data were analyzed to identify consensus themes, supported themes, and/or individual themes for this study.

In NVivo, linking concepts into categories is called making a node. Nodes are topics created by the researcher that contain all the information and the sources related to the topic from the descriptive codes analysis. The researcher analyzed and developed nodes in relation to other nodes. This association of nodes is called Tree nodes in NVivo. Tree nodes organized the researcher's categories, concept groups, and subgroups. From

the researcher's reading and reflection of the organized information, themes from the data emerged from the analysis.

Interview Questions

Preparation of interview questions in a research study is twofold. First, it is a means of translating the research objectives into a specific and measurable language. Second, it is a vehicle for motivating respondents to share their knowledge of the topic under study. Both of these interviewing purposes were employed for this study.

Patton (1990) informed the researcher that people's knowledge of a topic can range from fact to opinion. Keeping that knowledge range in mind, Patton listed six kinds of questions that can be used to gather different types of information from the respondents. The first kind are questions that will provide descriptions of experiences, behaviors, actions and activities that would have been observable had the observer been present. Opinion/value-type questions attempt to identity what people think about the world or specific program. Feeling-type questions focus on understanding a human's emotional response to his or her experiences and thoughts. Knowledge-type questions examine what a respondent considers to be factual information regarding the research topic. Sensory-type questions seek to find information related to sight, sound, touch, smell or taste. Background and demographic questions identify information related to people by age, education, race, residence, mobility, and community characteristics. Five of the six types of questions were used by the researcher for obtaining data from the

participants in this study. Questions related to the senses were not asked by the researcher for this study.

Some question types should be avoided during the interview. Multiple questions, defined as either one question that is really a double question or a series of single questions, do not allow the respondent a chance to answer one by one. Leading questions should be avoided, as these questions tend to set up the respondent to accept the researcher's point of view. The yes/no-type response questions should not be included as they are too simple to have research value. Patton (1990) recommended not asking "why" questions, which he suggests lead to difficulty in making causal inferences. The researcher avoided asking multiple questions, leading questions, yes/no and why questions of the participants in this study.

The researcher must develop a list of questions to facilitate the focus of the interview. According to Taylor and Bogdan, (1984), "The interview guide is not a structured schedule or protocol; rather it is a list of general areas to cover with each informant. In the interview situation, the researcher decides how to phrase questions and when to ask them" (p. 92). The open-ended questions are reminders to the researcher regarding the necessary information to be collected. The main purpose of the questions is to maintain the researcher's focus and to aid in gathering descriptive data in the informant's own words and from his or her perspective. The researcher committed the interview questions to memory prior to interviewing in order to enhance the flow of the interview process with the participants. A copy of the interview questions were glanced over occasionally by

the researcher during the interview process to ensure all questions were asked (see Appendix D).

The literature review yielded categories useful to gain information from the respondents as well as frame the researcher's questions. Revising and refining of the interview questions took place based on a pilot interview. The questions were developed in order to guide the respondents' perceptions regarding the following data-driven decision making categories of: (a) purpose, (b) procedures, (c) contextual characteristics, and (d) results. The projected semi-structured interview questions for this study are as follows in Table 5.

Data Collection

The researcher of this study gathered descriptive data focused on how educators used data-driven decision-making processes to implement an instructional change. The researcher of this study was the primary instrument for data collection and analysis. Data were translated through the researcher who acted as a human instrument, rather than through some survey inventory, questionnaire or machine. Lincoln and Guba (1985) defined the following characteristics distinguishing the human researcher from other data collection instruments: (a) the researcher as an instrument is responsive to the context; (b) the researcher can adapt techniques to the circumstances; (c) the total context can be considered; and (d) what is known about the situation can be expanded through sensitivity to nonverbal aspects. The researcher of this study processed the data immediately after each interview, observation, and reviewed document. The

principal investigator clarified and summarized the study as it evolved, and explored collected data to develop generalizations and common themes.

Table 5

Interview Questions in Relationship to Data-Driven Decision Categories

Data-Driven Decision-Making Categories	Interview Questions
Data Type (Bernhardt, 1998; Streifer, 2002)	Describe the data used to make data-driven decisions. Describe the data you examined.
Assessment Type (North Central Regional Educational Laboratory, 2000)	Describe the assessment(s) analyzed to make the data-driven decisions.
Data Analysis Level (Bernhardt, 1998)	Describe how data were analyzed to make decisions.
Purpose of Data (Bangser, 2000)	Tell me what you think was the purpose of the data-driven decision.
Data-Driven Characteristics (Allen & Calhoun, 1998; Eaker, Dufour, & Burnette, 2002; Lambert, 1998)	What characteristics would you say your school has that makes data-driven decision-making effective?
Data-Driven Process	Describe in a recipe version how data-driven decisions are made.
Decision Support System (Ligon, 2000)	What resources did you use to gather and analyze data to support data-driven decisions?

Bogdan and Biklen (1992) suggested a number of steps to consider during the data collection that aids the data analysis. For example, they recommend that during the data collection the investigator try to continually narrow the focus of what will be studied. As the researcher observed participants and pieces of the setting, a focus to the study began to evolve. It is important to have a focus, as it is beneficial in determining what data are relevant and what data are not. Also, having a focus to the study enables the researcher to design "data collection

sessions that are built on prior sessions, thereby affording the investigator the opportunities to gather richer, more focused data for analysis" (Bogdan & Biklen, 1992, p. 5).

Bogdan and Bilken (1992) also suggested recording the observer's comments, reflections, and memos during data collection. These pieces help the investigator to organize and focus the data analysis. The researcher of this study kept a reflective journal and recorded thoughts and reactions to the data reviewed. The journal recordings and notes placed in NVivo by the researcher were part of the data collection process for this study. The journal and NVivo software aided the investigator of this study to focus and think about the data analysis process.

Data Analysis

Merriam (1998) suggested that qualitative data collection and analysis are simultaneous activities. This interactive process allows the researcher to refine or reformulate research questions as insights, hunches, and tentative theories emerge. Analysis means taking something apart for examination. In order to find meaning in data collection, one must take thoughts, hunches, and impressions apart and analyze them for patterns, themes, new perceptions, and misperceptions. Meaning emerges as the researcher begins to understand the case.

Stake (1995) contended that the nature of the study, the focus of the research questions, and the curiosities of the researcher determine which analytic strategies should be followed, categorical aggregation or direct interpretation. Case studies rely on both of the analytical methods. In categorical aggregation, the researcher seeks a collection of instances from the data, hoping that issue-relevant meanings

will emerge. For example, a researcher may observe Johnny, a first grade student, hit a child, then 15 minutes later observes Johnny taking a pencil away from another student. Five minutes later the researcher observes Johnny pushing another student out of line when the students were asked by the teacher to line up for a rest room break. From these three observations of Johnny's behavior, the themes of aggression and violence may emerge. In direct interpretation, on the other hand, the case study researcher will look at a single instance and draw meaning from it without looking for multiple instances. For example, the researcher may have only observed Johnny hit a student one time. The researcher may not think Johnny was aggressive at all. The researcher might interpret Johnny's behavior as self defense because he observed another child who provoked Johnny. Also, the researcher might consider how much rest Johnny may have had the night before. The researcher will take that one incident and scrutinize it in order to understand why Johnny hit the student. It is a process of pulling the data apart and putting them back together in more meaningful ways.

Also, the researcher looks for patterns between two or more categories. From the emerging themes and commonalties, specific categories can be coded to show the relationship between two or more categories. Finally, the researcher develops naturalist generalizations from analyzing the data, generalizations from which people can learn either for themselves or as applications to other populations (Stake 1995). For example, a study on how educators merge evidence-based decisions into their professional practice tasks might develop into generalizations

for future studies related to organizational effectiveness, policy making, and program development.

Data collection and analysis are important characteristics of qualitative research. The process of data collection, either by interview or observation, coexists with the processes of data interpretation and analysis. It is difficult, if not impossible, for the researcher to separate data collection from data interpretation. The researcher should not attempt to separate the two processes. Data analysis begins with data collection (Bogdon & Biklen 1992). Analysis commences with the first interview, the first observation, and the first document encountered (Merriam, 1998). Emerging insights, hunches, and prospective hypotheses guide the next phase of data collection. A researcher observing a group interaction or listening to a participant's responses to interview questions cannot avoid forming opinions, interpreting activities, and identifying patterns. During this recursive process, the researcher refines and reformulates his or her questions. Although analysis is an ongoing process, it becomes a critical piece of the researcher's work once all of the data are in (Bogdan & Biklen, 1992). This study's level of descriptive analysis was defined by the original questions and data collection.

The first step in data analysis is managing the data so that they may be studied. Lincoln and Guba (1985) suggested that at the beginning stages of analysis, the researcher should utilize the data-identifying pieces of information that will, sooner or later, determine the basis for defining categories. A unit of information can be a phrase, sentence, or paragraph—it is the smallest piece of information that can stand by itself. The researcher in this study, coded

information units by related ideas and then by categories representing emerging themes or concepts with NVivo data analysis software.

Lincoln and Guba (1985) identified the second level of analysis as the step in which the researcher sorts the informational units into categories related to themes that emerged from the data. It is important to note that these themes are concepts identified by the data and not the data itself. Developing categories, typologies or themes require the researcher to examine regularities in the data. Much of the researcher's work in constructing categories is a form of content analysis. "The set of categories should seem plausible given the data from which they emerge, causing independent investigators to agree that the categories make sense in the light of the data. This strategy helps to insure reliability" (Merriam, 1998, p. 135). Interview transcripts were imported into the Nvivo software application. Each transcript was coded first into information units. The information units were examined by the researcher in order to identify consensus themes, supported themes, and individual themes that emerged from the participants' responses.

Creswell (1998) supported Lincoln and Cuba's (1985) and Merriam's (1998) ideas about data analysis when he stated that the researcher cannot interpret data until the data are broken down and classified in some way. He viewed data analysis as a four-step cyclical process focusing on: (a) becoming familiar with the data and identifying main themes in it (reading and memoing); (b) examining the data in depth to provide detailed descriptions of the setting, participants and activities (describing); (c) categorizing and coding pieces of data

and physically grouping them into themes (classifying); and (d) interpreting and synthesizing the organized data into general conclusions or understandings (interpreting). These four steps were employed by the researcher for this qualitative descriptive research study.

Once the researcher is fully engaged in analyzing the data, it is not the four-step process that enhances understanding and interpretation, rather it is the investigator's ability to think, imagine, hypothesize, and analyze that drives the data analysis. Having knowledge of the process is not enough, the researcher becomes the data interpreter and the quality of the analysis becomes dependent on the cognitive processes he or she brings to the research.

Data analysis is a process of digesting the contents of qualitative data and identifying common threads. The researcher cannot meaningfully accomplish the analysis tasks without making the necessary connections he or she needs to analyze and interpret qualitative data. In order to do so, the researcher must know the data—really know and live it in his or her head, not just on paper.

The qualitative software program NVivo was used in this study to assist the researcher in data analysis. T. J. Richards and L. Richards (1994) noted that researchers should look for qualitative data analysis software that seeks "to make its power more accessible to the nonprogrammer and to extend its rules to express more directly conceptual-level structures and knowledge about the world under study" as well as ways of "supporting project management and conceptual-level work in text-based research" (p. 460). The NVivo program was useful to help

code, classify, sort, combine, mesh, isolate, and display data collected from the interviews and other sources of information.

Issues of Validity and Reliability

External and internal validity is critical to conducting any research. A number of researchers have tried to identify validity and reliability characteristics related to qualitative data analysis (e.g., Lincoln and Guba, 1985, Miles and Huberman, 1994). The two criteria of credibility and plausibility demonstrate that the research was conducted in order to ensure that the subject was accurately identified and described. Credibility can be achieved by demonstrating that the concepts used to describe the inquiry are congruent with the data identified and collected. Lincoln and Guba (1985) recommended using the terms credibility for internal validity, dependability for reliability, and transferability for external validity. Merriam (1998) reminded the researcher that the basic question remains the same, “To what extent can the researcher trust the findings of a qualitative case study?” (p. 166).

Merriam (1998) defined internal validity as how well one’s findings match reality. Do the findings capture what is really there? Are observers measuring what they think they are measuring? Reality, according to Lincoln and Guba (1985), is a various set of mental constructions developed in the human mind and are accessible to those who made the constructions. Judging validity or credibility of a study is predicated on the investigator demonstrating that, "…he or she has represented those multiple constructions adequately, that is that the constructions (the findings and interpretations) that have been arrived at via the inquiry are

credible to the constructors of the original multiple realities..." (Lincoln, & Guba, 1985, p. 296).

Merriam (1998) identified basic strategies that a researcher can implement to insure internal validity. Three of these strategies were used in this study. They are: (a) triangulation—using multiple sources of data (in this study, numerous informants, documents, field notes, observations); (b) member checks—taking the transcription back to the persons from whom they were derived and verify with them that the transcription is accurate; and (c) peer examination—asking colleagues to comment on the findings as they emerge (pp. 204 -205).

Merriam (1998) stated that, "External validity is concerned with the extent to which the findings of one study can be applied to other situations" (p. 207). Lincoln and Guba (1985) cited external validity as an issue of transferability. They believe that to enhance the possibility of others generalizing the study's results, the investigator provides a detailed description of what the readers may need to know in order to comprehend the findings. Lincoln and Guba suggested that the researcher can improve generalizability by providing rich, detailed description so that any person interested in transferability has a knowledge base appropriate to that judgment. In this study, the researcher provided a detailed description of the process and supporting data in conjunction with the written summary of themes.

The account of this study shall afford the reader the opportunity to make decisions regarding the transferability of the research findings information to other situations or settings. The reader may benefit by drawing from his or her own experience as a context from which to apply the findings to his or her own

situation. A goal of this study was to provide information on how educators use data-driven decision-making to implement an instructional change. Subsequently, other educational practitioners pursuing knowledge on how to carry out data-driven decision-making can decide what information may or may not apply to his or her professional practice. This external validity application in which the reader applies this study's findings to other situations is called user generalizability (Merriam, 1998).

To address potential biases, a procedural safeguard was employed within this research design thorough field notes. Detailed field notes included consistent, open-ended interview questions, verbatim transcriptions of interview sessions, written accounts of onsite observations, and official documents or artifacts obtained from the school principal.

> Field notes can provide any study with a personal log that helps the researcher to keep track of the development of the project, to visualize how the research plan has been affected by the data collected, and to remain self-conscious of how he or she has been influenced by the data. (Bogdan & Biklen, 1992, p. 107)

Triangulation is an important and powerful approach to establish the credibility of a qualitative research study. Triangulation is a form of cross validation that pursues regularities in the data by comparing different participants, settings and methods to identify recurring results. The point of using triangulation methods is that the ability to produce similar results from different sources or methods enhances the credibility of the data and used for triangulation purposes.

As an additional procedural safeguard against bias, triangulation was employed by using multiple sources of data collection. A journal was maintained, and peer debriefing provided another method for reflection, interpretation and verification of the data collected (Erlandson, Harris, Skipper, & Alien, 1993; Lincoln & Cuba, 1985). Multiple sources of data were gathered in order to establish trustworthiness for this study. Interviews, field notes from observations, and document reviews were the primary sources of data collected for this case study.

Merriam (1998) described triangulation as "using multiple investigators, multiple sources of data, or multiple methods to confirm the emerging data" (p. 169). In a similar vein, Patton (1990) described triangulating data sources as "comparing and cross-checking the consistency of information derived at different times and by different means within qualitative methods" (p. 467). Patton (1990) discussed a method triangulation which "will mostly often revolve around comparing data collected through some kind of qualitative methods with data collected through some kind of quantitative methods" (p. 464). The variety of data sources from interviews, field notes and documents provided the triangulation of data for this study.

Merriam (1998) identified reliability as the extent to which one's findings can be replicated. In other words, if the study is simulated, will it produce the same results? However, Merriam also forewarned that the term reliability in the traditional sense is a misfit when applied to qualitative research. According to Merriam (1998), "There is no benchmark by which to take repeated

measures...[to] establish in the traditional sense" (p. 205). She further states that achieving reliability in the traditional sense is not only unlikely but impractical.

Lincoln and Guba (1985) believed that the researcher needs to think about the "dependability" or "consistency" of the obtained results from the data. They suggested that rather than demanding outsiders get the same results, outsiders concur that, given the data collected, the results make sense—they are consistent and dependable. In that study, findings were grounded in the data and inferences are logically drawn from the available sources of information. The researcher attempted to establish dependability for this study by describing in detail how data were collected, from whom, and how categories were derived.

Effective qualitative research uses data collected from a multitude of sources using multiple methods (Glesne & Peshkin, 1992; Merriam, 1998; Miles & Huberman, 1994; Patton, 1990; Yin, 1994). This is particularly true of case studies like this one, which Miles and Huberman call "within-case sampling" (p. 29), where the researcher has to decide which activities, processes, events, times, and locations to sample. Data were systematically collected from multiple sources in order to increase the reliability and validity for this research project.

Conclusion

Exploratory and descriptive qualitative inquiry methods of research were used by the researcher of this study in order to examine how elementary educators used data-driven decision-making processes that influenced instructional practices. Interviewing and observing how school educators make data-driven decisions may provide a model for other educators to construct knowledge about data-driven

decision-making processes that are applicable to their own setting. What is learned from this case study will be shared with other educators who want to know how to make data-driven decisions. Chapter IV will present the findings on how Oklahoma elementary educators made technology-supported, data-driven decisions that impacted instructional change.

CHAPTER IV

Data Analysis and Findings

This study is based on the premise that data-driven decision-making is a process some educators use to assess student learning and evaluate educational practices and programs. Deciding what should be taught to the students in the classrooms is one important educational practice. Once the decision is made on what should be taught to the students, educators often have a need to know if students are learning what is being taught. Educators need more than just hunches, speculations, and guesses when assessing student learning. Data are needed as evidence in order for educators to know if students are learning or not learning what is being taught. Before data can become useful information to educators, data have to be collected, organized, and analyzed. This study sought to develop an understanding of how elementary educators implemented data-driven decision-making to impact instructional practices. Specifically, this study revealed the data-driven decision-making processes and the support-system used in an Oklahoma Elementary school to influence instructional practices as described by six participants.

Many administrators and teachers have questions about utilizing data-driven decision-making processes to improve instruction. Some educators are in need of a clearer understanding of how data-driven decision-making looks in actual practice before attempted data-driven decision-making processes. Data-driven decision-making processes modeled by actual practitioners may reveal a clearer understanding of the process for some educators who may have found data-driven decision-making theory confusing. The findings from the data relevant to the research questions were analyzed

and are presented in narrative and table format. A summary of the findings are reported at the conclusion ofC hapter IV.

A survey of the literature suggested that educators do not routinely use data for several reasons: lack of access to data, lack of technical expertise in manipulating the data, lack of analytical training; and lack of training in developing an action plan based on the data (Choppin, 2002; Cromey, 2000). However, in spite of these barriers, there are educators in schools who are gathering and using data to make informed decisions about their instructional practices. This study reveals the voyage of six educators aboard one Oklahoma elementary school who have implemented and practiced data-driven decision-making processes.

Organization of Data

A voyage metaphor with related similes will be used to describe the findings of this study. The voyage of six educators who sailed on an ocean of data and found treasures of useful information navigated by data-driven decision-making processes are organized and presented in three categories. These three categories are purpose, processes, and contextual characteristics of data-driven decision-making. The data-driven decision-making process helped navigate these six educators to discover what data they really needed and what they did with these data.

The data collected were analyzed in order to describe the similarities and/or dissimilarities between the practitioners' actual practice of data-driven decision-making and data-driven decision-making concepts presented in literature. The voyage of how data-driven decisions were accomplished in an elementary school and the support system used to navigate data-driven decisions are described in this chapter.

To begin a voyage, it is often helpful to understand its purpose in order to know if one wants to go aboard the ship and reach the desired destination. The first data category described the purpose and need for data-driven decision-making at Crimson Creek Elementary. Data were sought in order to gain an understandingas to why a school staff would want to implement data-driven decision-making processes. The collected data that related to the purpose and need for datad riven decisions were reviewed and are compared in Table 6.

Once a ship sets sail on a voyage, the success of the voyage is often dependent on the crew's performances and procedures. The second data category described the procedures of data-driven decision-making at Crimson Creek Elementary. The data collected about data-driven decision-makingprocess es were separated into four subcategories. The four subcategories describing the processes of data-driven decision-making for this study include: (a) data-driven decision-making procedures, (b) data types, (c) data analysis, and (d) data-driven decision-making support. A comparison of the four subcategories data is presented in tables and is also described in narrative form in this chapter.

Sometimes during a voyage the crew and passengers may endure storms, and at other times they may find treasures. The third data category describes the storms and treasures of data-driven decision-making at Crimson Creek Elementary. The participants responded to four interview questions for this category. The descriptions of data-driven decision-making contextual factors from the data collected generated three subcategories: 1)improvements needed in data-driven decision-making procedures, 2) staff characteristics, and 3) data-driven decision-making results.

Data were collected on procedures used by elementary educators to make data-driven decisions through interviews, field notes, and documents. The findings on how elementary practitioners did data-driven decision-making were analyzed and compared to the data-driven decision-making models found in literature. The researcher disclosed the findings from all data sources after analyzing the information related to data-driven decision-making processes.

Despite the literature available to educators on the topic of data-driven decision-making, both teachers and school administrators have questions about data-driven decision-making. After attending a district in-service meeting on the subject of data-driven decision-making, a colleague of mine asked me directly, "So, how do you do it [data-driven decision-making]? How do you gather and use data?" Answering those questions is the purpose of this study. I have found in my practice as a school administrator that educational practitioners are interested in learning how other educational practitioners do things effectively. Even though literature and professional development opportunities make information available to educators, educational practitioners also desire to know how the information is applied in actual practice. This study was an attempt to address the issue of what educational practitioners do in an elementary setting to gather and use data to make decisions and share the findings to other educational practitioners interested in the data-driven decision-making process.

Purpose of the Voyage

The first data category described the purpose and need for data-driven decision-making at Crimson Creek Elementary from the participants' perspective. Identifying the purposes of data-driven decision-making will help the reader gain an understanding as to

why the data-driven decision-making voyage was taken. A voyage's destination is likely determined by the purpose of the voyage. Data were sought in order to understand why a school staff wanted to take a data-driven decision-making voyage. Information from the participants' responses, documents, and field notes related to purpose and need for data-driven decisions were reviewed and are compared in Table 6. The participants responded to two interview questions for this category. Questions from the interview that identified the purpose and need for data-driven decisions at Crimson Creek Elementary were:

1. What was the purpose for implementing data-driven decisions at this school from your perspective?
2. What need do you perceive you were responding to when data-driven decisions were made?

Table 6 shows the data relevant to identifying the purpose and need for data-driven decision-making at Crimson Creek Elementary.

The analysis of the data was to identify the purpose and the need for data-driven decision-making at Crimson Creek Elementary. The collected data were related to either an external or internal theme. External forces can have a tremendous impact on the way schools conduct business. Most of the pervasive and lasting changes in schools have been driven by external forces rather than by the plans of those inside the organization. External forces for the purpose of this study were identified as any stimulus, pressures and/or demands coming from a variety of sources outside the school site in an attempt to implement data-driven decision making processes. Internal force was characterized for this study as any motivation, aspiration, and/or desire to implement data driven decision-making from any source within Crimson Creek Elementary.

Table 6

Purpose and Need of Data-Driven Decision-Making

Resource	Purpose of DDD	Need Met
ınt A	ademic strengths and weakness school effectiveness ective teaching strategies hool safety udent attendance	lath and Reading rements of NCLB
Participant B	hool goals st scores ıdent achievement losses and gains titudes	te-based goals
Participant C	struction tudent achievement scores	juirement
Participant D	struction ırriculum	al Growth rowth
Particpant E	LB requirements udent achievement tendance udent behavior	nology skills of teachers ading skills Identify strengths and weaknesses in student learning Identify professional development needs
Participant F	more responsible for test scores juirement idence of our effectiveness rget areas g site improvement goals	ctives taught roups academic needs flection ıprovement areas
Documents	ademic strengths and weakness dent Acheivement Tests Results	District requirement Identify strengths and weaknesses in student learning
Field Notes	ading test scores Identify student achievement losses and gains tudent achievement	Grade level meeting Discuss reading strengths and weaknesses found from assessments

When the participants were asked to identify the purpose of data-driven decision-making at their school, internal factors emerged as a theme from the participants' responses. Responses related to internal factors included increasing student achievement, and improving school effectiveness, instruction, safety, attendance, and student behavior.

All six participants identified and/or made reference to increasing student achievement as the purpose for implementing data-driven decision-making processes at their school. Participant A said, "We want to know if we are making a difference in student learning." Participant B said, "It was to identify student achievement needs and the areas we know need improvement." Participant C said, "To diagnose everything we see that the children are doing, and make improvements where we need to in instruction in order to have higher test scores." Participant D stated that the purpose of data-driven decisions were "to improve our teaching practices to increase student achievement." Participant E stated, "In my case as a teacher, it is more for academic performance." Another similar response came from Participant F when she stated, "to analyze data and reflect on our own teaching and to see how we can improve student learning."

The data resources validated that one of the purposes of data-driven decision-making includes increasing student achievement. The researcher established from the collected data that student achievement was a critical factor for implementing data-driven decision-making in their school.

The data revealed external factors were also related to the purpose of implementing data-driven decision-making at Crimson Creek Elementary. Data related to external factors included fulfilling requirements from No Child Left Behind legislation and the district administration. Participant E said, "Data-driven, decision making as I understand it is where we are going to collect information to help us be more effective to fulfill the demands of No Child Left Behind." Participant F stated, "We were asked by the school district to become involved because we are directly responsible for the test scores that the students get."

The staff of Crimson Creek Elementary was required by district administration to collect and analyze data on student achievement results from standardized tests. The data collection and analyses were documented in annual progress reports. These reports were presented and explained to district administrators in the fourth quarter of each school year. These required reports acted as an external force that assisted the implementation of data-driven decision-making at Crimson Creek Elementary.

The supporting data revealed that the purpose of data-driven decision-making was implemented based on the internal need to increase student achievement. The data also recognized that the purpose of data-driven decisions were to fulfill requirements from external forces imposed upon their school from federal and local entities. The researcher identified from the collected data that a blend of both external and internal forces contributed to the purpose of implementing data-driven decisions at Crimson Creek Elementary.

In order to answer this study's research question on how practitioners describe the data-driven decision-making processes to make an instructional change, the researcher wanted to investigate the need data-driven decision-making voyage met. The researcher wanted to gain insight into why the crew bothered to make data-driven decisions. Investigating why the data-driven decision-making voyage was taken may provide background knowledge in understanding how data-driven decision-making started at Crimson Creek. Collected data were analyzed in order to identify the need that data-driven decisions addressed at this school. Two general themes emerged from the data. The data were identified as either meeting an internal need or an external need. The information that related data-driven decision-making to meet an internal need included:

improve math and reading, meet site-based goals, personal and professional growth, assess technology skills, identify strengths and weaknesses in student learning, identify professional development needs, track objectives taught, meet subgroups' academic needs, teacher reflection, and identify improvement areas. Table 7 was designed to show the relationship of the collected data findings to either an internal need or external force.

Table 7

Data Related to Internal or External Force

Summary of Collected Data	Related to an Internal Need	Related to an External Need
Improve math and reading	X	
Meet requirements of NCLB		X
Meet site-based goals	X	
District requirement		X
Professional growth	X	
Personal growth	X	
Assess technology skills of teachers	X	
Identify strengths and weaknesses in student learning	X	
Identify professional development needs	X	
NCLB		X
Track objectives taught	X	
Meet subgroups academic needs	X	
Teacher reflection	X	
Identify improvement areas	X	

The following comments are from three participants who described data-driven decision-making as a process to meet internal needs of their school. Participant A made the following comment:

> For me, it was probably more internal because that was kind of how I operated as a principal. When I started out as a principal it was external

> need because that was what the state was requiring. If those external forces were not there like NCLB, I would still do data-driven decisions. I can't imagine not doing data-driven decision-making because I know it works. I want to know what we are doing. I say it is more internal now probably because of the culturalization process of becoming a principal over the years. It has become a part of how I do things.

Participant D said, "I think it [data-driven decision-making] was more for our professional growth as educators. I believe it was started more for internal reasons. I think it caught on and everybody started doing it." Participant E stated, "Initially it was to meet external needs but now it is more for internal needs. If there are any areas of deficiencies that were brought to my attention through data, then I want to address that area."

Three participants described data-driven decision-making as a process to meet external needs. Participant B said, "Certainly, you have to meet these goals. I believe it meets external conditions." Participant C stated, "I think it probably came from our district. I think our district wanted us to look at test scores." Participant F shared how data-driven decision-making met external needs:

> If you are looking at NCLB, that has made states look at their teaching practices and their standards for whether a child was passing or failing. That has filtered to the state level where they had to create objectives that they feel are important to have before they pass to the next class. As a result of NCLB, we have been asked to address certain areas that we really haven't looked at before. In the past two years, this year and last year, our

> district has asked us to take a look at disaggregated data and look at subgroups of children who might not be performing up to a reasonable standard. So, I think initially it started at the federal level to the state which then came to the district. The district has asked the site to target students we are leaving behind so to speak.

Data revealed that data-driven decision-making also met the need to fulfill federal or state requirements such as No Child Left Behind and/or local academic performance goals. Initially, three participants described the data-driven decision-makingprocess as an obligation because of an external force. However, over a period of time however, the participants changed their external perceptions of data-driven decision-making to an internal perception.

The Crew's Performances and Procedures

To address this study's research question on how practitioners describe the data-driven decision-making processes to make an instructional change, the researcher wanted to investigate the Crew's procedures as they made the data-driven decision-making voyage. The second data category described the processes of data-driven decision-making at Crimson Creek Elementary. Data were sought in order to understand how data-driven decisions were accomplished at Crimson Creek Elementary. The descriptions of data-driven decision-making processes from the collected data generated subcategories such as: data-driven decision-making procedures, data types, data analysis, and data-driven decision-making support.

Data-Driven Decision-Making Procedures

The participants were asked two questions in order for the researcher to examine the procedures of data-driven decision-making implementation at Crimson Creek Elementary. The first question asked, "What steps were taken to implement data-driven decision-making in your school?" The second question asked participants to describe data-driven decision-making processes in a recipe version. The participants' responses were collected and a frequency table was prepared. The procedures were ranked accordingly to the recurrence of responses. The researcher confirmed these responses by examining documents and field notes made from observations. These findings are shown in Table 8.

Three themes emerged from the data regarding data-driven decision-making procedures. The themes included professional discourse, data analysis, and data collection. Each theme will be examined from the perspective of the interviewee.

Table 8

Identified Data-Driven Decision-Making Procedures

DDD Processes Identified	**Frequency**	**Rank**	**Confirmed in Documents**	**Confirmed in Field notes**
Professional Discourse	6	1		X
Data Analysis	6	1	X	X
Data Collection	6	1	X	X
Data Disaggregating	3	2	X	
Learning Terminology	1	3		
Make Graphs	1	3	X	X

Note:N=6

Professional discourse was addressed by allof the participants and noted by the researcher after observing a grade level meeting. Participant A said, "When we take a look at data, we will probably do that in two ways. In small groups we get some good discussion and teachers get heard. You also have to have it discussed by the whole group." Participant B had a similar perspective about data-driven decision-making procedures. She said, "The principal will accumulate all the information then we discuss it and identify where we have weaknesses." Participant C stated, "We meet in groups and talk about test scores, assessments, and anything we did in our classrooms and that really helps because it gives us a perspective of what other teachers are doing." Professional discourse procedures were explained by Participant D, "First, you look at the data and from there it goes into small groups, we call vertical groups, then we discuss commonalities, surprises, and differences we see in the data." Participant E affirmed, "We will have a discussion on what we see from the data." Participant F expressed, "We visit and meet as a group and reflect on what we have observed."

Evidence of data analysis was found in school annual reports and classroom record documents. It was noted by the researcher after observing a grade level meeting where teachers were discussing reading needs of the students that data analysis occurred. Data analysis was also expressed by allsix participants. Participant A said, "We got better in raising tests scores by using information and analysis." Participant B explained, "The principal always had the data out there for you to analyze and of course you get an intelligent decision because you look at the area you have a weakness in." Participant C stated, "We would break down all the data and analyze it." Participant D commented, "First, you really need to take time to examine the data by yourself then you kind of lay it

open to what kinds of things do you see and from there you draw your conclusions." Participant E expressed, "When we look at data, we analyze it in order to determine our weakness not per teacher but as a grade level." Participant F mentioned, "We analyze the test scores and we look for areas of weaknesses."

Information from documents, field notes, and six participants identified data collection as an important procedure in implementing data-driven decision-making. Participant A stated, "In a nutshell, we are going to gather and collect data from test scores." Participant B shared, "I collect data from reading scores." Participant C expressed, "I know we have a lot of faculty meetings and we talk about how to assess kids or how we are going to gather the data." Participant D stated, "If it is my own classroom data, I want to gather it myself. If something is going to affect all the teachers then I would expect administration to gather it and show me. I prefer gathering my own data when it comes to my classroom." Participant E reported, "We were taught about adult learning styles, technology, and about collecting and assimilating information in district meetings. We have a core team gathering data and assimilating data." Participant F stated, "When we are working with SuccessMaker or STAR it will give us some feedback as well. It helps me analyze students a lot faster when technology gathers the data."

Information from documents and three participants' responses were related to the data disaggregating theme. Participant A stated, "We disaggregated the data then we looked at the findings and conclusions." Participant C said, "We would look at test scores and anything we did in classrooms, the assessments we did in the classroom. We would break all that down and analyze it." Participant D reported, "We separate data into

different groups to see the differences. From there, you draw conclusions and how can you improve instruction, and suggest how to improve instruction."

The remaining two data-driven decision-making procedures were mentioned with one response each from two participants. The procedures receiving one response were learning data-driven decision-making terminology and making graphs. Documents or field notes did not produce any information that learning data-driven decision-making terminology was part of the voyage. Graphs were found in school related documents and mentioned in field notes after observing individual teachers.

Data Related Issues

The data collected provided clues for the researcher to investigate other procedural data-driven decision-making issues at Crimson Creek Elementary. The collected data provided insight into three subcategory procedures related to specific data issues: (a) types of data examined, (b) data gathering procedures, and (c) data analysis procedures.

Data Types

The participants were asked to reflect on what kinds of data were used to inform their decisions. Two themes emerged from the data. The first theme was perceptional data. Two of the six participants described the types of data used in their decision-making in terms of perceptions from students and parents. Participant A responded, "Perceptions of parents and students are the main data areas we are provided information." Participant D explained,

> It is very interesting to see from the children's perspectives why they are learning what they are learning. So that tells me, that I need to explain

> why we are doing this to make it more relevant. That was beneficial to me. Some of them didn't have a clue. I will use that and find out what the student is interested in and that should be on the survey also. Perceptions and attitudes are a big part of learning.

When the respondents disclosed the types of data used in their data-driven decision-making procedure, student learning emerged as the second theme. Four out of six participants provided data-type descriptions related to student learning. Participant B stated, "We look at standardized test score results from 3rd and 5th grades." Participant C made a similar statement when asked to describe the kinds of data used to inform her decisions, "I use standardized tests, Gates Reading tests, Otis Lennon tests. This year I am doing DRA (diagnostic reading assessment) testing. Last year, we did Rigby, which is a reading test." Participant E reported:

> I use data from reading and math and from all the academic core areas. I use standardized assessments and classroom assessments. The data helps me to determine what level my students are in various areas. What we want to do is look for patterns and use that information to help us implement instruction to targeted areas. We use that information to make instructional modifications to help the students.

Participant F explained, "In the past, we have looked at standardized achievement scores from those grades that were given standardized achievement tests. Right now we are using 3rd grade SAT 9 scores and 5th grade CRT (Criterion Reference Test) scores."

The participants were asked to identify which data type they perceived to be most useful when decisions were made to increase student learning. Six participants perceived

that student learning data were used most at their school when decisions were related to increasing student learning.

In addition to data related to student learning, one participant also reported that data related to school processes were frequently used to increase student learning. The participant explained, "A lot of our data-driven decisions have to do with what we are going to accomplish in our building and the way we are going to do it."

Data-Gathering Procedures

Two themes emerged from the collected information when data gathering procedures were examined. Teacher/Staff-engagement was the one of the themes. The other theme related to technology-engagement. The participants were asked to describe procedures used to gather data at their school. All six participants noted that school staff members take part in data gathering processes. Specific staff members mentioned by the participants were teachers and the principal. Data collected included: scores from standardized tests, perceptions of student and parents from surveys, classroom tests, and individual reading diagnostic assessment results.

Technology engagement was evident as a means to collect data for decision-making. Five participants described various technology applications that assisted them in collecting data. The technology applications that were mentioned by the participants of this study included: Survey Suit, STAR, and SuccessMaker. Documents from each software application were examined by the researcher. Students responded to computer-generated questions in the school's computer lab, classroom, and/or at home. Survey Suite collected perceptional data from students. STAR assessed the reading levels of the students based upon their responses. SuccessMaker asked questions related to math

and/or reading content areas. All three computer applications collected data from the students' responses and provided a report to be analyzed by the teacher.

Two participants said that they would adjust their classroom instruction based upon the analysis of the computer-generated report. One participant explained that she "looked at computer-generated reports weekly in order to adjust instruction." Another participant stated, "It helps me assess students a lot faster when technology gathers the data." After observing two participants teaching in their classrooms, comments from the researcher's field notes confirmed that computer –generated reports contributed to the instructional decisions made by the teachers.

Data Analysis Procedures

Participants were asked to describe the procedures they used to analyze data at their school. Four of the six participants described data analysis procedures as disaggregating data according to the students' skill level. The four participants explained after they reviewed math and reading assessments, students' strengths and weaknesses were identified by specific skills. Classroom instruction was adjusted based upon the assessment analysis. One participant stated:

> From data, we see a pretty good picture of where that student is academically. The data really helps to have it on paper and then if there is something that is surprising, it is an indication there is a clue that I need to investigate. Sometimes they will score really high or score really low on something and I will need to find out why. I analyze data according to objectives in the content areas that I am responsible for.

Another participant shared,

> If I am looking at an assessment, I ask myself, "How did my students do? Did they master the skill? Did the meet my expectations? Did we not do well as a class? I am constantly analyzing information. If I need to be reteaching something, I want to know as soon as possible.

Participant F expressed, "When we analyze test scores, we look for specific skills we need to improve. We do this for math and reading."

Three of the six participants identified analyzing data by ethnic groups. Participant C explained, "I have analyzed data by ethnic groups like Hispanic because the last few years there have been such a huge difference in our demographics. I know language is a very hard concept for them. I do modify for Hispanic students." Hispanics were the only ethnic group specifically mentioned by one of the participants. However, one participant stated, "Our population at this school is quite a bit different than most schools. I have not analyzed data by ethnic groups in my classroom."

Two participants recognized data analysis involved disaggregating data by low socioeconomic groups. Participant A said, "The staff looked at the data and made some conclusions about it. They concluded students on free and reduced lunches scored significantly lower than others on a subtest in vocabulary. The conclusion was we needed to address equity issues in regard to low socioeconomic students." Another participant stated, "It is interesting and very helpful when data are analyzed by socioeconomic groups." Only one participant disaggregated data by gender in her data analysis procedure.

Other data examined by the researcher also provides insight to how data were analyzed at Crimson Creek Elementary. Classroom reading documents reviewed by the researcher supported that student reading skills were assessed on an individual basis. After the teacher reviewed these reading assessments, an individual reading plan was implemented to address deficient reading skills of the student. This evidence supports the participants' claim that they disaggregate data according to student skill levels. Annual school reports contained disaggregated data on student achievement results by ethnic groups, gender, and socio economic status.

Responses to the question, "How often were data examined?" were varied among the six participants. Responses from the participants included: annually, quarterly, weekly, and daily. Participants provided examples for each of the timeframes. The timeframes used to examine the data were dependent on the type of data being examined. One participant stated, "We look at standardized test scores once or twice a year." Another participant said, "We examine our school improvement data quarterly and then we make a presentation to our district administrators usually first week of May." A third participant explained:

> SuccessMaker is data I look at on a weekly basis. I get a report every time students go into the computer lab. What I do is look at that report and look to see if students are spending too much time in one given area such as math or in reading. I look at how many times they use the help button. How many times they used the tutorials. How many times they timed out. That gives me information either to increase or decrease the amount of time they have to answer the question. I also look for growth. The point of all this is for academic

> growth and going up in grade level. If they are not going up in grade level, I look at the difficulty of the activities they are doing. I look at that data and determine their academic performance.

An example of classroom data being analyzed daily was described by a fourth participant who said, "I do it at the end of the day and through out the day. I look at averages: student averages and classroom averages. I am constantly assessing my effectiveness as a teacher with data."

School reports, computer-generated reports, and classroom records supported that data were examined on an annual, weekly, and daily basis. The examination of the data was dependent on the type of information the document was generating. For example, the school reports contained information on annual student achievement results from standardized tests. These school reports were prepared annually. The computer reports were generated and given to teachers on a weekly basis. These computer reports provided information on how students responded to questions related to math and reading concepts during their computer lab time. Grades from everyday assignments provided data that the teachers used to assess their instructional effectiveness on a daily basis.

Data-Driven Decision-Making Support.

The researcher analyzed the participants' responses to the interview question, "What resources did you use to make data-driven decisions?" The collected data were associated with either non-technological resources or technology-related resources. Table 9 was designed to show the relationship of the data examined to the resources used in data-driven decision-making processes.

Three of the participants identified three resources associated with non-technological support when data-driven decisions were made. The three non-related technological resources identified by the participants were Victoria Bernhardt's book, professional development opportunities, and the principal. Participant A stated,

> We did an activity from Victoria Bernhardt's book called Continuous Improvement Continuum. Her book is all on data analysis and school improvement processes. We rated ourselves where we were on the improvement continuum and developed our school improvement goals from that data."

Table 9

Identified Resources Used in Data-Driven Decision-Making Procedures

Support/Resource Used	**Participant A**	**Participant B**	**Participant C**	**Participant D**	**Participant E**	**Participant F**	**Documents**	**Field Notes**
Bernhardt Book	X						X	
Microsoft Word	X				X		X	X
Excel	X	X	X	X		X	X	X
Survey Suite	X						X	X
STAR		X	X	X		X	X	X
PowerPoint			X		X		X	X
SuccessMaker			X	X	X	X	X	X
Professional Development			X	X				
Principal				X				
Email					X			
Electronic Grade Book Program					X		X	X

Participant C said,

> The district pays for you to go to professional development classes in the summer. I have learned a lot from that. Sometimes, if you have data from the previous year, they ask you to bring it with you and we look at it together.

The principal was identified by Participant D as a resource she used to support her data-driven decisions.

Six participants made reference to various technology-related resources used to support their data-driven decision-making. The resources the participants identified to assist them in their data-driven decision-makingwere software applications such as: Microsoft Word, Microsoft Excel, Microsoft PowerPoint, STAR, SuccessMaker, Email, Survey Suit, and an electronic grade book program. Five of six participants stated that they used Microsoft Excel as a resource to support their data-driven decision-making process. Four of six participants identified two software applications named SuccessMaker and STAR as helpful resources in data-driven decision-making. Microsoft Word and PowerPoint were recognized by two participants as resources that supported their data-driven decisions. Email and electronic grade book received one response from Participant E. One participant explained, "With my laptop, I used Microsoft Word. I did all the charts and graphsfor our school profile. Each year I learned a little bit more and now we are using Survey Suite and Excel to assist us in gathering data."

Storms and Treasures

Enduring storms and finding treasures are sometimes experienced by the ship's crew during a voyage across the ocean. Each voyage will have its own particular

uniqueness thatcan not be exactly duplicated on other voyages. Due to differences in weather conditions, crews, passengers, and ships each voyage will develop its own uniqueness. Similarly, data-driven decision-making voyages in all schools may not be the same. The researcher wanted to examine conditions that may only be unique to Crimson Creek Elementary as they implemented data-driven decision-making processes. This information may provide additional understanding to the readers of this study how practitioners did data-driven decision-makingin order to make an instructional change under circumstances only related to this study's site.

The third data category described contextual characteristics of data-driven decision-making at Crimson Creek Elementary. Data were sought in order to understand data-driven decision factors related specifically within the school's culture. The descriptions of data-driven decision-making contextual factors from the data generated three categories: 1) improvements needed in data-driven decision-making procedures, 2) staff characteristics, and 3) data-driven decision-making results.

The participants responded to four interview questions for this category. Interview questions that were posed by the researcher in order to investigate the contextual factors of data-driven decision-making at Crimson Creek Elementary were:

1. What is needed to improve data-driven decision-making at your school from your perspective?
2. What characteristics do you perceive this staff has in order to make data-driven decisions?
3. How has your school changed as a result of data-driven decision-making?

4. What do you believe is the greatest accomplishment of data-driven decision-making in your school?

Improvements Needed in Data-driven Decision-Making

Data collected from the question, "What is needed to improve data-driven decision-making at your school from your perspective?" revealed one theme. All six participants made reference to time as a factor that would improve data-driven decision-making in their school. Participants expressed data-driven decision-making was very time consuming and more time was needed in order to give justice to the practice. One participant explained,

> Time is the factor that this school needs. Anytime you are evaluating information, anytime you are collecting information, it takes time to evaluate it and collect it. It also takes time to come up with a plan to implement or things to implement. We just don't have time during the instructional day. If we had two hours, built in on a Friday afternoon or on Wednesdays, if we had two hours a week, or three hours a week where you had time to work with your team. In that time, you would have time for professional development opportunities for data-driven decision-making. We would have time to assimilate and analyze information that would be built into the contract. I would be for extending the contractual school year or extending the school day. So you could have more time assimilating data and implementing plans to utilize it.

Another participant stated, "It would be beneficial to visit data more frequently. If you could borrow some time from somewhere–to have more frequent visits back to your data and relook at your questions is about the only thing that I would want to improve."

Staff Characteristics

One theme became apparent from the data in order to answer the question, "What characteristics do you perceive this staff has in order to make data-driven decisions?" Intrinsic characteristics emerged as the theme from the various responses. The responses from all six participants made reference to intrinsic characteristics of the staff that enabled them to make data-driven decisions. Hard working was the only characteristic mentioned by two of the participants. Other characteristics identified that were mentioned once by the participants included: knowledgeable of successful teaching strategies, highly motivated, caring, respecting of others' opinions, high expectations, goal-oriented, driven, trusting of others, and committed to student learning. One participant explained:

> The staff members here are high achievers. They set goals and meet those goals. We have extreme high expectations. Once we find out the expectations of our district or by our administrator, we will meet those expectations.

Data-Driven Decision-Making Results

Two interview questions asked the participants to share information on the data-driven decision-making outcomes they have seen at their school. The participants were asked to share from their perspective how their school has changed as a result of data-driven decisions. Also, the participants were asked to reflect and share on what they thought the greatest accomplishment has been in their school as a result of data-driven decision-making.

Responses to the question, "How has your school changed as a result of data-driven decision-making?" revealed two themes. All of the responses could be generalized into one of two themes: (a) increased focus on student learning, and (b) increased staff morale and enthusiasm. One participant explained how their school has changed by being more focused on student learning. She stated:

> We look more specifically at data and it has made us aware as teachers which students are possibly being left behind. It has made us look critically at each student to find out where their successes and failures are and to address those as they come. We had to look at interventions and accommodations for students who are struggling and to come up with methods to try to lessen the number of students who otherwise might be referred for special education testing that might be able to be addressed in the classroom just by making some adjustments in the teaching.

Another participant commented on how data-driven decision-making changed their school by saying, "We now use data on a more regular basis. This means you can more directly teach to what students need to work on." Another participant identified personal changes in the staff as a result of data-driven decision-making when he stated, "The staff feels more that they are part of the decision-making process. So, I think this helps the morale and enthusiasm of our staff."

Descriptions from the participants' responses when asked to describe the greatest accomplishment as a result of data-driven decision-making in their school generated one general theme. The theme that developed was that data-driven decision-making provided

relevant information to the teachers. One participant explained the greatest accomplishment in their school as a result of data-driven decision-making by stating:

> I think it would be to know what our areas of weaknesses are and to know where we need to be putting our efforts. The other accomplishment of data-driven decision-making is to know that we did make a difference. To be able to tell this is where we started and this is where we are now and to know that the strategies made a difference to improve our test scores. Data-driven decision-making helps us to know where we need to put our efforts and to know when we have reached our goals.

Another participant stated, "Data-driven decision-making helps us to identify what the students' needs are which gives the teachers and the students more success in the end."

Summary of Findings

The purpose of this summary is to focus on the major findings relative to the two research questions. The two research questions for this study were:

1. How do educators from an Oklahoma elementary school describe the data-driven decision-making processes that influence instructional practices?
2. What do elementary educators identify and describe as their decision support system?

A correlation of comprehensive themes from consensus themes, supported themes, and/or individual themes is presented. This case study examined the purpose, processes, and the contextual characteristics of data-driven decision-making. Findings from investigating how data-driven decision-making processes were practiced in an elementary school can

be summarized in comprehensive themes to related purpose, procedures, and contextual characteristics of data-driven decision-making.

One comprehensive theme emerged with regard to the purpose of data-driven decision-making in their school. The theme that teachers routinely used performance data to personalize learning and instruction for all students was revealed by the responses of all six participants. This theme developed from the participants' comments in response to two interview questions. All six participants' responses were related to increasing student achievement when asked to explain the purpose of data-driven decision-making

Comprehensive themes were developed by the researcher from the participants' responses, field notes, and documents on data-driven decision-making procedures. Seven comprehensive themes emerged from the data. The themes related to data-driven decision-making procedures that educational practitioners used at Crimson Creek Elementary included:

1. Identifying Data Sources
2. Aggregating/Disaggregating Data
3. Data Analyzing
4. Identifying Student Learning Needs/Problems
5. Communicating
6. Adjusting Instruction

Participants made reference to identifying data sources in five of the 14 interview questions. Identifying data sources was discussed by all six participants in terms of

gathering data from standardized tests, classroom assessments, surveys, and computer tutorial programs.

Data aggregation and disaggregating emerged as a comprehensive theme from three participants' responses, document analysis, and field notes. Data related to the data aggregation and disaggregating theme were in terms of graphs found in documents and interview responses. Data were aggregated and disaggregated from standardized test scores and were presented as graphs in four documents examined by the researcher. Interview responses related to the data aggregation theme were expressed in terms of "collecting data" and "gathering data." Data disaggregating procedures were expressed from three of the participants in terms of "breaking down data" and "separating data into different groups." Data aggregation/disaggregating processes were accomplished either by staff members themselves or with technology automation support.

Data analysis was another comprehensive procedural theme that emerged from the data. Five of the six participants used the term analysis in the response to interview questions. One participant used the phrase "examine the data" to explain the data analysis procedure. Data were examined annually, quarterly, weekly, and daily as expressed by the six participants.

Commingled with the data analysis process the procedural theme of identifying student learning needs emerged from the data. Four of the six participants commented on identifying "areas of weaknesses" as part of the data analysis process. Also, four school profile documents examined by the researcher contained school improvement goals that were based on identified student learning needs.

Communication emerged from the consensus theme of the participants and from field notes. The consensus theme of professional discourse developed from the six participants' comments in terms of "discussion," "talk," and "visit". Four participants spoke of or described gathering in small groups as a means to discuss data analysis findings. One participant mentioned getting into vertical groups to discuss findings from the data analysis.

The comprehensive theme of adjusting instruction developed from four participants' responses and from researcher's field notes. Four participants shared that after they did data analysis and "student learning strengths and weaknesses were identified, classroom instruction was adjusted to meet students' needs." Field notes taken by the researcher stated that a teacher was observed reteaching specific reading skills to three students who had similar deficient reading skills after the teacher analyzed results from a reading assessment.

Consensus themes, supported themes, and individual themes emerged from data related to the contextual data-driven decision-making characteristics. The descriptions of data-driven decision-making contextual factors from the participants generated three categories: 1) improvements needed in data-driven decision-making procedures, 2) staff characteristics, and 3) data-driven decision-making results. Four interview questions were posed by the researcher in order to investigate the contextual factors of data-driven decision-making at Crimson Creek. The improvements needed in data-driven decision-making procedures identified by the six participants focused on the consensus theme of time. When asked to describe the staff's characteristics that enable them to make data-driven decisions, the comprehensive theme of shared values developed from the

supported and individual themes identified. The comprehensive theme of school renewal developed from the participants' responses when asked to describe the results of data-driven decision-making.

In this chapter, the responses to the interview questions, data collection, and analysis were reviewed. Findings from the interview questions and data analysis were presented. The consensus themes, supported themes, and individual themes that emerged from the data were identified. Data that supported each theme were also presented.

Chapter V presents a summary of the findings and conclusions. Recommendations for further research and implications for practice are also included in the final chapter. A concluding commentary regarding the outcomes of the case study will close Chapter V.

CHAPTER V

Summary, Interpretation of Findings, Implications and Recommendations, and Commentary

This chapter contains a review of the study**,** including research procedures and demographic information of the participants. This summary will be followed by major findings from this investigation on data-driven decision-making. These findings were summarized and compared to related conclusions found in literature. Implications and recommendations derived from the data collected are also presented followed by a commentary from the researcher.

The purpose of this case study was to investigate how elementary educators utilized data-driven decision-making processes to influence instructional practices as well as investigate their decision-making support system. The participants were asked to describe the purpose, procedures, and contextual characteristics of data-driven decision-making in their school from their perspective. Data were examined to explain and describe how practitioners in one school make use of data-driven decision-making to influence instructional practices.

Review of Study

A qualitative design and methodology were used to collect, describe and examine elementary educators' perceptions regarding data-driven decision-making processes in order to influence instructional practices where student learning was found to be deficient. Recent demands for educational reform and improvement have created a need for a process in which schools become centers for educational change through continuous inquiry and improvement (Bernhardt, 1998; Eaker, Dufour, & Burnette, 2002; Fullan,

1991). Data-driven decision-making processes may be a solution other educators will want to use in order to meet today's call for educational reform and to address student learning needs. This investigation was directed by the following research questions:

1. How do educators from an Oklahoma elementary school describe the data-driven decision-making processes that influence instructional practices?
2. What do these elementary educators identify and describe as their decision support system?

Research Procedures

In order to achieve the purpose of the study, data were sought from elementary educators recognized for their exemplary practice in data-driven decision-making. The purpose of this study was to collect, describe, and examine data-driven decision-making processes that influenced instructional change within an elementary public school setting. Data were gathered from three sources: interviews, documents, and field notes. A principal and five teachers from an Oklahoma elementary public school were interviewed. Documents and field notes from observations contributed to the findings of this study.

Person-to-person interviews with each of the six participants were conducted. The interviews took place in the fall semester of the 2004-2005 school year. Interview questions and prompts (see Appendices D and E) served as this study's instruments for all interviews.

All interviews were audio-taped and transcribed by this study's researcher. All transcriptions were imported into NVivo, a qualitative data analysis software program,

for coding purposes. The collected data were coded in order to identify topics, themes, or issues related to the purpose of this study. The codes from the collected data were analyzed to identify consensus themes, supported themes, and/or individual themes for this study.

Participant Demographics

The principal and five classroom teachers from an Oklahoma elementary school site were interviewed for this study. The participants' years of experience in education ranged from 16 to 28 years. Five of the respondents have been employed at Crimson Creek since its opening in 1990. None of the participants were hired by the present principal. The principal had been there three years. Two participants acknowledged that they had technology-related college hours. Three participants considered themselves to be self-taught in technology skills. Letters of the alphabet were assigned to all six participants interviewed to protect their personal identity.

Interpretation of Findings

One goal of this study was to gain an understanding of how elementary educators use data-driven decision-making processes to influence instructional practices from those who do it well. Streifer (2002a) stated thateducators need contextual examples of how data-driven decision-making occurs using the support of technology. Bernhardt (1998) explained that some school staffs do not engage in data-driven decision-making because there are very few good examples of schools using data-driven decision-making after which to model. This research provides helpful information to other educational practitioners who are implementing data-driven decision making practices in their schools.

Data collected were analyzed in order to describe similar and/or dissimilar findings between the practitioners' actual practice of data-driven decision-making and data-driven decision-making pedagogy presented in literature. The data were examined and organized into three main data-driven decision-making categories found in literature: (1) purpose of data-driven decisions, (2) processes of data-driven decision-making, and (3) contextual characteristics of data-driven decision-making.

Purpose of Data-Driven Decision-Making

Two general themes emerged from the data when the purpose for implementing data-driven decision-making was investigated. The purposes of data-driven decision-making were related to external and/or internal themes. Participants' individual responses corresponded to at least one of the six primary purposes identified by Bangser (2000): (1) discovering issues, (2) diagnosing situations, (3) forecasting future conditions, (4) improving polices and practices, (5) evaluating effectiveness, and (6) promoting accountability.

It is significant that all six participants in this study understood thatthe purpose of data-driven decision-making in their school was to increase student achievement. Bernhardt (1998), Streifer (2002), and Eaker (2002) agree that educators who use data to understand their students' learning needs are in a better position to improve academic learning than those who don't use data to drive instructional practices.

Two respondents shared information that related to external factors when asked to describe the purpose of data-driven decision-making in their school. This is consistent with Bernhardt (1999) when she stated that the reason some schools' staff engaged in data-driven decision-making processes is for accountability purposes. The two

participants' responses more specifically stated that data-driven decision-making was implemented initially in their school to address either federal and/or local requirements.

Participants' responses indicated that a blend of both external and internal forces contributed to the purpose of implementing data-driven decisions at this study's site. It is also significant to note, the participants who initially described data-driven decision-making process as an obligation to meet external federal and local requirements changed their external perceptions of data-driven decision-making to an internal perception over a period of time. These participants recognized the benefits of data-driven decisions and now perceive the process useful for internal reasons.

The responses among the participants who identified external reasons as to why their school implemented data-driven decision-making processes may suggest that the theory of making instructional decisions based on data may not be a common practice held among educational practitioners. Their responses suggestthat without the external requirement that forced them to implement data-driven decisions they might not have implemented the process at all. Perhaps the practice of data-driven decision-making has not been given sufficient emphasis in educational training programs. This implication is supported in the literature. The practice of data-driven decision-making is not a common practice found among schools (Bernhardt, 1998; Streifer, 2002; & Eaker, 2002).

Processes of Data-Driven Decision Making

The second data category provided information on the data-driven decision-making processes at this study's site. The participants responded to eight interview questions for this category. Data were sought in order to understand how data-driven decisions were accomplished. The descriptions of data-driven decision-making processes

from the participants generated four subcategories: (a) data-driven decision-making procedures, (b) data types, (c) data analysis, and (d) data-driven decision-making support.

Data-Driven Decision-Making Procedures

Participants were asked to identify procedures used to implement data-driven decision-making processes in their school. Three data-driven decision-making procedural themes emerged from the data. The three themes that emerged from allthe collected data were: (a) professional discourse, (b) data analysis, and (c)data collection. Three participants' responses were related to the data disaggregating theme when describing data-driven decision-making procedures. The procedures receiving one response each from two participants were learningdata -driven decision-making terminology and making graphs.

It is evident that the participants recognized and implemented common data-driven procedures found in literature (Bernhardt, 1998; Eaker, 2002; Glickman, 1993; Streifer, 2002b). All the responses except for the response related to the procedure of learning data-driven decision-making terminology were addressed in the literature review for this study. This finding may represent a gap between what actual practitioners do in procedural processes when implementing data-driven decision-making practices compared to common procedures found in literature. The implication here may suggest that prior to a staff implementing data-driven decision-making practices it might be helpful if the staff were exposed first to common data-driven decision-making terminology.

When data were examined specifically on the procedure of data analysis, there was a lack of evidence from this study to support that the practitioners conducted any

deep levels of data analysis with their data. Data collected only supported that two multiple data categories were analyzed together from this site. Student learning and perceptional data categories were analyzed together. Literature supports that when multiple categories of data are measured together they provide more comprehensive information than a single measure of data taken one time (Bernhardt, 1998). The implication from this finding could indicate that the practitioners did not have a need for more comprehensive information by doing multiple categorical data analysis or maybe they have not been exposed to multiple categorical data analysis procedures.

Data Types

Literature supports that there are four types of categorical data areas from which to gather descriptive information in order to improve classroom instruction and student learning (Bernhardt, 1998). They are assessment data, student data, program data, and perception data. A consensus about what types of data were used to inform the participants' decisions was evident. Four out ofs ix participants stated that student learning data were used to influence instructional practices. Two of the six participants said perceptional type data were used in their data-driven decision-making processes. Documents examined from the site revealed that student demographic data, student learning data and perceptional data were used in their data-driven decision-making process. There was not any evidence of school program data being used by the participants of this study. What is not clear from the data collected is whether the practitioners saw a value in data related to school programs to the same degree its value is presented in literature.

Data Analysis

Participants were asked to describe procedures they used to analyze data at their school. Four of the six participants described data analysis procedures as disaggregating data according to the students' skill levels. Three of the six participants identified analyzing data by ethnic groups. Two participants recognized data analysis involved disaggregating data by low socioeconomic groups.

Analyzing and disaggregating data by ethnic groups and by low socioeconomic groups are common data-driven decision-making procedures found in literature (Bernhardt, 1998; Eaker, 2002; Streifer, 2002b). It is significant to note that the literature did not emphasize analyzing data by student performance on specific skills in content areas as a common data-driven decision-making procedure. Literature limited the data analysis concerning student achievement to an overall performance in a content area. The practitioners in this study not only wanted to know about overall student performance in a content area, but they also wanted to analyze data by specific skill within the content area. This study's participants wanted to identify low student performance by specific content skills in order to adjust their instructional practices and to meet the identified learning needs of their students. The implication is that the earlier the practitioner has the knowledge that students are failing specific content concepts the sooner teachers can adjust their teaching practices to meet the various leaning needs among the students. This identified practice seems to exceed practices found in literature.

Data-Driven Decision-Making Support

Participants were asked to identify what resources they used to support their data-driven decision-making processes. The participants' responses were associated with either non-technological resources or with technology-related resources. Six participants made reference to various technology-related resources used to support their data-driven decision-making. The resources the participants identified to assist them in their data-driven decision-making were software applications such as: Microsoft Word, Microsoft Excel, Microsoft PowerPoint, STAR, SuccessMaker, Email, Survey Suite, and an electronic grade book program. Out of 11 various responses from the participants, seven of the responses were related to technology resources and four responses were related to non-technological resources.

Literature supports that technology assists practitioners in effective data-driven decision-making processes (Fisher, Semrau, & Truban 1990; Ligon, 2000; Picciano 1998, Witten 1990). Literature speaks to general abilities of technology to assist practitioners in their data-driven decisions. Literature informs the practitioners that technology has the ability to store, manipulate, classify, sort, calculate, compare, and summarize data. However, the literature lacks specific information concerning what software applications practitioners have found to be useful in supporting their data-driven decision-making processes.

The practitioners in this study relied on two software applications (STAR & SuccessMaker) for their capability to test students on specific skills in content areas and provide immediate feedback in reports. The teaching practitioners of this study found the information from technology-generated reports useful to drive their instructional

practices for students who showed deficient levels of mastery on specific content skills. The teachers wanted more access to technology applications that would assess students on specific content skills in order to get immediate feedback and to adjust instruction to their students. The significance of technology-supporting data-driven decision-making to influence instructional practices is its capability to provide immediate feedback to teachers on the progress of many students at one time concerning specific content skills. The teachers in this study stated that the earlier they had knowledge that students were not mastering specific content skills the earlier they were able to address learning deficiencies by adjusting their instruction. The finding implies that teachers who participated in this study relied on technology to support their instructional decisions because of its ability to test isolated content skills and for its capability to provide immediate feedback on student performance.

Contextual Characteristics of Data-Driven Decision-Making

The third data category described contextual characteristics of data-driven decision-making at this study's site. The participants responded to four interview questions for this category. Data were sought in order to understand data-driven decision factors related specifically within the school's culture. The descriptions of data-driven decision-making contextual factors from the participants generated three categories: 1) improvements needed in data-driven decision-making procedures, 2) staff characteristics, and 3) data-driven decision-making results. Major findings in these three categories are summarized.

Improvements Needed in Data-Driven Decision-Making Procedures

All six participants made reference to time as a factor that would improve data-driven decision-making in their school. Participants expressed data-driven decision-making was very time consuming and more time was needed in order to give justice to the practice. Literature supported the finding that data-driven decision making is time consuming. However, the literature claimed when technology is used as part of the decision support-system process, more time could be spent on solutions and improvement implementations and less time on gathering and analyzing data (Bluhm, 1987; Kearsley, 1990; Picciano, 1998; Sharp, 1998; Streifer, 2002b). This literature claim could not be verified by the researcher because of the limitations of this study. This study's purpose was not to investigate how much time was spent on data-driven decision-making processes. However, the consensus from additional participants' responses supported that more time was spent on implementing instructional improvements to address various students' learning needs after reviewing data from computer-generated reports than time was used for gathering and analyzing data.

Staff Characteristics

Intrinsic characteristics emerged as the theme from the various responses of the participants. The responses from all six participants made reference to intrinsic characteristics of the staff that enabled them to make data-driven decisions. Hard working was the only characteristic mentioned by two of the participants. Other characteristics identified were mentioned once by the participants and included: knowledge of successful teaching strategies, highly motivated, caring, respecting of

others' opinions, high expectations, goal-oriented, driven, trusting of others, and committed to student learning.

The literature identified teachers having a strong sense of efficacy and a shared belief system as common staff characteristics found in schools implementing data-driven decisions effectively (Bernhardt, 1998; Eaker, Dufour, Burnette 2002; Glickman, 1993). The findings from this research may represent a gap between what practitioners of this study perceived their characteristics were that enabled them to implement data-driven decisions and what the literature identified as characteristics needed for educators to utilize data-driven decision-making processes effectively.

Data-Driven Decision-Making Results

The participants were asked to share from their perspective how their school has changed as a result of data-driven decisions. All of the participants' responses could be generalized into one of two themes: (a) increased attention on student learning needs, and (b) increased staff morale and enthusiasm.

When asked to describe the greatest accomplishment as a result of data-driven decision-making in their school, the participants' responses supported one general theme. The theme that developed from the participants' responses was that data-driven decision-making provided relevant information to the teachers so they could determine to continue with what they are doing instructionally or try something else in order to produce different results. One participant explained, "Data-driven decision-making helps us to identify what the students' needs are which gives the teachers and the students more success in the end."

The overall purpose of data-driven decision-making supported by the literature is to lead educators toward more success in their business of schooling. The success and/or lack of success within each school can often be measured by gathering and analyzing data. The evidence from data guides educators to know what is working or what is not working in their schools. Data-driven decision-making is not necessarily in itself the solution to problems educators face. However, it is evident from literature and from the findings of this study that data-driven decision-making serves as a vital process for educators to embrace as they go about their school improvement endeavors to impact instructional change.

Implications and Recommendations

This descriptive case study investigated how elementary educators use technology as their support-system in order to make data-driven decisions to influence instructional practices. The conclusions drawn from this single case study added to the existing knowledge base by summarizing the specific findings from how practitioners utilized data-driven decision-making processes and their support-system used to influence their instructional practices. Describing such findings, may be helpful in developing effective professional training for teachers and administrators alike. Findings also may be helpful to other educational practitioners who are beginning to utilize data-driven decision-making processes. Caution should be taken when considering the implication and recommendations from this study. Due to the limitations of this study and the fact that information in this study was represented from the respondents' perceptions, the implications and recommendations may not be applicable for all educators. Generalizations, implications, and recommendations may be considered representative

for the sampled population in this study and are only suggestions to other similar populations.

Implications for Practice

The capacity to use data to inform educational practices and improve student learning is critical in this era of accountability. Educators need knowledge and understanding as to how their students benefit from their instructional practices. School personnel should ask difficult questions and engage in professional discourse with other educators about student learning on a regular and systematic basis in order to construct this knowledge and understanding. Asking questions about student learning requires the implementation of a thoughtful process for collecting, analyzing and disseminating relevant data. This process is known as data-driven decision-making.

Rather than depending on perceptions or speculation only, educators should rely on data to provide compelling evidence that grounds theories and conclusions in actual results. Data are essential tools of school improvement that direct the energy and efforts of school personnel toward the goal of maximizing student success. Data are also important for monitoring a school's or district's mission. Data are often described as either quantitative, such as enrollment figures, dropout rates and test scores, or qualitative, based on interviews, focus groups or observations. Regardless of the form or source, data are essential for diagnosing and finding problems in student achievement areas.

Recent advances in technological data warehousing and presentation have resulted in tools that assist educators to gather and analyze data in more efficient ways than in the past. This research study described the issues surrounding the use of student

data-based decision-making processes with technological support. Advances in computer hardware and software have made solutions to store, retrieve, and manipulate data more cost effective when compared to paper-pencil methods. An implication of the study suggests that teachers would make valuable use of data to inform their instructional practices if data were quickly available to them in forms that fit their needs and answer their questions.

This study identified that computer hardware and software applications work together as an effective support system for educational practitioners to use in the data-driven decision-making processes. Research on school improvement and effective instruction has shown data usage to be a critical factor in the school improvement process. This study described the role technology played to support instructional decisions in efforts to improve student learning experiences.

Data use can no longer be a choice for school leaders to ignore or haphazardly implement. It is an absolute necessity to have accurate data in the era of school accountability. Although data use is not necessarily an easy task for educators, technological advances are helping school personnel to overcome barriers and aid them in their data use process.

Educational settings present a different set of challenges for software companies than those found in the business world. Software companies should work closely with educational practitioners in order to provide technological-related products that are appropriate and beneficial to those in education. Educators should help software developers learn what the school needs are so that software programmers can develop appropriate applications that will better meet the learning needs of all students.

School personnel should carefully evaluate their data and analytical needs before purchasing appropriate software. There may not be a "best" program currently available due to various strengths and features found in current software packages. However, it is possible for school leaders to choose an adequate program presently with the forethought that future technological advances will be available to meet their future expansion and flexibility needs.

School personnel should realize that there are many other issues besides determining their data use needs and finding appropriate software applications to meet those needs. The other issues to consider when implementing technological-support into their data-driven decision-making processes may include: time to implement, cost, training, software compatibility with present applications, and user-friendliness.

Educators constantly make decisions that affect student learning on a day-to-day basis. When policymakers and school personnel either ignore data or fail to rely upon adequate data, student learning issues often go unaddressed. For example, school personnel may depend on their hunches, opinions and/or assumptions thinking learning is adequately being accomplished by all students when data are not effectively used. When this happens, valuable time, energy, and resources are wasted when new programs and instructional practices are adopted that fail to meet student needs or fail to show evidence of effectiveness. The effect on students and their learning is even more tragic than the loss of time and energy if students progress through the educational process without evidence of being exposed to effective instruction.

The practitioners of this study confirmed that data-driven decision-making processes are time consuming and difficult to implement initially, but they are well worth

the effort in the long run. Consider, timecould actually be saved when baseline indicators are established, improvements are monitored continuously and instructional adjustments are made accordingly using effective data as compared to time wasted on assumed effectiveness. Furthermore, school personnel who use data to assess and identify the learning needs of their students are better prepared to make informed decisions about their instructional practices and to recognize whether their efforts are effective. Students deserve the best possible education, one based upon sound data and well-informed decisions.

Since data-driven decision-making is time consuming, administrators should look for creative ways to give adequate time for teachers to practice data-driven decision-making. A few suggestions to address the time factor related to data-driven decision-making include:

- Use substitutes to free teachers during the school day;
- Transfer time spent on faculty meetings to data-driven decision-making processes;
- Provide stipends for teachers for participation beyond contract hours;
- Use technology more efficiently;
- Extend the school day and provide an early release on the fifth day;
- Engage volunteers to cover classes one morning per week in order for teachers to meet together;
- Provide common planning times for teachers.

Victoria Bernhardt (1998) identified four major measures or categories of data: (1) demographics, (2) student learning, (3) school processes, and (4) perceptions. School

personnel should seek to obtain and relate data from all four data categories in order to help them understand the effects of their schooling efforts on students. Furthermore, by looking at interactions among these measures, school personnel may obtain the information necessary in order to achieve desired results in student learning. In order to obtain richer information to guide curriculum and instruction changes for the purpose of increasing student learning, combining measures from all four categorical data areas may be more effective for school personnel than limiting the data measures from just one or two single data categories.

The findings from this study's site did not revealthat data were collected from all four data categories and interrelated in the analysis stage. This represents a gap from the information presented in the literature and what the practitioners actually did in the data-driven decision-making process. Perhaps in the future the staff at Crimson Creek Elementary may want to consider collecting school program/processes data and relate it to other present collected data. This additional data collection may help the staff to better understand the effects of their school programs on student learning.

In addition to knowing what data to collect and where to find it, school personnel need to know when and how to collect the data. According to Bernhardt (1998), school teams should collect data on a regular basis throughout the school year rather than waiting for an external force to require it. The data-driven decision process should involve teams of teachers and administrators working collaboratively over an extended period of time with teachers having more autonomy when it comes to the actual collection and analysis of the data. Accountability teams, curriculum committees, faculty, grade-level, and department or team meetings are possible structures

administrators could use to bring teachers into the process. Although team composition and structure may vary, the literature recommends that teams could actually benefit from diversity in terms of gender, race, ethnicity, grade level, years of experience and content area. Some researchers further recommend that school teams include students, parents and other community members for the purposes of asking questions, collecting and analyzing the data and suggesting improvement strategies.

The data from this study revealed that the staff did use a team approach to data-driven decision making process. However, in this study the data only revealed the team was limited to educators. Considering enlarging the team to include parents, students, and community member in the data-driven decision-making process would be recommended.

When school personnel engage in data collection and analysis, they are better able to connect the results with what they do in the classroom. They will understand what needs to change and how to go about making those changes. Because data-driven decision processes are open and participatory, administrators should give their school teams permission and support to act upon their decisions and findings. Prior to initiating a data-driven decision process, professional development opportunities should be planned by those in administration for school teams in order to learn more about data analysis, meeting design and facilitation skills, effective communication methods, teamwork, and systemic change.

Generally, detailed data analysis follows data collection. Data analysis is all about making sense out of the data. During the analysis process, school personnel should

identify patterns, possible explanations, units of information that fit together, meanings, and implications for action.

School personnel should clarify the purposes of the analysis and discuss how the results will be used before the team begins the comprehensive data analysis phase. This will help guide the analyses and ensure better use of results. The primary purpose of in-depth analysis should be to assist personnel in assessing how well they are meeting their students' needs.

Analyses should focus on the school's mission and vision statements. The school's guiding principles should provide the necessary direction for the analyses. A solid data analysis should reveal if those mission and vision statements are being accomplished. The data-driven process is most successful when everyone understands that the purpose of data analysis is not to point fingers or blame individuals but to move the school forward in meeting the needs of the students.

Sometimes in order to uncover and understand root problems in student learning, further data disaggregations or additional data collection are necessary. Typically, student achievement data are reported for whole populations and by general performances in content areas as aggregate data. Disaggregation involves dismantling or separating the aggregate information and looking at the performances of specific subgroups of students and/or performances on specific content skills. Disaggregating academic data within and among student subgroups and by performances on specific content skills are important ways that help school personnel to understand what is happening in the classrooms. School personnel should do data disaggregation in order to reveal critical issues that often go undetected in aggregated data.

The final stages of the data-driven decision process should involve using the findings to improve practices and procedures throughout the school. After all the data are collected, analyzed and discussed thoroughly, school personnel should search for solutions and develop action plans. Additional stakeholder dialogues would also be beneficial to school personnel in order to generate additional and appropriate solutions.

Professional discourse is a group process where conversations among teachers take place on a regular basis. The sharing and listening among the practitioners are focused on the academic, curricular, and instructional concerns of their practice, as well as other issues related to students. Professional discourse among school personnel and community stakeholders will enhance effective data-driven decision-making processes. Administration should ensure that structures for professional discourse are in place. Time is a crucial factor to effective data-driven dialogue. Administrators must remember to provide sufficient time to bring a diverse range of individuals together as they begin to determine solutions and implement action plans.

After action plans and/or changes in instructional practices are implemented, periodic monitoring should follow. School personnel should measure and evaluate the effects of their new actions through additional data collection and analysis. The re-monitoring allows school personnel to evaluate how well and to what degree the strategies worked.

The key to effective monitoring is for the school personnel to agree upon a set benchmark or upon a desired result during the planning phase. Then, it is simply a matter of examining the progress periodically to ensure desired results are being achieved. If desired results are not evident in the data collection and analysis, school personnel should

come together again and implement new solutions/practices in order to achieve the intended results.

Research supports that teachers who use data to guide and improve their teaching are more effective than teachers who do not use such information. Assessing student learning is an important process in order to measure progress of student learning, but equally and perhaps even more importantly is how teachers use assessment results to drive their instruction practices. Effective teachers use data daily to inform them which students are learning and which are not, and then tailor instruction to meet the learning needs of all students. School personnel should take advantage of the opportunity to use data in order to provide the best possible instruction for student learning so that all students succeed.

Recommendations for Future Research

1. A qualitative, more in-depth case study should be conducted in order to examine the data-driven decision-making process within different organizational structures other than elementary schools, such as those found in secondary schools, alternative schools, or charter schools.
2. A comparative case study should investigate schools that implemented data-driven decision-making processes from internally-developed innovation, while another study examines data-driven decision-making processes where the process has been externally imposed.
3. A study should be conducted using a larger population sample to explore and identify knowledge, skills, and characteristics of school teams who

include community stakeholders in their data-driven decision-making process.

4. A study should be conducted to determine the types of professional training needed to support principals and staff to implement and sustain data-driven decision-making processes.
5. A longitudinal case study should be conducted to determine what instructional changes influenced by data have impacted student achievement and to what degree as a result of data-driven decision-making.
6. An in depth study should be conducted to investigate how much time various data-driven decision-making procedures take. This information would be helpful to practitioners for planning purposes before making a commitment to data-driven decision-making processes.

Commentary

School personnel are presently being inundated with data. In this present Information Age, educational practitioners may feel like they are being engulfed with oceanic waves of data. Like a lighthouse assisting troubled ships safely to shore, it was this researcher's desire to provide "guiding light" to those endeavoring to implement data-driven decision-making processes.

This study attempted to explore the purpose, processes, and contextual characteristics of data-driven decision-making within an elementary setting. The significant outcome of this study includes the following:

1. Further clarification on how data-driven decisions are carried out by educational practitioners;
2. Actions and processes that educators must take to implement data-driven decisions;
3. Decision support-systems that assist data-driven decisions and impact instructional practices;
4. Organizational characteristics that support data-driven decision-making processes.

Although Crimson Creek Elementary is an exemplary model of a school that practices data-driven decision-making processes in local educational circles, it is by no means solely dedicated to all the data-driven decision-making pedagogy and processes found in literature. However, Crimson Creek continues to benefit from the data-driven decision-making processes that they have implemented in order to impact instructional practices for the purpose of improving student learning. Using Crimson Creek Elementary as an example, the researcher encourages other educators not to wait until all data-driven decision-making pedagogy is understood as presented in literature before they feel they are confident to implement the process. There might not be a "right model" to implement data-driven decision-making processes. The voyage to sail into an ocean of data and retrieve valuable treasures of useful information may be difficult but it is not impossible. May all the educators who brave the data-driven decision-making voyage find solutions that will better meet the learning needs of all their students.

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Appendix A: Individual Informed Consent Form for Research University of Oklahoma, Norman

This interview/observation is part of research being conducted under the auspices of the University of Oklahoma-Norman Campus. This document is intended to provide information so participants can acknowledge informed consent for participation in a research project

Title: **Technology-Supported Data-Driven Decision-Making in an Oklahoma Elementary School**
Principal investigator: Dennis Gentry (Doctoral Student, University of Oklahoma)
Faculty Sponsor: Dr. Gregg Garn (University of Oklahoma)

This researcher will conduct interviews and/or observations for two purposes: (1) information collected in the interview and/or observation will be used by the researcher to prepare a scholarly paper (dissertation) about how schools make data-driven decision to enhance instructional practices, and (2) information collected by the doctoral student may be used in scholarly publications of the student and/or dissertation advisor.

The interview should last for one-half hour to one hour and a half and will be tape-recorded. The questions asked will be developed by the doctoral student. All participants will be asked the same general questions. Prior to the interview, participants will be asked to complete a brief biographical questionnaire to provide data on educational training and experience. The researcher will type transcripts of the interview for analysis. The dissertation advisor may review these transcripts. All tapes and transcripts are treated as confidential materials. These tapes and transcripts will be kept secured until the transcription process is completed. After the transcription process is completed, the tapes will be destroyed.

Do you agree to be recorded by audiotape during the interview process? [ ] yes [ ] no

The observations will be conducted during scheduled faculty or specialized-focus committee meetings. Notes will be taken by the researcher. The dissertation advisor may also review these notes. All notes are treated as confidential materials. Only the dissertation advisor and researcher will have access to these secured notes. After the dissertation development, the field notes will be destroyed.

Pseudonyms will be assigned for each person interviewed and/or observed. These pseudonyms will be used in all discussions and in all written materials dealing with interviews and observations. Lastly, no interview or observation will be accepted or used by the researcher unless this consent form has been signed by all parties. This form will be filled and retained for at least two years under secure conditions.

The interest in data-driven decision-making is increasing within educational circles due to the recent federal mandate of No Child Left Behind. Data-driven decision-making can be a complicated and fearful process for many schools today. Research in this area could provide information for principal preparations programs as well as for teachers and administrators in the field. The research in this area could also be used as a model for other schools interested in making data-driven decisions for school improvement endeavors.

Understanding

Please read the following statements:

1. My participation in this study is entirely voluntary. Refusal to participate will involve no penalty.
2. I understand that the interview and/or observation will be conducted according to commonly accepted research procedures and that information taken from the interview will be recorded in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.
3. All information I give will be kept confidential.
4. I understand I am entitled to no benefits for participation.
5. I may terminate my participation at any time prior to the completion of this study without penalty.
6. Any information I may give during my participation will be used for research purposes only. Responses will not be shared with persons who are not directly involved with this study.
7. I understand that there are no foreseeable risks for participating in this study.

Risk and Benefit Statement

No foreseeable risks or discomforts to neither participants nor society are anticipated as a result from participation in this project. Benefits to the participant may include an increase understanding of technology-supported, data-driven decision-making to change instructional practices in schools.

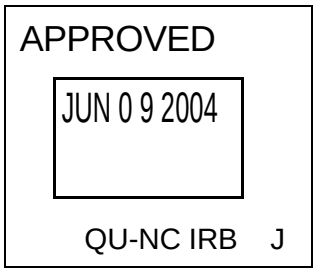
You may contact the dissertation advisor, Dr. Gregg Garn at (405) 325.6832 or the researcher, Dennis Gentry at (405) 325-0447 or by email (dennisg@ou.edu).

_____ _____

Signature of Participant Date

_____ _____

Printed Name of Participant Researcher Signature



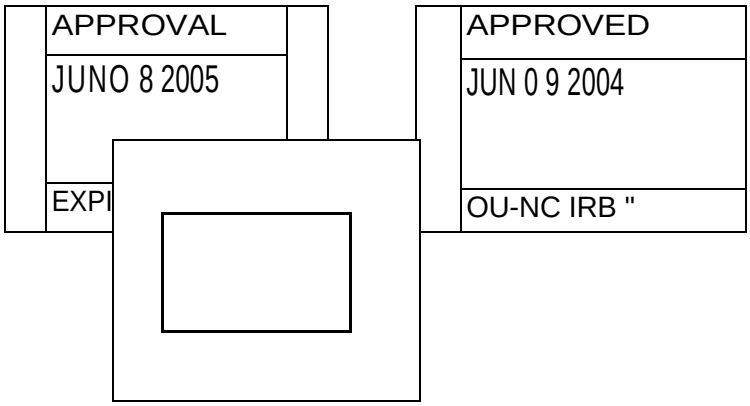
Appendix B: Oral Solicitation

My name is Dennis Gentry and I am a doctoral student at University of Oklahoma. I am writing a dissertation investigating how elementary educators (principals & teachers) make data-driven decisions to enhance classroom instructional practices. This research will present a holistic picture of the data-driven decision-making process within the context of a school setting.

I need your assistance to document how your decisions are carried out. I want to be as accurate as possible and include as many viewpoints as possible.

Each participant will be asked to engage in an interview session, an observation, or both. All interviews will be tape recorded, transcribed and analyzed. All audiotapes will be destroyed after transcription. Notes taken following observation periods will be coded, analyzed, and subsequently destroyed. Pseudonyms will be used after transcription as well. I, as the research, will have the only copy of real names with the pseudonyms: this master copy will also be destroyed following completion of the research project. Your identity will be protected with compete anonymity. You do not have to respond to any question that you choose not to answer. You may also stop the interview/observation session at any time.

I am available to meet with you before school, after school, during school hours, and on weekends. Please provide me with a time and date that is most convenient for you. My contact information will be given to you in writing it will include my home and work numbers as well as my home address. Feel free to contact me for any additional information. Thank you for your cooperation and assistance.



Appendix C: Demographic Data Form

Name _____

Age_____ Race_____ Gender_____

Number of years in the educational field _____

Number of months/years at present employment_____

Number of years with technology experience _____

Do you have college credit technology skill-related training? (yes) (no)

If yes, how many technology-related college hours do you have? _____

Do you consider your technology skills to be self-taught? (yes) (no)

Where did you receive most of your technology skill related training? college _____

District professional development _____ Other _____

(name the training)

Educational Background:

List your highest degree

School/College/University	Location	Degree/Area	Dates
_____	_____	_____	_____

Appendix D: Interview Questions

The purpose of my study is to describe the processes of technology-supported, data-driven decisions in an elementary school setting. My first set of questions will focus why you perceive data-driven decision-making was implemented in your school.

1. What was the purpose for implementing data-driven decisions at this school from your perspective?
2. What need do you perceive you were responding to when data-driven decisions were made?

The next eight interview questions will ask you to describe the processes and procedures of data-driven decision-making at your school:

3. What steps were taken to implement data-driven decision-making in your school?
4. Describe in a recipe version how data-driven decisions are made at your school?
5. What kinds of data did you use to inform decisions?
6. Describe the type of data you perceive is most useful to use when decisions were made to increase student learning
7. How were data gathered to inform decision-making?
8. How were data analyzed to inform decision-making?
9. How often is data examined?
10. What resources/support did you use to make data-driven decisions?

The next set of interview questions will ask you to describe the contextual factors of data-driven decision-making perceived at your school.

11. What is needed to improve data-driven decision-making at your school from your perspective?
12. What characteristics do you perceive this staff has in order to make data-driven decisions?
13. How has your school changed as a result to data-driven decision-making?
14. What do you believe is the greatest accomplishment of data-driven decision-making in your school?

Appendix E: Probe Question Prompts

General probes used in the individual interviews were:

1. Can you give me more details about …
2. Describe this to me …
3. Explain to me more on …
4. Can you give me a specific example on ….
5. Can you clarify your statement on …

Appendix F: List of Documents Reviewed

1997 School Improvement Plan (30 pages)

1998 Spring District Presentation Report (40 pages)

1998 - 1999 School Site Portfolio (25 pages)

1999 – 2000 School Site Plan (87 pages)

2000 -2001 School Site Plan (39 pages)

2000 - 2001 Blue Ribbon School Application (24 pages)

2001 – 2002 School Site Plan (33 pages)

2001 – 2002 Site Plan Evaluation (18 pages)

2001 -2002 Blue Ribbon School Report (20 pages)

2002 - 2003 Site Goals and School Profile Report (72 pages)

2003 – 2004 School Progress Report (39 pages)

2003 – 2004 OETT Grant Progress Report (28 pages)

School Facts from http://greatschool.net/modperl/browse_school/ok/print/1070 (access date 9/30/04)

2003 -2004 Oklahoma Test Score Averages for Reading, Math, and Science

Quarter OETT/OK-ACTS Grant Report (12/1/03)

2004 Classroom STAR Report

2004 Classroom CCC Report

2004 Individual Student Reading Assessment Report

2004 Diagnostic Class Profile Reading Assessment Report

2004 Excel Spreadsheet Reading Assessment Student Report

2004 5th grade Electronic Grade Book

Continuous Improvement Continuum

VITA

Dennis Gentry, Ed.D

Thesis: Technology-Supported Data-Driven Decision-Making in an Oklahoma Elementary School

Major Field: Educational Administration and Leadership

Personal Data: Born in Seminole, Oklahoma

Education: Graduated from Midwest City High School, Midwest City, Oklahoma; received Bachelor of Science degree in Christian Ministry from Southwestern College of Christian Ministry, Oklahoma City, Oklahoma in May 1983; received Master's of Education in Elementary Studies from the University of Central Oklahoma, Edmond, Oklahoma, in July 1992; completed requirements for Elementary School Principal and School Superintendent certifications from the University of Oklahoma, Norman, Oklahoma in Fall, 1995; completed requirements for the Doctor of Education degree at the University of Oklahoma in Spring, 2005.

Experience: Dennis Gentry has worked for the Western Heights Public Schools district for ten years as a classroom teacher, technology technician, assistant principal, and elementary principal. As a principal, he led school improvement initiatives in literacy, technology, teacher leadership and professional learning, and implemented a community mentoring program. He is a four time grant recipient for the purpose of increasing program effectiveness in literacy, parental involvement, math, and foreign language. He is currently serving on the professional development committee for the Cooperative Council for Oklahoma School Administrators. He is a member of the Oklahoma Association of Elementary School Principals and also served on the technology committee.

He served as a co-director and technology director for Phase II of the OK-ACTS program (Oklahoma's Achievement through Collaboration and Technology Support): A Bill and Melinda Gates State Leadership through the University of Oklahoma. Currently, he is serving El Reno Public Schools as a head elementary principal in a year-round school.