THE EFFECTS OF A STANDARDS-BASED CURRICULUM ON SCIENCE TEACHERS' INSTRUCTIONAL DECISIONS

A Dissertation

by

JANE MAUREEN METTY

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2010

Major Subject: Curriculum and Instruction

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Approved by:

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ABSTRACT

The Effects of a Standards-Based Curriculum on Science Teachers'

Instructional Decisions.

August 2010

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Chair of Advisory Committee: Dr. Lynn M. Burlbaw

Teachers are an essential link between the curriculum and student achievement. Teachers make instructional decisions that (1) determine the success or failure of a curricular intervention and (2) can result in either alignment or disconnect between the written and enacted curricula. Despite overwhelming evidence linking the success or the failure of a curricular intervention to the classroom teacher, little is known about the instructional decisions teachers make when using a standards-based curriculum. The use of standards-based curriculum is becoming common, therefore, it is essential to know how teachers are using it.

This study focused on three questions. First, can the factors that influence instructional decisions be consolidated into manageable, representative, and useful categories? Second, what instructional decisions did six science teachers in a rural central Texas school district make when using the standards-based curriculum,

CSCOPE? Finally, what steps did one district take to select and adopt the SBC, CSCOPE?

This study found that the factors that influence instructional decisions could be clustered into four categories: (1) working conditions, (2) pedagogical content knowledge, (3) prior experiences, and (4) beliefs. Further, that teachers made instructional decisions both to use CSCOPE as intended and to modify CSCOPE lessons. Modifications to CSCOPE were made despite (1) an administrative mandate not to modify CSCOPE, (2) good administrative support, and (3) the stated intention of these teachers to adhere to CSCOPE. Teachers omitted, replaced and/or supplemented lessons and/or parts of lessons in order to (1) accommodate the needs of their students and (2) prepare students for the state assessment. Finally, several steps taken by Bluecat ISD administrators assisted teachers in using CSCOPE as intended.

This study makes three contributions to the educational literature. First, no useful categorization exists of the factors that influence teachers' instructional decisions. Chapter II provides an initial categorization of these factors that is manageable, representative, and useful. Second, administrators need to be able to anticipate how teachers may use a standards-based curriculum. Chapter III identifies the instructional decisions made by these six science teachers. Chapter IV identifies the measures put in place to support teachers as they adjusted to CSCOPE.

DEDICATION

I would like to dedicate this dissertation to my sister, Beth. You have been my harshest critic and my strongest advocate. You have made me cry and you have made me laugh through this process. Words cannot express the depth of gratitude I feel. I want to thank you for the countless hours you spent in helping me to improve my writing ability, transcribing my audios, editing my drafts, and encouraging me to stay the course. So often when you were working with me I marveled at your intellect and your magical way with words. What a gift you have. You were so patient despite the frustration you must have felt. I could not have completed this dissertation without you. It is only fitting and it is my honor to dedicate this dissertation to you, Beth. I love you and I'm grateful beyond words.

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Dr. Kelly, thank you for the encouragement and support that you gave me in teaching science methods courses and working with pre-service teachers. I have grown to admire and respect you greatly. You have been an excellent mentor and friend. As I move forward, I will strive to use the advice and skills you have given me to be the best science educator I can be. Thank you, Dr. Kelly.

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how I could repay you for all your time and effort on my behalf. You told me that soon it would be my turn to help someone else. I want you to know, I will "pay it forward" using all you have taught me as I mentor others. Thank you, Dr. Schielack.

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TABLE OF CONTENTS

CHAPTER Page

LIST OF TABLES

CHAPTER I

INTRODUCTION: IMPORTANCE OF THE RESEARCH

The modern standards-based movement, now entering its second decade, occupies a central role in the policy initiatives being developed at the state and national level (Massell, 2008; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2009). According to a report from the National Center for Research on Evaluation, Standards, and Student Testing (CRESST), this trend is likely to continue. In this report, Herman (2009) predicted that the next generation of standards will shift from state standards to a single set of national standards. Forty-eight states have already agreed to adopt the national content and performance standards currently being developed (Zehr, 2009). Three hundred and fifty million dollars of federal funds have been allocated to the Common Core State Standards Initiative (CCSSI) through a variety of stimulus investments, including the *American Recovery and Reinvestment Act of 2009* and its sequel, the *Race to the Top Fund* (ARRA, 2009; Herman, 2009; Massell, 2008; United States Department of Education, 2010). School districts are adopting standards-based curricula with increasing frequency and this trend is likely to continue. The move toward using a standards-based curriculum (SBC) will continue to dominate the development of school curricula for the foreseeable future.

This dissertation follows the style of *Teaching and Teacher Education*.

Darling-Hammond and Baratz-Snowden (2005) found that student achievement depends on consistent and coherent implementation of the curriculum across all grades. (Darling-Hammond & Baratz-Snowden, 2005; Duschl, 1989; Squires, 2009). Blank (2002) concluded that how the teacher implements the curriculum is the key to the success of an aligned curriculum. Bruner and Greenlee (2002) noted that, " … aligning the standards and benchmarks of the mandated curriculum with what is actually taught is essential for student success" (p. 24). In light of this, Marzano's (2002) comments on how teachers use structured textbooks is especially informative. He reported that, "… studies indicate that even when highly structured textbooks are used as the basis for a curriculum, teachers commonly make independent and idiosyncratic decisions regarding what should be emphasized, what should be added, and what should be deleted" (p. 7).

Squires (1998) wrote, "Individual teacher's decisions about what to emphasize, made in isolation and with good intentions, are unlikely to result in higher levels of student learning as reflected on test scores" (p. 17). When teachers make independent decisions about what to include and what to omit, gaps in the curricular continuum are created. Yet, despite this evidence, most of the studies that connected a SBC with student achievement ignored the influence of the teacher and the student (Schoen, Cabulla, Finn, & Fi, 2003). "Such studies provide evidence of the feasibility of the curriculum, but they tell little about the ways that teachers and students interacted with the curriculum that may have produced the improved learning" (Schoen, et al., 2003, p. 230). In 1977 Hall and Loucks had arrived at a similar conclusion. The consequence of ignoring the influence of teachers' instructional decisions is well documented in the

literature (Bryan & Atwater, 2002; Cronin-Jones, 1991; Czerniak & Lumpe, 1996; Haney, Lumpe, Czerniak, & Egan, 2002; Johnson, 2006; Jones & Carter, 2007; Laplante, 1997). The fate of curricular interventions rests, to a large extent, on the way in which teachers choose to implement them.

This study focuses on answering three questions. First, can the factors that influence instructional decisions which are scattered throughout the educational literature be consolidated into manageable, representative, and useful categories? Second, what decisions did six science teachers in a rural central Texas school district make when using the SBC, CSCOPE? Third, what steps did one district take to select and adopt the SBC, CSCOPE? Numerous factors have been documented in the educational literature as having an influence on the daily instructional decisions made by teachers. Chapter II provides a review of these factors. In this study, I have gathered these factors together and organized them into workable categories. I then used these categories as a framework for examining the decisions of the science teachers in this study. Very little research that deals with these factors was done in the context of a SBC. One might assume that in making instructional decisions, teachers are influenced by the same factors irrespective of the context in which they are made. However, to know with any certainty if this is the case, research was needed within the context of a SBC. This study addressed that issue.

This study uses a qualitative methodology. Qualitative methods were used for several reasons. First, qualitative research methods are ideal for understanding and describing events that occur in a phenomenon (Creswell, 2003). In this study, the

phenomenon is the instructional decisions six science teachers made within the context of CSCOPE. A second reason for using qualitative methods is the role that can be assumed by the researcher. By interacting with the participants, the researcher is able to establish a relationship in which the participants trust the researcher. The qualitative paradigm supports and values this relationship (Creswell, 2007). Third, the quality of the data collected is dependent on the strength of the relationship between the researcher and the teacher-participants. Data gathered as a result of this relationship allows the researcher to better understand the phenomenon and to more accurately interpret data within the context of the phenomenon (Maxwell & Loomis, 2003). Further, the relationship between the researcher and the participants enhances the likelihood that the data collected will be trustworthy (Creswell, 2003). The qualitative paradigm allows for the evolution of the study as the research proceeds. The researcher has the latitude to modify the study as necessary in order to gather the kinds of data needed to address the research questions (Maxwell & Loomis, 2003; Wolcott, 1994). Finally, the qualitative paradigm values emergent categories. During the process of categorizing the factors identified in the educational literature and identifying what decisions teachers made, it was important to allow the categories to emerge from the data rather than to fit the data to predetermined categories (Gall, Gall, & Borg, 2005). When the researcher allows the categories to emerge from the data rather than determining ahead of time what categories to look for, the researcher is able to allow the data to tell the story.

This dissertation is organized into five chapters, beginning with this introduction. Chapter II identifies the factors that influence instructional decisions which are scattered

throughout the educational literature and consolidates them into manageable, representative, and useful categories. Chapter III discusses the instructional decisions made by six science teachers in Bluecat ISD during their first year using CSCOPE. Chapter IV is a case study which chronicles the steps taken by Bluecat ISD to find and adopt CSCOPE. In Chapter IV, I discuss (1) why the district felt it needed a SBC, and (2) the selection and adoption process. I also provide an overview of the SBC reform movement and of CSCOPE. Chapter V summarizes and links the individual sections of my dissertation together. In Chapter V, I also answer my research questions and address the significance of the study and the need for further research.

CHAPTER II

FACTORS THAT INFLUENCE SCIENCE TEACHERS' INSTRUCTIONAL DECISIONS

1. Introduction

Educational research has shown that teachers have a significant influence on student achievement through the instructional decisions they make (Blank, 2002; Darling-Hammond & Bransford, 2005; Marzano, 2003; Shank, 2005; Squires, 2009). There is a long history documenting the fact that teachers' decisions can determine the success or failure of a curricular intervention (Cronin-Jones, 1991; Czerniak & Lumpe, 1996; Feiman-Nemser & Buchmann, 2005; Kang & Wallace, 2005). Nevertheless, curriculum is often designed without considering the role of the teacher as decision-maker (Hall & Loucks, 1977; Kendall & Marzano, 2000; Marzano, 2003; Mazurek & Winzer, 2006; Schoen, et al., 2003).

In the past, teachers made many of the critical decisions relating to curriculum and instruction, including: (1) what content students needed to know, (2) the amount of time it would take to teach that content, (3) which instructional strategies to use, (4) what the goals and objectives were for instruction, and (5) what to assess and how it should be assessed (Harnack, 1968). More recently, however, these decisions are being taken out of the hands of teachers and made at the district level (Day, 2002; Massell, 2008). As a result of the report, *A Nation at Risk: The Imperative for Educational Reform*, and more recently of the accountability associated with the *No Child Left Behind Act of 2002*

(NCLB), school districts are increasingly concerned with standardizing the scope and sequence of instruction (National Commision on Excellence in Education, 1983; United States Department of Education, 2002). At the district level, this is typically done by adopting a standards-based curriculum (SBC) that is aligned vertically and horizontally, and is aligned with the state standards (Bruner & Greenlee, 2002; Marzano, 2002). Studies suggest that a vertically and horizontally aligned curriculum: (1) increases student achievement on high-stakes state assessments, (2) reduces instructional gaps from year to year and from teacher to teacher, and (3) sets the stage for increased instructional rigor (Herman, 2009; Marzano, 2003; Teacher Education Service Center Curriculum Collaborative, 2009).

A district may adopt a SBC with the expectation that their teachers will use it without alteration, but studies clearly show that teachers do alter curriculum and that they have considerable control over its success or failure (Cronin-Jones, 1991; Darling-Hammond, 2006; Marzano, 2002). Relatively little research has been done at this point into how teachers use a SBC. Consequently, school districts are limited in what they can find to inform their understanding of what decisions teachers are likely to make when using a SBC, and/or of the factors that are likely to influence those decisions.

One reason for this lack of research is that the standards-based reform movement is relatively new (Massell, 2008). Although districts have expected their teachers to comply with state standards for some time, it has only been recently that districts have begun to develop curricula with a centralized scope and sequence of instruction. This is a labor and time intensive process, and very few small and middle sized districts have the

infrastructure, personnel, or financial resources to develop their own curriculum. As a result, they often turn to one of the services that package and distribute aligned SBCs (Teacher Education Service Center Curriculum Collaborative, 2009; Texas Association of School Boards, 2009). Once a district has adopted a SBC, the role of teacher decision-making in implementation must be considered to determine the effectiveness of the intervention. How would a district know, for example, if improved student performance is a function of the new SBC or of savvy teachers who circumvented its flaws? Improvement in student performance depends not only on having a well designed SBC, but also on the teachers who implement it and the instructional decisions they make. This paper gathers the factors that influence instructional decisions which have been independently identified in the educational literature and organizes them so that they can be used by those who work with teachers or research teacher practices.

2. Factors influencing instructional decisions

A significant number of studies have independently identified factors that influence instructional decisions. However, as Jones and Carter (2007) have pointed out, no useful categorization of these factors has been attempted. Without this categorization, those who work with teachers have difficulty: (1) understanding what influences their instructional decisions, (2) knowing how teachers are likely to use curriculum, (3) designing curricular interventions that teachers are likely to use as intended, and (4) knowing what concerns to address when developing professional development. A

categorization of these factors would assist those who work with teachers in their efforts to create an environment in which teachers will choose to use the curriculum as intended (for studies on adult learners and effective professional development, see Darling-Hammond, 2006; Darling-Hammond & McLaughlin, 1995; Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; Loucks-Horsley, 1998; Loucks-Horsley & Matsumoto, 1999; Mundry, 2003).

Many studies have identified individual factors such as beliefs, working conditions, or knowledge of the teacher (Buckley, Schneider, & Shang, 2004; Buehl & Alexander, 2006; Gess-Newsome, 1999a; Richardson, 2007) as influencing teachers' decisions. Other studies suggest that instructional decisions are the result of a combination of factors (Fang, 1996; Feiman-Nemser & Buchmann, 2005). For example, while they acknowledged the connection between epistemological beliefs and curricular decisions, Kang and Wallace (2005) suggested that the instructional context and the teacher's instructional goals also influenced instructional decisions. In particular, they noted that limited resources and constraints in working conditions overrode the influence of beliefs in the decision-making process. Duschl (1989) found that three factors influenced teachers' instructional decisions: (1) student ability, (2) curricular goals and objectives, and (3) administrative pressures. Tomanek and colleagues (2008) concluded that teachers based instructional decisions on four things: (1) accountability pressures, (2) cognitive complexity of the task, (3) beliefs about how students learn and what students need to know, and (4) working conditions. Feldman (2002) found evidence that teachers based instructional decisions on what they perceived to be the intended career paths of

their students. Yerrick, Pederson, and Amason (1998) identified the personal needs of the teacher and the teacher's ability to manage a classroom as critical factors in instructional decisions. They also found that these overrode the influence of the teacher's beliefs. Further, Yero (2002) found that the way teachers interpreted a task influenced their decisions.

These are just a small sample of the numerous studies that have independently identified factors that influence instructional decisions. Table 1 draws attention to the large number of studies that have identified influential factors, and highlights the need for organizing this literature base into manageable, representative, and useful categories.

3. Methods

The purpose of this paper is to address one question. Can the factors that influence instructional decisions which are scattered throughout the educational literature be consolidated into manageable, representative, and useful categories?

3.1. Procedures for collecting and categorizing the factors

To find the studies which identified factors that influenced science teachers' decisions, the researcher searched the following key words: teacher decisions, teacher decision-making process, instructional decisions, curricular decisions, instructional practices, and curricular practices. The search was limited to publications from the educational literature. Initially, the word *science* was also included as a limiting factor in each of the key word searches. However, that proved to be too limiting**,** and therefore the

Table 1.
Summary of factors that influence teachers' instructional decisions.

Factors that influence teacher decisions	Researcher and publication year
Epistemological beliefs	(Guarino, 2006; Hanushek, Kain, & Rivkin, 2004b; Ingersoll, 2003)
Instructional context Instructional goal Working condition constraints override beliefs	(Brown & Melear, 2007; Brownlee, Boulton-Lewis, & Purdie, 2002; Feiman-Nemser & Buchmann, 2005; Limón, 2006; Luft, 2001; Luft & Roehrig, 2007; Morine-Dershimer & Oliver, 2005; Olafson & Schraw, 2006; Yilmaz-Tuzun & Topcu, 2008)
Personal beliefs override the influence of PCK and working conditions	(Kang & Wallace, 2005)
Beliefs about the role of the teacher	(Jones & Carter, 2007; Luft, 2001; Luft & Roehrig, 2007; Luft, Roehrig, & Patterson, 2003; Olafson & Schraw, 2006; Richardson, 1994)
Student ability Curricular goals and objectives Administrative pressures	(Cronin-Jones, 1991; Magnusson, Krajcik, & Borko, 1999; Yero, 2002)
Beliefs about how students learn	(Duschl, 1989)
Beliefs about how students learn Beliefs about what students can learn	(Czerniak & Lumpe, 1996; Haney, et al., 2002)
Accountability pressures Cognitive complexity of the task Working conditions Beliefs about how students learn and what students need to know Beliefs about student ability	(Brownlee, et al., 2002; Fives & Buehl, 2008; Kang & Wallace, 2005)
Beliefs about student ability	(Tomanek, et al., 2008)
Relationship between beliefs about how students learn and the instructional strategies used	(Metty-Scallon, 2006; Zohar & Dori, 2003)
Beliefs about what is important to know	(Brownlee, et al., 2002; Correa, Perry, Sims, Miller, & Fang, 2008)
Student's career path	(Magnusson, et al., 1999; Morine-Dershimer & Corrigan, 1997; Morine-Dershimer & Kent, 1999; Nespor, 1987; Pajares, 1992; Richardson, 1994)
Teachers interpretation of the task	(Yerrick, et al., 1998)
Efficacy beliefs	(Moss & Kaufman, 2003)
Teacher's ability to manage a classroom Personal needs of the teacher	(Feldman, 2002)

Table 1 continued.

Findings from independent studies	Researcher and publication Year
Inadequate budget Large class size Too many class preparations Duty assignments unrelated to instruction	(Yero, 2002)
Administrative policies that structure instructional scope and sequence	(Buckley, 2005)
Class size Tracking of students and student diversity Administrative mandates and policies Classroom management Relationships with co-workers	(M. Johnson, 2002; Shank, 2005)
Over-management of teachers Adequacy of resources, facilities, and technology	(Brown & Melear, 2007)
Student responsiveness	(Darling-Hammond & Baratz-Snowden, 2005; Lumpe, Haney, & Czerniak, 2000; Rhoton & Shane, 2006)
Pedagogical content knowledge	(Gess-Newsome, 1999a; Magnusson, et al., 1999; Shulman, 1986)
Classroom management Teacher beliefs	(Jones & Carter, 2007)
Stated beliefs do not always match actions	(Jones & Carter, 2007; Lumpe, et al., 2000)
Experience outside the classroom	(Brown & Melear, 2007; Correa, et al., 2008; Fang, 1996; Simmons, et al., 1999; Waggett, 2001)
Prior experiences used to frame instructional practice	(Feiman-Nemser & Buchmann, 2005; Haney, et al., 2002)
Prior experiences convince teachers students learn the same way they learn	(Trundle, Atwood, & Chistopher, 2007)
Teachers accept or reject information based on their prior experiences	(Laplante, 1997; Smith, 2005; Varelas, House, & Wenzel, 2005)
Past experiences in science are linked to current instructional practice	(Feiman-Nemser & Buchmann, 2005)
Relationship between structure of the discipline and the thought process used to make curricular decisions	(Smith, 2005)

key word search was repeated without the limiting word. For each of the resulting publications, the researcher reviewed the reference sections for additional publications. As the literature base broadened, additional key words became evident (teacher working conditions, teacher work environment, teacher prior knowledge, teacher prior experience, teacher beliefs, teacher knowledge, teacher choices, pedagogical content knowledge, teacher practice, and teacher epistemological beliefs). Further searches were done using these key words. A review of the reference section of the resulting publications was also completed. Eventually, very few new studies emerged, and the researcher concluded that most of the studies published in the educational literature relating to factors that influenced instructional decisions for the ten year period from 1998 to 2008 had been located.

Phrases within the publications which referenced events that influenced teachers' actions were identified. Using constant comparative methods (Boeige, 2002; Hallberg, 2006), these phrases were grouped into categories which emerged from the data (Gall, et al., 2005; Yin, 2003a, 2003b).

After the searches were completed and the results analyzed, the following four categories appeared to account for the major factors that influenced instructional decisions: (1) working conditions, (2) pedagogical content knowledge (PCK), (3) teacher beliefs, and (4) prior experiences. There were other factors mentioned in the literature that suggested that the personal goals and the disposition of the teacher were also influential, but there was little research to indicate that they were major factors. For this reason, they were not considered in the initial categorization. This categorization is

meant to serve as a starting point; a framework on which to build as new information becomes available. The following sections briefly review the literature with respect to each of these categories and discuss them in more detail.

4. Categorization of factors

4.1. Teacher working conditions

Working conditions encompass both the tangible and intangible aspects of the work environment. Working conditions include class size, time constraints, duty assignments, and availability of adequate facilities, technology, resources, and materials. Working conditions also include administrative expectations, mandates, policies, and support of the teacher. Finally, working conditions include the relationship between the teacher and the community, including relationships with students, parents, and co-workers (Darling-Hammond, 1998, 2003; Guarino, 2006; Hanushek, et al., 2004b; Metty & Ivey, 2007; Metty & Stuessy, 2007).

The conditions in which teachers work on a day-to-day basis have been the focus of a substantial number of studies (e.g., see Buckley, et al., 2004; Darling-Hammond, 2003; Feiman-Nemser, 2001; Glenn, 2000; Guarino, 2006; Hanushek, Kain, & Rivkin, 2004a; Hanushek, et al., 2004b; Hirsch, 2004; Johnson, 2006; Kwakman, 2003; Metty & Ivey, 2007). Irrespective of how working conditions were defined, all of these studies reported a discernable link between the conditions in which the teacher worked and the curricular decisions that the teacher made. Studies suggested that support from the

administration, community, students, and parents significantly influenced teachers as they made curricular decisions (for information on the influence of community on teacher decisions, see Bransford, Brown, & Cocking, 2000; Darling-Hammond, 2003; Darling-Hammond & McLaughlin, 1995; Metty & Stuessy, 2007; National Commission on Teaching and America's Future, 1996; Singer, Hilton, & Schweingruber, 2006; Yerrick & Hoving, 1999). Administrative decisions that provided the teacher with inadequate budgets, large class sizes, too many class preparations, or duty assignments unrelated to instruction all limited what the teacher was willing and/or able to do in the classroom (Buckley, et al., 2004). The adequacy of resources, facilities, and technology also influenced instructional decisions. Teachers with antiquated and inadequate facilities may be unwilling or unable to safely engage their students in laboratory-based exploration and activities. Teachers with inadequate technology or poor technology support often opted not to use technology at all (for more information on science teacher facilities, see Abrams, Southerland, & Silva, 2007; Darling-Hammond & Baratz-Snowden, 2005; Lumpe, et al., 2000; Metty & Stuessy, 2007; Rhoton & Shane, 2006; Singer, et al., 2006).

Brown and Melear (2006, 2007) found that teachers routinely modified the curriculum to fit the limitations of their working conditions. These researchers identified several factors that influenced teachers as they made instructional decisions: (1) class size, (2) tracking of students, (3) administrative mandates and policies, (4) student diversity, (5) classroom management issues, and (6) relationships with co-workers. Jones and Carter (2007) found that student responsiveness also influenced teachers'

instructional decisions. For example, when teachers thought that students were not interested in a topic, they either avoided that topic entirely or covered the material quickly. Moss and Kaufman (2003) found that pre-service teachers with constructivist views of learning did not implement constructivist strategies when they were concerned about maintaining order in the classroom. They opted instead for strategies that allowed them more control over their students. These studies make it clear that the conditions in which teachers work are a major influence in their instructional decisions.

4.2. Teacher pedagogical content knowledge

Studies dating from Shulman (1986) to the present suggest that PCK has a profound impact on instructional decisions (for example, see Grossman, 1990; Magnusson, et al., 1999; Morine-Dershimer & Kent, 1999; van Driel & Beijaard, 2003). PCK is an efficient "chunking" or integration of three independent knowledge domains: knowledge of subject, knowledge of pedagogy, and knowledge of context. These domains function as one domain of knowledge, yet knowledge within each of these areas can be flexibly applied to any number of situations to propose unique solutions (Crawford, 2007; Gess-Newsome, 1999a). Many studies made a distinction between teacher knowledge and teacher beliefs. Still other studies choose to deal only with what the teacher believed and avoided making any distinction between knowledge and beliefs. As a result, many of the studies that addressed issues of PCK were done under the umbrella of epistemological beliefs. For this reason, PCK is addressed in the section on epistemological beliefs.

4.3. Teacher personal beliefs

Studies have found that what the teacher believes plays a decisive role in his or her instructional decisions (Jones & Carter, 2007; Luft, 2001; Luft & Roehrig, 2007; Luft, et al., 2003; Olafson & Schraw, 2006; Richardson, 1994). Some researchers have suggested that personal beliefs override the influence of both PCK and working conditions (Luft & Roehrig, 2007; Magnusson, et al., 1999). Cronin-Jones (1991) found that teachers modified or completely rejected curricula that conflicted with their beliefs. Other studies revealed that teachers defied administrative mandates when these mandates were in strong opposition to their beliefs (Metty & Stuessy, 2007; Stuessy & Metty, 2007). Beliefs serve as gatekeepers; they filter new information and influence how teachers interpret and act on this information (Bandura, 1997; Nespor, 1987; Pajares, 1992).

Personal beliefs emerged as an influential and complex category. Because of the vast literature base documenting teacher beliefs, I have divided them into the following four categories: (1) teachers' beliefs about their role in the classroom and the goals of education, (2) teachers' epistemological beliefs about how students learn and what students are able to learn, (3) teachers' beliefs about subject matter and the structure of the discipline, and (4) teachers' beliefs about self-efficacy (for articles that review belief studies, see Fang, 1996; Jones & Carter, 2007; Nespor, 1987; Pajares, 1992; Richardson, 2007; Smith & Southerland, 2007).

4.3.1. Beliefs about the role of the teacher and the goals of education

Studies have found that what teachers believed about their role influenced the decisions they made (Magnusson, et al., 1999; Yero, 2002). For example, teachers who believed that their role was to teach and the student's role was to learn did not see any need to change their practice when their students were not successful. Even if the teacher recognized that the student was not learning, her beliefs prevented her from seeing that she had any role beyond presenting the information (Yero, 2002). Brown and Melear (2006) found that teachers who held teacher-centered beliefs (where the teacher controls the pace and direction of instruction) thought that students learned best through lecture, drill, practice, review, and testing. On the other hand, teachers who held student-centered beliefs (where the teacher adjusts instruction to address the needs and interests of students) thought that students learned best by constructing their own understanding, and endeavored to engage students' higher-level thinking skills through instructional strategies such as problem-solving. Teachers who held teacher-centered beliefs tended to cite events outside their control, such as lack of support, time, money, and/or the type of students in their classroom, to explain poor student performance. They held firmly to their belief that it is the teacher's responsibility to teach and it is the student's responsibility to learn. Consequently, if they presented the material and the student did not understand it, the teacher concluded that the student wasn't trying hard enough. On the other hand, teachers with student-centered beliefs tried different strategies to help struggling students, because they believed that it was their responsibility to ensure that their students learned.

Finally, Cronin-Jones (1991) found that some teachers believed that it was their responsibility to expose students to a wide variety of perspectives, and that it was the student's role to decide what to accept. When these teachers were instructed to use an agenda-driven curriculum in which the teacher was required to present a single point of view, the teachers supplemented the curriculum with additional materials and information in order to expose students to multiple perspectives.

4.3.2. Epistemological beliefs about how students learn and what students can learn

Epistemological beliefs are beliefs about what knowledge is and how knowledge is acquired. These beliefs have a powerful influence on instructional decisions (Brownlee et al., 2002; Fives & Buehl, 2008; Kang & Wallace, 2005). Epistemological beliefs influence how teachers approach teaching and learning within a given context. They also act as filters through which new information is evaluated (for studies on the influence of epistemological beliefs, see Brownlee, et al., 2002; Gregoire, 2003; Lotter et al., 2007; Luft, 2001; Luft & Roehrig, 2007; Roehrig & Luft, 2004).

Teachers hold a number of different beliefs about what it means to learn. For example, Bransford and colleagues (2000) reported that some teachers believed that learning involves the transmission of knowledge, while others believed that learning involves the development of the "whole" child. Still other teachers believed that learning is a complex process of interactions in which students develop the ability to think for themselves. Others believed that learning is the continual restructuring of prior knowledge. Studies show that, in fact, most teachers hold some combination of these beliefs (e.g., see Brown & Melear, 2007; Brownlee, et al., 2002; Hofer & Pintrich, 1997;

Luft & Roehrig, 2007; Yero, 2002). Czerniak and Lumpe (1996) reported that teachers found it difficult, if not impossible, to adopt instructional strategies that were inconsistent with their beliefs about how students learn. They found that teachers who believed that students learned by transmission of knowledge were unlikely to adopt constructivist strategies. Constructivism holds that learners learn by constructing their own understanding (Haney & McArthur, 2002).

There is a relationship between the beliefs teachers have about how learning occurs and the strategies they will use (Brownlee, et al., 2002; Correa, et al., 2008). Teachers who believed that students needed structure and discipline to learn provided more restrictive learning environments than teachers who believed that students should direct their own learning (Cronin-Jones, 1991). Tomanek and associates (2008) found that what teachers believed about their students' abilities strongly influenced their decisions about how to design assessment instruments. Similarly, Metty-Scallon (2006) found that what a teacher believed about her students' abilities weighed heavily in her instructional decisions. In this study, the teacher believed that special-needs students were unable to engage in complex problem solving strategies in an unstructured learning environment. The teacher also believed that students who exhibited behavior problems or who were unmotivated would not be successful in a learning environment where students were responsible for their own learning. As a result, this teacher was extremely reluctant to introduce student-centered independent inquiry into her instructional practice.

Zohar and Dori (2003) found that many teachers believed that instruction in higher-order thinking skills was appropriate for high-achieving students but not for low-

achieving students. These teachers believed that students who had trouble mastering basic facts would be unable to complete tasks that required higher-order thinking skills. As a result, these teachers did not provide the same opportunities for low-achieving students as they did for high-achieving students. Clearly, teachers base their instructional decisions on their epistemological beliefs about how students learn and what students are able to do.

4.3.3. Beliefs about subject matter and the structure of the discipline

Studies show that teachers' beliefs about what it is important to know in a subject influenced their instructional decisions (Cronin-Jones, 1991; Magnusson, et al., 1999; Morine-Dershimer & Kent, 1999; Nespor, 1987; Pajares, 1992; Richardson, 1994, 1996, 2007). Cronin-Jones (1991) found that teachers who did not believe that an issue was important for students to understand either omitted it or only covered it superficially, even when the state standards mandated that the concept be explored in depth.

Studies demonstrate that many science teachers do not have a well-defined sense of the nature of science or how the discipline of science is structured (for studies on the nature of science beliefs, see Gess-Newsome, Southerland, Johnston, & Woodbury, 2003; Schwartz, Lederman, & Crawford, 2000; Westerlund, Schwartz, Lederman, & Koke, 2001). For example, Bryan and Atwater (2002) found that teachers who did not understand the importance of modeling in science did not see modeling as an important concept to teach. Science teachers who had little or no experience in scientific research typically had little understanding of what it means to do science or how scientists go about doing their work. This lack of experience allowed these teachers to hold onto

beliefs that were inconsistent with the true structure of science. That is, teachers who were not scientifically literate often saw science as a stagnant discipline full of facts, rather than as a dynamic discipline where knowledge is tentative (e.g., see Brown & Melear, 2007; Clemente & Ramírez, 2008; Dixon & Wilke, 2007; Drayton & Falk, 2006; Dresner & Worley, 2006). Kang and Wallace (2005) found that teachers who believed that students should understand science as a discipline of tentative knowledge were inclined to provide problem-solving laboratory experiences. On the other hand, teachers who believed that it was important to learn the facts of science were inclined to provide more demonstrations and to minimize the students' cognitive involvement in science.

4.3.4. Beliefs about self-efficacy

Self-efficacy beliefs are beliefs teachers have about their ability to be successful (Bandura, 1997). Efficacy beliefs have been found to heavily influence the decision-making process (Jones & Carter, 2007; Lumpe, et al., 2000). Teachers with low self-efficacy were reluctant to engage in instructional strategies in which they believed they would be unsuccessful, or to use instructional technology in which they did not feel proficient (for additional studies that address self-efficacy, see Sockman & Sharma, 2008; Wood & Bandura, 1989; Yilmaz-Tuzun & Topcu, 2008).

Jones and Carter (2007) reported that teachers with strong self-efficacy overcame constraints in their work environment. They took greater risks and experimented with new instructional strategies. Jones and Carter further reported that teachers who lacked confidence in their content knowledge avoided that content area. Likewise, teachers who

had minimal pedagogical knowledge used only those limited instructional strategies with which they were comfortable. In short, teachers preferred to use pedagogical practices in which they were proficient and to teach content that they knew (Brownlee, et al., 2002; Kang & Wallace, 2005). Teachers forced to implement a curriculum that they were uncomfortable with or that violated their beliefs modified the curriculum, often omitting critical aspects (Clemente & Ramírez, 2008; Cronin-Jones, 1991; Keys & Bryan, 2001).

4.4. Teacher prior experience (prior knowledge)

"Teacher preparation is a brief period of formal study proceeded by a long period of informal learning through teacher watching and classroom participation as a pupil" (Feiman-Nemser & Buchmann, 2005, p. 22). Prior experiences form the foundation on which prior knowledge is built (Bransford, et al., 2000). There is widespread agreement in the literature that prior experiences profoundly influence teachers as they make instructional decisions (Gess-Newsome, et al., 2003; Laughran, 2007; Mundry, 2003). Prior experiences act as filters through which new information and new experiences are interpreted and evaluated. Prior experiences influence the decisions teachers make on a day-to-day basis as they: (1) determine the merit and worth of new information, (2) interpret and makes sense of new information, (3) construct new knowledge and understanding, and (4) determine what to do in the classroom (Feiman-Nemser & Buchmann, 2005).

Prior experiences are the basis on which a teacher constructs her knowledge and understanding of teaching (Feiman-Nemser & Buchmann, 2005; King, 2005a). Feiman-Nemser and Buchmann (2005) suggest that teachers' experiences as students in school

form the basis on which they develop their initial understanding of what it means to teach. In short, teachers tend to teach as they were taught (Davis, 2002; Fishman, Marx, Best, & Tal, 2003).

Knowledge based on prior experiences has been shown to be extremely resistant to change (Trundle, et al., 2007). Evidence suggests that teachers use their prior knowledge to frame their instructional practice. Trundle and associates (2007) found that teachers often used instructional strategies similar to the ones they experienced when they were students. Studies have shown that teachers' prior experiences can convince them that if they were able to learn a certain way, then students will also be able to learn that way (Cronin-Jones, 1991; Laplante, 1997; Smith, 2005; Varelas, et al., 2005).

Smith (2005) found an association between past experiences in science and the teacher's current instructional practice. Specifically, teachers with limited experience in science usually taught science as a series of facts to be memorized. Accordingly, these teachers used instructional strategies that favored transmission of knowledge. Smith also found that teachers with prior experiences in science, even informal science experience, used more constructivist instructional strategies than science teachers without these experiences. Feiman-Nemser and Buchmann (2005) found that teachers often used their own prior experience to explain concepts to students during instruction. Often, the teacher failed to consider that students may not have had the same experience and therefore the example would not help them.

Morine-Dershimer and Oliver (2005) found, as did Leinhardt and Greeno (1986), that a relationship existed between the structure of the discipline and the thought process

used to make curricular decisions. For example, mathematics and science teachers had a tendency to focus first on instructional goals and then choose strategies that would accomplish those goals. English and social studies teachers, on the other hand, tended to focus on the strategy first, and then on the instructional goals. The thought processes that teachers developed as a result of their educational training became part of their prior knowledge and experience and influenced the instructional decisions they made.

The powerful influence of prior knowledge was clearly illustrated in a study done by Feiman-Nemser and Buchmann (2005), in which a teacher's interpretation of a curriculum about migrant workers was largely based on her existing beliefs and past experiences with migrant workers and not on the curriculum itself. When the teacher was asked to explain the curriculum, her explanation was inconsistent with what was actually in the curriculum. Instead, her explanation reflected her prior experiences with migrant workers. This study suggests that teachers accept or reject information based on their prior experiences, asking themselves: Based on my experience, does this seem true? Although prior experiences do not change, new experiences add to prior knowledge (Gess-Newsome, 1999b; Jones & Carter, 2007). Teachers, as active learners, constantly reevaluate, revise, and adjust their beliefs and knowledge in light of new information (Henze, van Driel, & Verloop, 2007; Jones & Carter, 2007).

5. Conclusion

Clearly, the days when it was acceptable for teachers to walk into their classrooms, close the door, and teach what they want to are gone. All indications are that standards-based reform, curricular alignment, district management of the instructional scope and sequence, and high-stakes accountability are here to stay. Further, research shows that teachers are a vital link between the curriculum and student achievement. Nothing in the literature suggests that teachers stop making critical instructional decisions just because the scope and sequence of instruction is decided at the district level. For this reason, understanding what instructional decisions teachers are making in this environment and what factors influence those decisions is essential.

This paper focused on gathering the factors that influence instructional decisions which have been independently identified in the educational literature and organizing them. These factors were clustered and categorized using constant comparative analysis resulting in four general categories: (1) working conditions, (2) pedagogical content knowledge, (3) beliefs, and (4) prior experience.

CHAPTER III

INSTRUCTIONAL DECISIONS OF SCIENCE TEACHERS USING A STANDARDS-BASED CURRICULUM

1. Introduction

Over the past two decades school districts have come under increasing pressure to improve student performance. Most recently, the federal *No Child Left Behind Act of 2002* (NCLB) required states to develop content standards for core subjects in kindergarten through twelfth grade and mandated that states give regular performance assessments to monitor student progress toward meeting those standards (United States Department of Education, 2002). Increasingly, school administrators have taken the decision about the scope and sequence of instruction out of the hands of the teachers and centralized it at the district level (Davis, 2002; Johnson, 2006). While the emphasis on the alignment of the scope and sequence of instruction and on student achievement is appropriate, the role of the classroom teachers who implement the standards-based curriculum (SBC) is not well understood (Schoen, et al., 2003). Numerous studies have suggested that the teacher plays a critical role in how curriculum is used in the classroom and emphasized that the influence of the teacher should not be ignored (Abrams, et al., 2007; Armstrong, 2006; Bencze, Bowen, & Alsop, 2006; Blanchard & Muire, 2005; Cobern, 2000; Cronin-Jones, 1991; Darling-Hammond & Baratz-Snowden, 2005; Loeb, Darling-Hammond, & Luczak, 2005; Marzano, 2003; Richardson, 2007; Schoen, et al., 2003).

2. School reform

Authors of school reform literature present many models, one of which is the "externally developed reform design model" (Datnow, Borman, & Stringfield, 2000; Stringfield, Reynolds, & Schaffer, 2008). This model describes school reforms or improvements that are developed by organizations outside of the school. The SBC in this study is an example of an externally developed reform. Nunnery (1998) suggested that this model, when supported by the district, offers schools the best chance of improving student achievement. Fullan (1999) observed that reform efforts need to address local conditions in order to be successful; therefore, they require a degree of flexibility in the reform design. Datnow and Springfield (2000) further found, "that clear, strong district support positively impacted reform implementation (p. 194). They suggested that these externally developed efforts must integrate teachers, principals, administrators, and the design team as a whole-school effort. The success of a reform, according to Datnow et al. (2000), comes from the combined effort of all the actors at various levels working together to co-construct a whole-school reform imitative.

A continuing body of research indicates that gains in student achievement are accomplished at the level of the teacher, which implies that the role of the teacher in school reform must be considered (Brophy & Good, 1986; Teddlie & Reynolds, 2000). Datnow and Springfield (2000) found that teachers frequently modified reform designs:

> …when a curricular reform is introduced, teachers interpret it in terms of their own ideologies and experiences in the class room. Teachers also (were) bound by what they (felt) they must do to respond practically to their students' needs (p. 170).

Further, in environments where there is high-stakes testing, such as Texas, invariably teachers opted to prepare students for the test over enacting school reform (Datnow & Stringfield, 2000). Therefore, externally developed reforms must allow enough flexibility for teachers to prepare for mandated state assessments (Datnow, et al., 2000).

The way in which a school goes about implementing a reform is critical (Nunnery, 1998; Ross, Stringfield, Sanders, & Wright, 2003; Stringfield, et al., 1997). Schools should not undertake more reform than they can strongly support (Stringfield, et al., 2008). Further, schools need to provide professional development related to the reform to teachers, and this professional development must be ongoing. While Fullan (1999) acknowledged that teaching practices are resistant to change, Fullan also found that intensive professional development did result in changes in teacher practice. In summary, reform literature suggests that school improvement is possible when the reform is well thought out, teachers are actively involved in the process, there are sufficient resources and time allocated to support the reform, capable leadership is present, and the culture of the school changes to align with the reform (Stringfield, et al., 2008).

3. Standards-based reform movement

The modern standards-based reform movement, now entering its second decade, has been central to the policy initiatives developed at the state and national level (Massell, 2008; National Governors Association Center for Best Practices & Council of

Chief State School Officers, 2009). A 2009 report from the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) concluded that standards-based reform initiatives will continue to gain momentum. In this report, Herman (2009) predicted that the next generation of standards would move from standards developed by individual states to a single set of national standards. Already there are calls for voluntary national content and performance standards (Zehr, 2009). In addition, $350 million in federal funds have been allocated to the Common Core State Standards Initiative (CCSSI) through a variety of stimulus investments, including the *American Recovery and Reinvestment Act of 2009* (American Recovery and Reinvestment Act, 2009). Clearly, standards-based reform initiatives have dominated and will continue to dominate the development of school curricula for the foreseeable future.

4. Rationale for standards-based curricular alignment

Improving student performance on state assessments has been a high-stakes issue for school districts throughout the United States. In Texas, for example, chronically underperforming school districts have faced closure (Herman, 2009; Texas Education Agency, 2005, 2006). Studies suggest that student achievement depends heavily on having a well-planned curriculum aligned with both the state standards and the state assessment (Squires, 1998, 2005; Woodward, 1999). In addition, the curriculum must be implemented consistently and coherently across all grade levels (Chapel Hill School District, 2001; Marzano, 2003). By standardizing the scope and sequence of instruction,

districts are able to vertically and horizontally align instruction. Vertical alignment ensures that concepts are taught at the appropriate grade level and then reinforced or built upon in subsequent grades. Horizontal alignment paces instruction within the grade level, ensuring that all of the standards for a particular grade level are covered during the school year.

One function of SBCs is to give specificity to state standards. In Texas, for example, the standards (Texas Essential Knowledge and Skills [TEKS]) provide general guidelines for what students in each grade should know and be able to do (Texas Education Agency, 2009b). However, they do not supply the clarity and the specificity that is needed to build an effective vertically and horizontally aligned curriculum (Herman, 2009; Teacher Education Service Center Curriculum Collaborative, 2009). Clarity and specificity are necessary to avoid inconsistent implementation of the state standards and the resultant instructional gaps in curriculum coverage. However, aligning the SBC with the state standards is not enough; the SBC must also be aligned with the state assessment document. Accurate assessment of student achievement can only be accomplished if the written curriculum and the taught curriculum are also aligned with the assessment instrument (English & Steffy, 2002; Kendall & Marzano, 2000; Squires, 2009). Clearly, a strong argument can be made in support of developing the instructional scope and sequence around the state standards and the state assessment instrument. A well-designed SBC aligns the written, taught and assessed curriculum.

5. Role of the teacher in a standards-based curriculum

Student achievement requires more than a well-planned SBC. To improve student performance the SBC must be consistently and coherently implemented. Teachers have a significant influence on student achievement through the instructional decisions they make in the classroom (Darling-Hammond & Baratz-Snowden, 2005; Duschl, 1989). Bruner and Greenlee (2002) noted that " … aligning the standards and benchmarks of the mandated curriculum with what is actually taught is essential for student success" (p. 24). Achieving consistent and coherent alignment requires that teachers use the curriculum as intended. If teachers make independent decisions to alter the SBC, some of these decisions may create gaps in the curricular continuum and undermine the continuity of the SBC (Squires, 2005). Telling teachers not to deviate from the SBC and ignoring the fact that teachers make independent decisions in the classroom every day simply does not work. Indeed, the futility of disregarding the role of the teacher in curriculum implementation is underscored by a large body of research. (Bryan & Atwater, 2002; Cronin-Jones, 1991; Czerniak & Lumpe, 1996; Haney, et al., 2002; Johnson, 2006; Jones & Carter, 2007; Laplante, 1997). Administrators who want to effectively implement a well-planned SBC need to understand that classroom teachers make independent instructional decisions (as they are trained to do) and that administrative efforts are better placed in the direction of understanding what kinds of decisions teachers are making and what drives these decisions. If administrators understand the instructional decisions made by teachers, they will be able to provide an

informed support structure that assists and encourages the teacher to use the adopted SBC as intended.

6. Problem

District adoption of a SBC is no guarantee that student performance will improve. As previously mentioned, consistent and coherent implementation of that SBC in all grade levels must also accompany adoption. Hall and Loucks (1977) warned that teachers' use of a curricular intervention should not be left to chance. The usefulness of studies that purport to evaluate a curricular intervention, such as a SBC, may be questionable when the role of the teacher as implementer of that curricular intervention is ignored.

Hall and Loucks (1977) argued that to understand how an intervention is being used it is necessary to obtain firsthand knowledge, through classroom observation, of teachers using an intervention. Further, they found that many studies paid little attention to how a curricular intervention was actually used.

> … in most experimental and evaluation studies, the presence of the innovation, the treatment, is taken more on faith than on the basis of systematic documentation. … In many of the change models and studies … implementation of the innovation is assumed once the adoption decision has been made (p. 264).

Fullan and Pomfret (1977) reviewed 15 studies which were published between 1971 and 1977. Twelve of those studies purported to study the fidelity of implementation (defined by them as the degree to which an innovation is implemented as intended). In reviewing

those studies, Fullan and Pomfret noted that researchers often assumed that innovations were being implemented as intended. They found that many of the studies that claimed to be investigating teacher implementation were, in fact, looking at student outcome and not classroom practice.

> There is a singular lack of curiosity about what happened to an innovation between the time it was designed and various people agreed to carry it out, and the time that the consequences became evident. Once an innovation was planned and adopted, interest tended to shift toward the monitoring of outcomes. The assumption appears to have been that the move from the drawing board to the school or classroom was unproblematic, that the innovation would be implemented or used more or less as planned, and that the actual use would eventually correspond to planned or intended use. The whole area of implementation, what the innovation actually consists of in practice and why it develops as it does, was viewed as a "black box" where innovations entering one side somehow produce the consequences emanating from the other (p. 337).

Since these studies were published, a substantial amount of research has investigated the role of the teacher in implementing curriculum. A significant body of literature now exists that demonstrates the pivotal role of the teacher in determining how a curricular intervention is used. Many studies focused on understanding what influenced teachers as they implemented a curricular intervention rather than how the teacher used the curriculum (Ajzen, 1985; Ball & Cohren, 1999; Beason, 2007; Bencze, 1999; Buckley, 2005; Davis, 2002; Duschl, 1989; Gess-Newsome, et al., 2003; Haney, et al., 2002; Ingersoll, 2003; Jones & Carter, 2007; Kang & Wallace, 2005; Laplante, 1997; Nespor, 1987; Richardson, 2007; Shulman, 1986; Yero, 2002; Ziechner, 1994). Consequently, a large number of variables have been identified that are known to influence teachers as they use a curriculum (Jones & Carter, 2007).

Despite the growing number of studies that have looked at how variables like working conditions, pedagogical content knowledge, prior knowledge, beliefs, and the disposition of the teacher influence teachers, few studies have been carried out within the context of a SBC. Schoen and colleagues (2003) reported on instructional practices that enhanced student achievement within the context of a SBC. Kelly (2005) investigated the process of adoption and implementation of an inquiry-based science program in kindergarten through sixth grade. Kelly used the Concerns Based Adoption Model (Hall, 1979) to determine teacher concerns about the curricular intervention. However, the study did not examine how teachers actually used the curriculum. There is a need for studies that investigate firsthand how teachers use a SBC. A SBC that (1) is well designed, (2) is based on standards, and (3) incorporates the most current research on learning, may be of little value in the hands of teachers who do not to use it as it is intended to be used.

The purpose of this study was to understand how six science teachers implemented a district-adopted SBC as evidenced by the instructional decisions that they made. In particular, what decisions did these elementary and middle school science teachers make when using the SBC, CSCOPE?

7. Methodology

7.1. Location of the study and participants

Bluecat ISD (a pseudonym)is located in rural central Texas and has a total enrollment of 950 students. Approximately 58% of the district's students come from economically disadvantaged homes and approximately 45% of the student body is classified as "at risk" (that is, they are in danger of inadequate performance on state academic assessments as defined in NCLB (United States Department of Education, 2002)).

As with many small rural schools, the school functions as the hub of the community and much of the social fabric of the community revolves around football and agriculture. For example, time is taken out of the regular school day when there is a football game so that students can attend pep rallies and/or travel to an away game, and there is no school on the day of the county livestock show. According to one teacher, if school were scheduled for the day of the county live stock show, over one half of the students would be absent (third grade teacher, personal communication, February 18, 2010). Many of the teachers have lived in this community most of their lives and know the students and their parents well. In short, this is a tightly-knit community where almost everyone knows everyone else.

The district employs two science teachers to teach the sixth, seventh and eighth grade science courses. In this district, third through fifth grade are departmentalized; each teacher teaches only one subject area. Kindergarten, first, and second grades

function as self-contained classrooms in which each teacher teaches all core subjects to one set of students (approximately 16 students in each class). There are a total of 12 teachers who teach either kindergarten, first, or second grade.

For this study, six science teachers were selected to participate using purposeful sampling. The two middle school teachers participated in the study, along with the third, fourth and fifth grade science teachers. One kindergarten teacher agreed to participate. Five of the six teachers were female.

7.2. Rationale for qualitative research methods in this study

Qualitative methods were appropriate for this study because of the nature of the research question. Qualitative research methods are ideal for understanding and describing processes, events, phenomena, and/or people (Creswell, 2003). The qualitative paradigm values the relationship between the participant and the researcher (Creswell, 2007). First, the relationship allows the researcher to better understand the phenomenon under study, which increases the researcher's ability to accurately interpret the data. Second, it allows for the interpretation of the data as it relates to the context of the phenomenon (Maxwell & Loomis, 2003). Third, it enhances the likelihood that the data collected will be trustworthy (Creswell, 2003). Each of these aspects assists the researcher to more accurately understand, interpret, and present the data.

The qualitative paradigm also allows for the evolution of the study. Within the qualitative paradigm, the researcher has the flexibility to modify the study as necessary in order to gather the kinds of data needed (Maxwell & Loomis, 2003; Wolcott, 1994). To understand how teachers used the SBC, modification of the research design was

necessary, as was the cultivation of a relationship with participants and the ability to answer a non-numeric question. Finally, the qualitative paradigm values emergent categories. In categorizing the decisions teachers made, categories were developed from the data rather than attempting to fit the data to predetermined categories (Gall, et al., 2005). Qualitative methods were the most logical choice for this study.

7.3. Procedures

Teachers were initially informed about this study through a presentation made at a regularly scheduled departmental meeting. The researcher then spoke with each teacher who expressed interest in participating. Teachers were assured that their responses would be confidential. In particular, the administration would not have access to any of the data collected unless pre-approved by the teacher. Each teacher agreed to perform a member check after the research report was written. All of the teachers who agreed to participate were selected. Once the teachers were selected, the researcher met with each teacher individually to choose a lesson for observation and to schedule the days of observation and the related interviews. This initial interview also provided a mechanism by which the thought process used by the teacher in preparing the lesson could be exposed.

The lessons in CSCOPE are formatted using the 5-E model (Bybee, et al., 2006) and occur over a series of days (typically between four and twenty-one days), so observations were scheduled for a sequential series of days in order that a significant portion of the lesson could be observed. After selecting the lesson, the researcher reviewed the lesson privately and then met with the teacher again. At this meeting the

teacher was asked to go over the lesson with the researcher and explain how he or she intended to teach it. This meeting was digitally recorded. The lesson was then observed in the classroom and a follow-up interview was conducted with the teacher as soon after the lesson as possible. During classroom observation the researcher noted any changes the teacher made to the lesson. Detailed field notes were taken of the sequence of instruction, teacher-student interactions, and questions to ask the teacher, and researcher reflections. These field notes were used to guide the follow-up interview with the teacher. The observations and the follow-up interview were digitally recorded. Using stimulated recall (Calderhead, 1981; Gass & Mackey, 2000), semi-structured interview protocol, (Boeige, 2002; J. Johnson, 2002; Tierney & Dilley, 2002) and the researcher's notes, the teacher was asked to discuss the decisions he or she made while teaching the lesson.

Two different lesson series were observed for each grade level and an average of four classroom observations were made of each lesson taught, for an average of 16 classroom observations per teacher. During observation of the lessons, the researcher remained seated at the back of the classroom and did not interact with the teacher or the students. See Table 2 for a list of research procedures.

Semi-structured interviews were also conducted with the district's curriculum director (pseudonym, Sarah), the elementary school principal (pseudonym, Lynn), the middle school principal (pseudonym, Debra), and the science education specialist from the educational service center that serves this school district. The purpose of these interviews was to: (1) learn how the district came to choose CSCOPE from the

Table 2.
Procedures.

Steps	Procedure
Step 1.	Group meeting with all science teachers, followed by individually contacting each teacher about study participation
Step 2.	Initial teacher interview prior to observation (digitally recorded)
Step 3.	Observation sequence (digitally recorded & field notes)
Step 4.	Follow up teacher interview after observations (digitally recorded)
Step 5.	Constant Comparative Analysis of the data
Step 6.	Member check
Step 7.	Corrections made based on member check
Step 8.	Interview administrative staff (principals, curriculum director, superintendent)

perspective of different administrators, (2) learn about the history and structure of CSCOPE, (3) gain an understanding of how the district expected the teachers to use CSCOPE, (4) understand the training that these teachers had in using CSCOPE and the ongoing support that was available to them, and (5) uncover how these administrators perceived that the teachers were using CSCOPE. All of the data sources used for this study are listed in Table 3, and Appendix E provides the audit trail.

7.4. Data analysis

From the transcribed interviews and researcher notes, phrases that referenced a teacher's decision were highlighted. These phrases were then grouped into one of two categories that emerged from the data, decisions to modify and decisions not to modify. These categories were further divided to reflect what action resulted from the decision.

For example, what did the teacher actually do when he or she modified the curriculum? Decisions to omit a lesson or portion of a lesson formed one category. Decisions to alter the lesson in some way were placed in a second category. These included decisions to delay, re-sequence, substitute, and/or replace lessons or sections of lessons. Decisions to supplement lessons formed the third category.

Table 3.
Data sources used in this study.

Data sources
Teacher observation (notes & digital record)
SBC lessons
Researcher field notes & reflections for each interview & observation
Interview with administrative personnel (digital record)
Interview with educational service center specialist (digital record)
Interviews with teachers (notes & digital record)
Background information on SBC (newsletters, publications, power points and training materials)

8. Results

CSCOPE uses inquiry-based instructional methods (TESCCC, 2008). According to the curriculum director and several of the teachers interviewed, CSCOPE lessons are designed to be more academically rigorous than previous instruction. CSCOPE uses the 5E model to structure instruction and relies heavily on hands-on, participatory classroom

activities. There are no textbooks and little homework. Student understanding is assessed through a variety of traditional and alternative assessments,such as student journals, foldables, presentations, stories, and portfolios. CSCOPE provides teachers with a vertical alignment document and a horizontal alignment document as the basic curriculum framework. In addition, teachers have access to scripted lessons. Even though the lessons are scripted, they are intended to be modified by the teachers to address the individual needs of the diverse learners in their classroom (TESCCC, 2009a).

8.1. Decisions not to modify

This study found that teachers made intentional decisions not to modify CSCOPE based largely on: (1) the support of the administration, (2) the success they had with their earlier lessons, and (3) the teachers' comfort level with content and/or pedagogy. These findings are consistent with studies found in the school reform literature (Datnow, et al., 2000; Ross, et al., 2003; Stringfield, et al., 2008), the adult learning literature (Lowquenberg, Ball, & Cohen, 1999; Mundry, 2003), and the effective professional development literature (Darling-Hammond, 2006; Darling-Hammond & Bransford, 2005; Darling-Hammond & McLaughlin, 1995), will be discussed in more detail below.

Analysis of interviews suggested that seven steps taken by the administration acted as determinants in the teachers' decisions to use CSCOPE as written. First, the district actively involved teachers from core subject areas in the CSCOPE selection process. Teachers accompanied administrators to districts using CSCOPE. During these visits, teachers were encouraged to talk with the teachers at those schools about CSCOPE.

Teachers also participated in the subsequent meetings where the pros and cons of CSCOPE were discussed. In addition, the district provided funds for all teachers who were interested to attend a summer conference held by TESCCC. At this conference, CSCOPE was explained, sample lessons were examined and the participants were encouraged to discuss CSCOPE with other teachers and administrators currently using CSCOPE. In short, the district afforded teachers every opportunity to become familiar with CSCOPE.

> We all knew exactly what we looking at when we got CSCOPE. The (teacher) buy-in was basically already there. … They [administrators] were very upfront about it (Debra, interview I).

Research suggests that effective reform depends on having teachers implement the reforms as intended; therefore prudent reform designers involve teachers in the reform process (Datnow, et al., 2000; Datnow & Stringfield, 2000). Loucks-Horsley (2003) and Mundry (2003) also recommend that teachers be included in curricular decisions to increase teacher buy-in to a reform initiative.

Second, once CSCOPE was adopted the teachers were given full access to CSCOPE well in advance of when they were expected to use it. The administration believed that teacher buy-in was critical, and that in order to get teacher buy-in it was important to give the teachers time to become familiar with and adjust to CSCOPE.

> The districts that had trouble are the districts that had given CSCOPE to their teachers in August and basically said ‘go forth and do,’ and there was bitterness. … It was April before we were able to purchase it and get log-ins for all of our teachers. As soon as we did, I had workshops for them on how to use it and let them play with it. They could use it the last six weeks if they wanted to. ... They had it all summer to play with and plan from. I think that was one of the best

> things you could do for your teachers, give them time. No surprises (Sarah, interview III).

Research suggests that teachers are unlikely to use any curriculum in which they do not feel competent (Bencze, 1999; Clarke & Hollingsworth, 2002; Davis, 2002; Gregoire, 2003; Richardson, 2007). They need time to adjust and become familiar with any change they are expected to implement (Mundry, 2003). Further, transformative learning theory suggests that teachers must be given ample time to experiment with a new intervention in their own classroom and with their own students if transformation in the teacher's practice is to result (King, 2005b; Reed & Black, 2006; Stephens, Hodges, Givvons, Hunt, & Turvey, 2006; Sterling, Matkins, & Frazier, 2007).

Third, the administration communicated to the teachers a vision of shared responsibility for student achievement as a result of implementing CSCOPE. On one hand, the administrators directed teachers to use the new, rigorous, inquiry-based lessons as written and made clear that teachers were still responsible for student performance on state assessments. On the other hand, administrators assured the teachers that if CSCOPE was implemented correctly and district scores on the TAKS test (Texas' state assessment) went down, the administration would share in that responsibility. The importance of the administration sharing responsibility for the outcomes of an innovation is confirmed by findings that teachers need to be confident that they have the support of the administration if they are going to risk implementing a new curriculum, especially one which is a radical departure from previous practice, such as CSCOPE (Darling-Hammond, 2003; Glenn, 2000; Ingersoll, 2003).

Fourth, the administration took steps to provide teachers with the materials and resources they needed to implement CSCOPE. As this inquiry-based SBC depends almost entirely on hands-on classroom activities, the list of necessary supplies is extensive. Before the school year began, all of these supplies were purchased. To accommodate the need for additional supplies during the year, the district opened an account at a local store where teachers could charge necessary supplies to the district. The fourth grade teacher commented,

> So far, they [the administration] have been really good. We knew we were doing CSCOPE in the fall before school ended last year, so we had all that time in the summer to think about it and look at it. We made a fall list before we left at the end of the year of what we would need. [The third, fourth, and fifth grade teachers] went [shopping] right before school started … and then as I needed things, like the honey, I just tell (the principal) what I need and go down to the store and charge it on the account and give them [the office] the receipt. So I haven't had to buy too many supplies (fourth grade teacher, interview I).

Knowing that this SBC required more of the teachers' time to prepare for lessons, the district assigned aides to assist the teachers.

> There are a ton of manipulatives with CSCOPE … So what we tried to do was to make sure that we had a budget that would support any of the extra costs that would be associated with CSCOPE, and they were fairly substantial. Basically we had to go out and make all that stuff, or have somebody make it. We really wanted to take it off the shoulders of the teachers from the standpoint that they wouldn't have to spend a lot of time making those things. So we designated a couple of aides; their job is to make sure those things are made and ready. From a financial standpoint, we used … stimulus funds from the government for supplies (Gerard, interview I).

The kindergarten teacher commented, "I put the stuff in the workroom and they make it for me" (kindergarten teacher, interview I). Despite these administrative efforts, one

teacher noted that in this first year the burden of preparing necessary materials on top of teaching a new curriculum was heavy.

> CSCOPE is a lot of work. The activities! It's just so much preparation when you have two grade levels, switching the stuff out between classes. … I just feel like I'm working my tail off. I really feel like in science we work a lot harder. Every night I do something from home. Every night! If I don't, I'm not going to be totally prepared (sixth grade teacher, interview I).

The educational literature documents many examples of curricular interventions that have failed, not because of teacher resistance, but because administrations failed to provide adequate budgets and time for teachers to prepare lessons (Darling-Hammond, 2003; Feiman-Nemser, 2001; Hanushek, et al., 2004b; Johnson, 2006). The allocation of adequate funds and provision for additional time must accompany reform (Darling-Hammond, 2003; Darling-Hammond & Baratz-Snowden, 2005). Clearly, Bluecat ISD understood this.

Fifth, the district was committed to professional development. Prior to implementing CSCOPE, all administrators and teachers attended professional development on the new curriculum.

> The summer training that we did essentially taught us how to get to the website and how to find the documents. It was not content specific, it was more general curriculum instruction. They did a good job of that. We did that about three times. Obviously, to the point where I was saying I know where these things are, now leave me alone. Now at the service center we have a science specialist. [Every six weeks] she goes through the units and uses her judgment to add to the lessons and provide alternatives like AIMS. The training is really good ... they have been very helpful. It's not so much that what they have given me isn't something I could have come up with on my own, but I feel much more comfortable modifying CSCOPE and knowing that I am staying with the intent of the lesson. I don't have to follow the script. I feel like they [the science specialist at the regional service center] have

> given me permission to use my own judgment (eighth grade teacher, interview II).

In the above quote, the teacher alluded to content training held by TESCCC at the educational service center. The district made attendance at these professional development meetings (called swap meets) mandatory, and they provided release time to the teachers and substitute teachers to cover their classes. Swap meets were held at the beginning of each six-week term. One teacher described the swap meets she attended this way,

> When I go to the workshops she[the presenter] gives us a whole six-week lesson plan. We go over each lesson. She gives alternative activities … you can use. That's been more helpful to me than the conference (third grade teacher, interview II).

At these swap meets, teachers were given an opportunity to ask questions and they left with copies of some of the materials that they needed for the next six weeks. In addition to the swap meets, the curriculum director met with the teachers by content area every six weeks so that teachers could talk across grade levels. At one of these meetings (attended by the researcher), the curriculum director asked if the teachers had any concerns. The third grade teacher confided that her students were not able to distinguish on a paper-pencil test which of four scales correctly represented the weight of two items, yet the students had no trouble showing her using the actual balance. In response, the fifth grade teacher suggested that she have the students draw what they were seeing when they were working with the actual balance. She suggested that this exercise might help the students make the connection between the observed event and the paper

representation of it (Researcher field notes, six-week departmental meeting, January 8, 2010). One principal discussed another goal of these meetings.

> It is important that the teachers see how concepts build from elementary to high school. … Our teachers only see within their own four walls and they don't see … what's going to happen next year or two years from now. … They need to hear it from other teachers (Lynn, interview I).

Fullan (1999) found that intensive professional development could bring about changes in teacher practice and therefore advocated that professional development be part of any school reform initiative. Similarly, Borko et al. (2002) found that teacher professional development was critical to the implementation of the Kentucky school reform effort. Numerous other studies provide a strong argument for the importance of providing professional development and for the benefits that can result (Fetters, Czerniak, & Fish, 2002; Lotter, Harwood, & Bonner, 2006; Loucks-Horsley, 1998; Lowquenberg, et al., 1999).

Sixth, administrators suspected that parents would be concerned about the new curriculum, as this SBC was a radical departure from the way things had been done in the past.

> We also anticipated that there would be some parent issues with CSCOPE because it's a totally different concept than what we've been doing. Homework issues would be different. They don't have textbooks to carry home as they did before. So we knew there would really be some need to educate parents (Gerard, interview I).

With no textbooks, homework at a minimum, and students doing hands-on activities rather than worksheets, it was also more difficult for students to make up work. Grades were determined using a variety of alternative assessments like portfolios, as well as the

traditional tests and quizzes that parents were accustomed to. In anticipation of these concerns, several meetings were held for the community to explain CSCOPE and to answer questions. The curriculum director also visited the local civic groups (Kiwanis, Lions and Rotary) to explain the new curriculum. On the elementary campus, the principal held an interactive meeting in which parents were able to participate in an exemplar lesson similar to the lessons that their children would experience.

Seventh, the campus principals enforced the use of CSCOPE, but also encouraged and supported their teachers as they adjusted to CSCOPE. For example, the elementary principal said,

> I think my job is to be here if a teacher is struggling with a concept, if a teacher needs assistance in her classroom management, with cooperative learning … I need to be able to help her, show her ways to make it work within her classroom (Lynn, interview I).

To clarify how the elementary principal saw her role, she related a story about a teacher who wanted to omit what the teacher believed was redundant material in a lesson. The principal showed her that the "redundant material" was essentially independent practice and was critical in assessing student understanding. The principal also explained that although this activity was similar to an earlier activity in the lesson, the objective of this activity was completely different and therefore should not be omitted.

The middle school principal discussed her role as an enforcer, but also believed she should praise her teachers' efforts.

> I have to oversee and make sure the teachers are following CSCOPE (and) I'm a cheerleader of sorts. … I try real hard, when I do a walk-through and I see something you might need to be doing, I try to put it in a way that is pleasing to the palate for them. I'm not going to jump

> somebody … as long as they're trying to do what they're supposed to be doing (Debra, interview I).

As teachers expressed concern about preparing students for the TAKS test, the elementary school principal realized that they were having a difficult time letting go of the idea that students needed to be drilled, through worksheets, in order to do well on the state assessment. In response, she built a 45 minute time period into the schedule each day in which the teachers could drill students if they wished.

Beyond the support of the administration, each of the teachers in this study indicated that they intended to comply with the district's mandate and adhere to CSCOPE.

> I have tried, being the first year and I want to really give it a chance, you know, and I have tried to kind of stick to it this year. I do digress a little bit, but pretty much I try to stick to it this year. I want to really give it a chance on how it is. ... You know we were told, 'we have a new curriculum and you're going to use it.' So I try to stick by it (sixth grade teacher, interview I).

The curriculum director conveyed the district's policy this way:

> Right now, we have made CSCOPE the total package. It's non-negotiable. We expect our teachers to go into it lock, stock and barrel (Sarah, interview I).

Teachers also made the decision to not deviate because of a lack of content knowledge. Understandably, teachers are reluctant to teach content when they do not feel competent to do so (Beck, Czerniak, & Lumpe, 2000; Czerniak & Lumpe, 1996; Haney & McArthur, 2002).

> I like the fact that it's all laid out for me. Sometimes I don't feel like I have the [science] knowledge … I need to have to be able to teach the kids and I feel a little frustrated (third grade teacher, interview II).

Several teachers said that they followed CSCOPE carefully because it builds on knowledge year to year and deviations would create knowledge gaps.

> I think if you are going to have a curriculum like this that is a building curriculum … it's essential that we're all doing what we're supposed to be doing (fifth grade teacher, interview IV).

When a teacher was not comfortable with a lesson, prior successes with CSCOPE often gave the teacher the confidence give the SBC lesson the benefit of the doubt. One teacher shared this success story during a follow-up interview. Before Christmas break, students had engaged in an activity designed to teach them the concept of sediment movement. A month later, they were asked to use their journals and their memories of the event and write a story. The teacher was amazed at the detailed recollection that the students recorded in their stories. She confessed that when she taught the lesson, she didn't think that the students would remember it and she wasn't sure that the students had even made the connection between the activity and the concept of sediment movement. The detailed accounts in her students' stories convinced her otherwise.

> "… they had Christmas break in between! It just hit home for me. So I think that hands-on and moving and writing it down and having it there a month later, I think that's pretty profound … they had it (fourth grade teacher, interview IV).

Another teacher commented that she usually taught students about the solar system using a different sequence of instruction, but she followed the CSCOPE lesson and realized that the way it progressed through the solar system was better. She believed that her students made connections with concepts beyond those typically taught in a solar system lesson, such as force and motion (fifth grade teacher, interview III). The eighth grade teacher was surprised by the level of engagement he saw in one particular lesson

where students cut out shapes to make a creature; each shape represented a characteristic. The point of the lesson was to understand (1) how the characteristics of an organism affect its ability to survive, and (2) that animals that can adapt to environmental changes are likely to survive. In the follow-up interview, the teacher said:

> Who would have thought 8th grade kids would get so excited about cutting and pasting, but they did and they stayed engaged in learning. I've learned that those are very positive things in the classroom. So that's making me a better teacher. Whether we keep doing CSCOPE or not, I'm going to try to keep incorporating those sorts of things (eighth grade teacher, interview IV).

Finally, another teacher commented that she didn't deviate from CSCOPE because she has been impressed with the deeper thinking that CSCOPE expects of students.

> I think CSCOPE is really going to cause the kids to think deeper about the whys, and even though I try to do that too, sometimes with your kids you want so badly for all the kids to get the basic information that you find yourself lowering standards a little bit (fifth grade teacher, interview III).

She went on to say that CSCOPE keeps her focused on stretching the kids' thinking.

> It makes me a better teacher to those kids that need to be stretched … I like CSCOPE in that it causes me to think about stretching the kids (fifth grade teacher, interview III).

Support for these findings can be found in studies on transformative learning and teacher change. Transformative change in teacher practices requires that teachers experience success using the new practice in the context of their own classroom and with their own students (Borko, Davinroy, Bliem, & Cumbo, 2000; Marsick & Mezirow, 2002; Richardson & Placier, 2001; Rodriquez, 2005). Teachers need to experience for themselves that a reform-initiated change is an improvement over their previous practice (Laughran, 2007; Lotter, et al., 2007).

In some cases, unintentional modifications occurred. These were usually the result of faulty understanding or instructions that were poorly written. Most of the teachers in this study remarked that some of the lesson instructions were difficult to understand.

> I usually start off in first period and I go through it [the lesson] like CSCOPE tells me to and if it is something that I completely don't understand, I just take it out and put something else in. But most of the time it dawns on me by the end of first period. 'Oh this is what they want me to do'. Like the sediment pan the other week. They said to fill the pans half full. For me I thought that meant half way bottom to top … they meant fill half of the pan so that the students could see the sediment move, by fourth period I realized what they meant. … They had pictures drawn for me, but it didn't make sense (fourth grade teacher, interview II).

During one observation, the teacher thought she was following the lesson instructions but was confused. The activity didn't seem to fit the data sheet, so she made changes to the data sheet to fit what she was doing. During the follow up interview, we discussed this section of the lesson and found that she had completely misunderstood the lesson instructions and consequently had unintentionally modified the lesson (fourth grade teacher, interview II).

8.2. Decisions to modify

The modifications identified in this study fit into one of three categories: (1) to skip or omit, (2) to alter, replace or delay, and (3) to supplement. Generally, changes to CSCOPE occurred as a result of one or more of the following four things: (1) pressure the teacher felt to do well on the TAKS test, (2) time constraints, (3) teachers' perception of students' abilities, and (4) dedication to the success of the students.

8.2.1. Skip or omit

8.2.1.1. Pressure to do well on the TAKS test

The changes that teachers made to CSCOPE were often rooted in pressures to do well on the state assessment. This is consistent with the findings of Datnow et al., (2000), whose team found that teachers who were expected to implement school reform initiatives in states with high-stakes testing, such as Texas, generally opted to prepare students for the test over teaching the reform. One teacher referenced a lesson he omitted because he was concerned about the tested concepts he had not yet covered.

> We haven't gotten into the rock cycle, or plate tectonics. … They [students] have had no exposure to those concepts … the kids have at least had exposure to it [the concepts in the week and a half unit I omitted]. By the way, the TAKS test is less likely to have many questions on it [the omitted content] and let's get on to things that are on the test. That's not the way to do it in a perfect world, but sometimes you have to do triage (eighth grade teacher, interview V).

Clearly, teachers in tested years (in Texas science is tested in fifth and eighth grade) felt intense pressure to have their students do well on these tests. One teacher confided,

> I know the girl that was here [teaching this grade] a couple years ago, that had 60% [passing] and she's not here anymore … and I know she felt so much pressure, she was glad that she moved … she was so devastated … when I got the job, my superintendent said, 'I expect great things from the scores now' (fifth grade teacher, interview I).

Another teacher expressed the realities of preparing students for the TAKS test this way,

> We all recognize that the TAKS test is what we live and die by. We may not teach to the test … we teach concepts, but at some point you have to recognize that you have to prepare for the TAKS test, you've got to review, you've got to assess where you are, and you have to

> remediate, and that takes class time (eighth grade teacher, interview IV).

Lessons or portions of lessons that contained information that the teacher believed was not important because it was not tested on the TAKS test were regularly omitted. According to one teacher, the TESCCC representative told the teachers in a swap meet,

> …when you get to this lesson, this isn't tested till [a later grade] so if you're running behind on time … this would be the lesson to skip (third grade teacher, interview II).

With the exception of the kindergarten teacher, all of the science teachers in this study were two to three weeks behind in CSCOPE's scope and sequence. Consequently, the teachers were looking for ways to trim material from CSCOPE. Content that had been previously covered was frequently omitted in the interest of "getting caught up". Two teachers omitted entire lessons; one skipped a lesson series that totaled 28 instructional days in order to get caught up, and the other omitted a lesson series that totaled 21 instructional days. The justification was that the tested content of these lessons had already been covered and there was not time to cover the content that was not tested on the TAKS test.

> I would love to teach this lesson, but I am just so fearful that my children are not going to have what they need before the [state assessment is given] (fifth grade teacher, interview I)

8.2.1.2. Time constraints

One teacher excluded the unit evaluations because time was not built into the scope and sequence of CSCOPE for them and the teacher wanted time to review, re-teach, and if possible to get caught up. Finally, teachers complained that non-academic requirements often took up valuable instructional time. These included things such as

pep-rallies, travel time to games, early release days, red ribbon days, and theme driven campaigns.

> Next year, one of the places we play football is a three and a half hour bus ride. So, I know in junior high on Thursdays when our boys play out of town, my instructional day is over at noon. And on Fridays it's over at noon. Your week's not five instructional days, it's four till football season is over. And then there is basketball… (eighth grade teacher, interview IV).

8.2.1.3. Teacher perception of student abilities

All the teachers made references to the difficulty level of CSCOPE. Teachers perceived that concepts were either not covered in enough detail or that concepts were inappropriately difficult for the grade level or for the students these teachers taught. One teacher commented,

> I don't feel like CSCOPE goes in-depth enough sometimes and then sometimes I get a lesson and it's way over their heads … and so I do make adjustments there (third grade teacher, interview II)

The kindergarten teacher added,

> CSCOPE is really basic. I add stuff to it. I just cram it in. I want my kids to tell time and that's not part of CSCOPE but I think it is important. Also students really need to be adding by the time they get to first grade. ... And CSCOPE don't teach them. CSCOPE also doesn't have any reading stuff in it. It has no phonics. It has students reading sentences, but it doesn't teach how to read sentences beforehand. It kind of expects them to do that. So I supplement [with other curriculum] (kindergarten teacher, interview I).

Sometimes adjustments needed to be made for particular students. For example, one teacher confided,

> I get really frustrated during [a specific class]. I feel like … we don't get through the materials and I shorten it a lot of times because … they're never going to get what [another class] gets. … It's not sinking in (third grade teacher, interview III).

Another teacher explained,

> With the first class, I let them be more like scientists because with this class, they need a little bit more. They don't need to be so much in a box and to be told everything to do. But my last class really needs some clear-cut directions or they're very very lost (fifth grade teacher, interview IV).

Another teacher omitted a more cognitively complex version of an activity in favor of a less cognitively complex version in order to accommodate her lower performing students. Still another teacher skipped the calculation component of a microscope lab because of concern that the students would get bogged down in the math and miss the main science concepts.

> I didn't use their CSCOPE material and I'll tell you why, in the lesson, students have to calculate the magnification for the microscope. You know, it is really important, but with some of these kids math skills are so low, they are going to get bogged down and frustrated with some mathematics that have nothing to do with the concept we're working on. If we want them to understand that there are levels of organization, they're going to miss all that because they can't figure out how to multiply 40 times 30 or something. (eighth grade teacher, interview III).

8.2.1.4. Dedication to the success of the students

There were a number of modifications that teachers made for special needs students. They generally fell into the category of supplements rather than omissions to the curriculum and so are addressed in the section on supplements. CSCOPE does not make any specific modifications for special-needs students. Rather, TESCCC values the teacher as the appropriate person to individualize instruction to meet the needs of diverse learners. In summary, when the teachers believed that the curriculum was not going to help their students be successful, they did not hesitate to modify CSCOPE. Analysis of

teacher interview transcripts suggested that these teachers believed it was their responsibility to insure that their students were successful in: (1) passing the state assessment, (2) being prepared for future grades, (3) developing self-esteem, and (4) developing adequate skills to be successful as adults. Studies on teachers' epistemological beliefs support the powerful influence of what a teacher believes (Beck, et al., 2000; Brownlee, et al., 2002; Haney, et al., 2002; Jones & Carter, 2007). Further, teacher beliefs have been found to be extremely resistant to change (Beck, et al., 2000; Brownlee, et al., 2002; Haney, et al., 2002; Jones & Carter, 2007; Kagan, 1992; Luft & Roehrig, 2007; Lumpe, et al., 2000; Olafson & Schraw, 2006; Pajares, 1992). The eighth grade teacher summed up what he believed to be his responsibility as a teacher,

> My job is to teach science. My job is to get them ready for high school and a chance to be successful in high school, and learn science (eighth grade teacher, interview II).

As long as teachers perceived that CSCOPE enabled students to be successful in one or more of these areas, they used it as intended.

8.2.2. Alter, replace, or delay

Teachers altered or replaced portions of the SBC based on: (1) classroom management issues, (2) student interests, and (3) resources available.

8.2.2.1. Classroom management issues

One teacher altered a lesson on environmental adaptation because of classroom management concerns. Both his prior experiences managing his classroom, and the pedagogical knowledge he has about classroom management influenced the way he chose to implement this particular lesson. The lesson was intended to show how

populations decline under adverse environmental conditions. Each student had created a paper creature with specific characteristics. As these creatures died off (unhappy creatures) because they could not adapt to changing environmental situations, CSCOPE called for the students to sit down. The teacher commented,

> If the unhappy creatures aren't doing something, they're going to find something to do in the classroom; probably not what I want them to do. So I've got to give them something to keep them busy. So I had the unhappy creatures mate too (eighth grade teacher, interview III).

As a result, the students stayed engaged in the lesson. The teacher provided clarification to the students at the end of the lesson about what would have really happened to the unhappy creatures, because he understood that the modification he made could have conveyed a misconception to the students. Likewise, other studies found that teachers use their pedagogical content knowledge (Gess-Newsome, 1999a) to make decisions about how to implement curriculum. In another instance a teacher declared, "This is not a CSCOPE day!" When asked what the comment meant, the teacher pointed to the bad weather outside and referenced power outages and the snow that fell the day before and said that the students would be wild. In fact, this comment was made by several of the teachers observed that day. These teachers believed that students were too "wound up" to participate in the hands-on activities associated with CSCOPE lessons.

The presence of substitute teachers presented another classroom management issue. All of the teachers agreed it was difficult to leave CSCOPE lessons for substitute teachers. Because of the hands-on nature of the activities, the time involved in setting

them up, and the inclination of the students to misbehave when there was a substitute, these teachers abandoned CSCOPE in favor of textbooks and worksheets for substitutes.

> Substitutes and CSCOPE at this point in time I'd say they're incompatible, and part of it's a discipline issue. I would never ask a sub to try to teach one of these CSCOPE lessons because even though they are scripted, I think you still need to be an expert in your content to try to teach the content. … For the time being, I would do a good old chapter in the book … and they did a good old worksheet. I know that's not the best pedagogy, but when I'm not here it's a way to keep the blood off the floor while the sub's here (eighth grade teacher, interview III).

8.2.2.2. Dedication to the success of the students

Several of the teachers altered, replaced, or delayed lessons because they believed that it was in the students' best interests to do so. Studies on teacher beliefs reveal that teachers are heavily influenced by what they believe students are capable of doing (Metty-Scallon, 2006; Zohar & Dori, 2003) and by their epistemological beliefs (Brownlee, et al., 2002; Luft & Roehrig, 2007). In one situation, the middle school teacher who teaches 6th and 8th grade chose to replace one 8th grade lesson on energy transformation with a 6th grade lesson on the same subject.

> I thought the 6th grade lesson was marvelous and the 8th grade lesson … was terribly confusing … so I just taught the same thing to 8th grade (eighth grade teacher, interview III).

8.2.2.3. Teacher perception of student abilities

Teachers also modified lessons from class to class based on the specific needs of the students in those classes. Teachers commented that some classes required more structure, modeling, and repetition, while other classes seemed to grasp concepts easily and students were able to work with minimal guidance.

> We have to teach who we have. So I think sometimes that's where we get behind in CSCOPE. You have to fill in some blanks. You have to, I don't want to say dumb it down, but you have to give some background information or at least alter the language to a context that some of these kids understand better, and that takes time (eighth grade teacher, interview II)

The fourth grade teacher recalled an activity where students were learning about the layers of the earth. In this activity the students were digging through layers of an artificial archeological dig. As part of the activity, students were to excavate artifacts and then create a possible scenario about the events that may have occurred.

> It [the lesson] took longer than I thought it would take, I added in a few things. I had them take notes and share their story and that made it take a little longer. I wanted to keep them focused on the group that was talking and to keep them actively involved in listening because they knew that they were going to have to write it down, and the other reason was just so they could reiterate what they had done in their own dig. They found this artifact first and that artifact second. And what those clues could tell you about that place. That was really hard for them to get that concept. I found an anchor and ship parts, what could that tell me about the place? I had to do a lot of helping. There was probably water at one time. CSCOPE was really hard for them at the beginning of the year, they weren't thinking for themselves (fourth grade teacher, interview II).

In one situation, a teacher changed the purpose of the activity. The activity was originally an evaluation piece, but the teacher changed it into guided practice. He felt that the students needed to have the thought process modeled for them and they needed practice applying the concept in an authentic situation. In this activity, the students were to throw dice to select an environmental condition and then they were to decide what the effects of this environmental condition would be on their creature and what adaptations would have helped it to survive. Rather than use a random toss of the dice, he decided to

provide a more likely and logical progression of events (forest to drought to forest fire). As a class, the students discussed how this change in environmental conditions would affect the different creatures. The teacher said,

> I felt like the students were going to need a little guidance into how these changes in the environment led to adaptations in the organisms, so we used the Promethium board and we started with that normal condition of the forest and then I just … assigned the change (eighth grade teacher, interview III).

Another teacher used the ideas and interests of the students to frame class discussion during a lesson on inheritance; she believed it was more important to address students' questions and interests than to follow the prescribed scope and sequence of CSCOPE.

> They [students] were interested … and they had questions [about inherited traits] and anytime they ask questions I don't think you ought to just ignore it. Usually anytime I teach genetics I go over all of that (but) it was not in CSCOPE, it was stuff I added. I am going to add questions about it on my test even though it's not on the CSCOPE assessment (sixth grade teacher, interview I).

In another case, the teacher re-sequenced a lesson to avoid creating the misconception that fossils are found in igneous rock. In this lesson, both volcanic layering and fossils were discussed. As a result, she took out the section of the lesson that dealt with fossils and planned instead to cover it in a lesson on sedimentary rock. Other teachers used unit assessments as bell work (independent work students did while the teacher took attendance) and reviews.

> I think using the CSCOPE unit assessments as bell work is a good way to have kids on task while I'm doing all the stuff at the beginning of the period, checking roll and such. It's stuff that I am going to test them over, (and) it's TAKS test formatted questions so I feel like it's good to

> prepare them for their test. (The principal) likes us doing bell work too (Sixth grade teacher, interview I).

Without exception, all of the teachers in this study adjusted lessons based on what they believed their students were capable of doing and/or needed to do in order to be successful.

There were a few circumstances in which teachers decided to delay lessons. For example, teachers were reluctant to start a new lesson on Friday because their prior experiences convinced them that the students would not remember the material the following Monday. Literature on teacher change suggests that a teacher's prior experience has a profound influence on his or her practice (Bencze, 1999; Richardson, 2007).Teachers also delayed instruction in order to comply with administrative directives such as participating in themed events like "no bullying" or "drug free week", or to give benchmark tests. Teachers at the junior high are required to give benchmark tests every six weeks. One teacher delayed CSCOPE three days because of benchmark testing; one day was spent reviewing for the test, a second day administering it, and a third day going over the results of the benchmark with the students. This three day delay in CSCOPE fueled the teacher's anxiety about being behind and running out of time to cover tested material before the state assessment was given. Literature on teacher working conditions shows that administrative mandates can and often do interfere with instructional practices (Hong, 2001).

An administrative mandate to incorporate technology also fostered deviation from CSCOPE lessons. This district had been awarded a large technology grant from which each student, fourth through twelfth grade, was provided a laptop computer. The

teachers were encouraged to integrate as much technology into their lessons as possible. As the lessons in CSCOPE had very little technology embedded in them, in order to comply with administrative directives to use the new technology teachers had to alter, replace, or supplement lessons. Teachers believed that the technology embedded in CSCOPE was substandard, so they rarely used what CSCOPE provided. According to the ESC science specialist, CSCOPE was designed so that it could be used successfully by districts with minimal resources (ESC science specialist, interview I). As a result, teachers often replaced the technology applications in CSCOPE with technology resources they found on the internet or that they already had in their own collections. For example, teachers asked students to create power points to represent what they had learned rather than asking students to record what they had learned in their science journals. Other teachers used the Promethium boards as an instructional tool to augment CSCOPE lessons. Still others had students create music videos and books.

8.2.3. Supplement

This study found that there were a number of situations in which teachers felt it necessary to supplement. These were: (1) to increase the depth to which concepts were covered, (2) to accommodate the needs of diverse learners, (3) to prepare for the state assessment, and (4) to deal with time conflicts.

8.2.3.1. Increase depth of content

All of the teachers in this study supplemented CSCOPE for one reason or another. One middle school teacher added content about genetics to a lesson on environmental adaptation because he believed that students needed to review basic genetics concepts in

the context of environmental adaptation. According to this teacher, this lesson provided a natural connection between two concepts that students often see as unrelated; genetic inheritance and survival and/or adaptation within an environmental system. This deviation suggests that the teacher's pedagogical content knowledge and beliefs about how students learn caused the teacher to override the lesson script and alter the lesson. Following are several additional examples of instances where the teachers' pedagogical content knowledge overrode CSCOPE lessons.

One teacher introduced additional vocabulary into her lessons because "it was logical [to add the additional words]" (fourth grade teacher, interview II). In a lesson where only one example of the concept of sequencing and progression was provided, the fourth grade teacher carefully selected additional examples which would make sense to her particular students because she did not believe that one example was sufficient for her students to grasp the concept. This same teacher supplemented a lesson on changes over time by having her students diagram their life as a time line in the same way that layers of the Earth represent time: bottom to top.

8.2.3.2. Teacher perception of student abilities

Teachers also supplemented CSCOPE based on the perceived needs of their students. One teacher commented that it was necessary to spend time supplying background information to students so that they could understand the lesson.

> You have to fill in some blanks…. You have to give them some background information or at least alter the language to a context that they understand ... and that takes a little time (eighth grade teacher, interview IV).
>
> .

Teachers added test-taking strategies, reviews, vocabulary, and content from prior grades in order to prepare students for the TAKS test.

> I've got to fill these gaps. If they [students] had been doing CSCOPE for four years then (by now) they would have had everything they needed. (fifth grade teacher, interview II).

Most of the teachers acknowledged that they supplemented CSCOPE with resources that they felt were more appropriate for their students. For example, one teacher felt that the unit assessments in CSCOPE were too difficult for most of the students and she was concerned that they would feel like failures and give up, so she added some simple questions to each assessment so that all of the students would be able to answer at least some of the questions correctly.

> Some kids are just hanging on by a thread just to get to school, their home lives are horrible, school is the safe place, it's where they feel successful. … Some of the evaluation pieces I might not agree with, but that's okay, and I change these tests a little bit, I add some things to them. Basic knowledge. Just simply because it is hard for kids to make a 60. For kids who are use to getting A's to make a 70 or a 60 it does something to their self-esteem. I think they need to be pushed. I think they need to see areas of growth, but I don't think we need to beat up our kids because we make the test [CSCOPE unit assessment] so hard (fifth grade teacher, interview I).

8.2.3.3. Prepare students for the TAKS test

Teachers supplemented CSCOPE to help students prepare for and do well on the TAKS test. One teacher spent time teaching test-taking strategies and revisiting concepts through games and other activities. When a concept covered in CSCOPE was a tested concept, teachers admitted that they spent more time reviewing and also added additional examples to be sure students understood the concept in the context in which it

was likely to be tested. Teachers also supplemented CSCOPE with worksheets that were formatted like the TAKS test in order to familiarize students with the testing format. Teachers commented that sometimes CSCOPE did not cover tested concepts in enough depth, and therefore these teachers felt it was important to supplement those areas with additional materials. Several teachers complained that CSCOPE didn't build in time to review or re-teach. "If there is one weakness in CSCOPE, there is no room built in to … prepare for the TAKS test and review" (eight grade teacher, interview III). This teacher spent an entire instructional week having the students disaggregate their own practice test to see what areas they needed to work on.

> After Christmas we did our benchmarking. I created a benchmark analysis form. I showed them how to find their weaknesses by objective and student expectation. This week I created a quiz for every single student expectation that I teach. I do this because everything I hear when I go to workshops is that students need to take ownership of their own education. If you do your own evaluation and you look at your test and did your own analysis for yourself and you see for yourself areas that you are struggling in. I am seeing ownership from the students. I have to take class time to do this. When they look at their folder they are studying for themselves, not for me. I think it is important (eighth grade teacher, interview IV).

Regardless, teachers took the time they needed and supplemented as necessary in order to expand on heavily tested content. They also took the time they needed to accommodate their special-needs students. One teacher commented, "I won't leave these children behind just to follow a curriculum that may be moving too fast" (fifth grade teacher, interview IV). One teacher found it necessary to supplement the SBC with additional examples because many of his students had limited prior knowledge which limited their ability to grasp concepts.

> Some of my middle class students travel and have life experiences and things they bring to class with them and can just dive into the lesson, and then some of these students live troubled lives (and) do not have experiences that they can draw on and it's hard for them (eighth grade teacher, interview I).

8.2.3.4. Time constraints .

Most of the teachers abandoned CSCOPE for a time when grades were due. They had students watch instructional videos or do worksheets so that they could have the time they needed to submit grades.

> We had progress reports due on Monday and I was like, I just need a day to get caught up, to get grades in and so that day I gave them the video to watch. … Sometimes you think well, this isn't part of CSCOPE and you almost feel guilty for doing that, but it went with our lesson (sixth grade teacher, interview II).

9. Discussion and conclusions

This study found that even with teacher buy-in, solid administrative support, and the intention to strictly adhere to CSCOPE, teachers modified CSCOPE because of: (1) pressure the teacher felt to do well on the TAKS test, (2) time constraints, (3) teachers' perception of students' abilities, and (4) dedication to the success of the students. The teachers in this study communicated that they believed it was their responsibility to comply with administrative mandates, yet the study also suggests that they did not relinquish their autonomy with respect to how instruction was delivered. Despite an explicit directive to use CSCOPE without alteration during this first year of implementation, the teachers omitted, altered, replaced, delayed and/or supplemented

CSCOPE in one or more of these situations: (1) unspoken pressure for students to do well on the TAKS test, (2) pressure to "get caught up" with the scope and sequence of CSCOPE, (3) the need to comply with conflicting administrative directives (to give benchmark tests or to incorporate technology, for example), (4) real-world situations (holidays or freak weather), (5) a perceived disconnect between CSCOPE and student ability or knowledge gaps, and/or (6) a perceived disconnect between CSCOPE and what would make students successful.

The district's insistence that teachers use CSCOPE without modification was in conflict with the intent of CSCOPE itself. TESCCC's position is that the teacher should adapt and supplement the lesson to meet the needs of diverse learners. The district's rationale for asking teachers to not modify CSCOPE was that many of teachers were not familiar with the rigorous, inquiry-based instructional approach embedded in CSCOPE. Further, administrators believed that many of their teachers were teaching to the state test rather than to understanding of the concepts of the state standards. The district's decision to require all teachers to use CSCOPE as written during the first year was an effort to improve the quality of instruction district-wide. In effect, the district was using CSCOPE as a training tool for teachers who were not accustomed to student-centered, hands-on instruction that focused on conceptual understanding. The district hoped that requiring teachers to use the inquiry-based SBC as written would help them learn to teach this way. The administration intended to allow teachers the flexibility to modify CSCOPE as soon as it was confident that its teachers had learned to teach to the level of rigor necessary to master the state standards.

Analysis of the situations in which teachers made intentional decisions to deviate from CSCOPE showed that many of the teachers' decisions were consistent with the intent of CSCOPE. CSCOPE lessons encourage teachers to make the changes needed to accommodate the needs of their learners. The modifications identified in this study were made because teachers believed the changes would benefit the students by preparing them to pass the state assessment, and/or by preparing them for future grades, building self-esteem, or developing adequate skills to make them successful adults. In that sense, the modifications made by these teachers were consistent with the intent of CSCOPE. Teachers are trained professionals who interact with their students on a daily basis. Their prior experiences inform their current practice and influence their instructional decisions (Abell, 2007; Beijaard & Verloop, 1996; Grossman, 1990). CSCOPE was intended to provide specificity to the state standards, and trusts the teachers as the professionals in the classroom to make the necessary adjustments to accommodate the needs of their specific learners.

CHAPTER IV

ONE DISTRICT'S DECISION TO ADOPT AND USE A STANDARDS-BASED CURRICULUM

1. Introduction

The purpose of this case study is to examine the concerns that ultimately convinced Bluecat Independent School District (ISD) of the need to align their curriculum and manage it at the district level (Bluecat ISD is a pseudonym). This case study also chronicles Bluecat's search for a standards-based curriculum (SBC) and their adoption and implementation of the SBC called CSCOPE (Teacher Education Service Center Curriculum Collaborative, 2010). This paper is organized into the following sections. Section 2 offers a historical perspective on the standards-based reform movement beginning with the landmark report entitled, *A Nation at Risk: The Imperative for Educational Reform* (National Commision on Excellence in Education, 1983). Section 3 provides an overview of the curriculum component of CSCOPE. Section 4 describes the methodology for this paper. Section 5 provides a narrative account of the district's story from the perspective of the curriculum director. Sections 6 and 7 present the combined perspectives of the superintendent, the elementary school principal, and the middle school principal. Section 6 discusses the problems that ultimately led Bluecat ISD to standardize their curriculum at the district level. Section 7 discusses the implementation

of CSCOPE. The last section (Section 8) presents the researcher's synthesis and comments.

2. A historical perspective

In 1983 a landmark report entitled, *A Nation at Risk: The Imperative for Educational Reform*, shocked the nation by declaring that schools in the United States were not producing students capable of competing in a global society (National Commision on Excellence in Education, 1983). The report concluded that instructional rigor must be increased and that in order to do this, measureable standards must be established. Although minimum competency standards were in place in the 1980's, there were no content standards specifying what students should know and be able to do in a given content area (Squires, 2005).

In response to this report, in 1989 the National Council of Teachers of Mathematics published content standards for Mathematics for kindergarten through twelfth grade (Woodward, 1999). Over the next eight years, other national professional associations published content standards in their respective disciplines. These efforts were reinforced and partially funded by *Goals 2000: Educate America Act of 1994* (Goals 2000) (Horn, 2004; Squires, 2005; United States Department of Education, 1998). However, not until the federal *No Child Left Behind Act of 2002* (NCLB) were states required to develop content standards for core subjects (English language arts, social studies, science, and mathematics) for kindergarten through twelfth grade(United States Department of

Education, 2002). In addition, NCLB required that states assess progress toward student mastery of these content standards (DeBoar, 2006; United States Department of Education, 2002).

National science literacy goals for high school graduates were first proposed in 1989 by the American Association for the Advancement of Science (AAAS) in the publication *Science For All Americans* (AAAS, 1989*)*. In 1993, AAAS published *Benchmarks for Science Literacy* (AAAS, 1993*).* This publication provided clear statements about what students should know and be able to do in science. These publications influenced the National Research Council (NRC) as it developed the *National Science Education Standards* (NSES). The final draft of the NSES was released in December of 1995 (National Research Council, 1996, 2000; Woodward, 1999). The Texas Education Agency (TEA) adopted state standards for science in 1997. These standards, called Texas Essential Knowledge and Skills (TEKS), are based on the NSES and went into effect in September of 1998 (Charles A. Dana Center, 2010). In 2009, the science TEKS were revised and will go into effect in the fall of 2010 (TEA, 2009b).

In 2003, the Texas Assessment of Knowledge and Skills (TAKS) test was adopted by the TEA and replaced the Texas Assessment of Academic Success (TAAS) test, which had been in place since 1991. The TAAS test required students to use basic thinking skills such as identifying and locating facts and solving simple problems. The TAKS test, on the other hand, required students to use more complex thinking skills such as applying, analyzing, and evaluating. Students in Texas must pass the TAKS test in all core subject areas in order to graduate from high school. Because the TAKS test is

considerably more rigorous than its predecessor, school districts across Texas have been looking more closely at their instructional scope and sequence and the level of instructional rigor in the classroom. In the fall of 2011, the TAKS test will be replaced by what TEA refers to as an even more rigorous state assessment called the State of Texas Assessment of Academic Readiness (STAAR) (TEA, 2010).

The TEKS provide the general framework of what students need to know and be able to do in Texas schools. However, they do not provide specificity to these general concepts. For example, the second grade Earth and Space TEKS reads, "The student knows that the natural world includes earth materials. The student is expected to observe and describe rocks by size, texture, and color …" (TEA, 2009b). Teachers planning instruction are left to wonder a number of things, such as: (1) what kinds of rocks should students be familiar with, (2) do students need to differentiate between igneous, sedimentary, and metamorphic rock, (3) what should students know about textures, colors, and sizes of rocks, and (4) what is an age-appropriate observation and description for a second grade student?

In the past, districts expected teachers to translate the TEKS into a specific curricular scope and sequence and then design lessons aligned with that scope and sequence. However, because the TEKS are not specific, teachers interpreted them differently. Consequently, instruction differed from teacher to teacher and from grade to grade. The result has been inconsistency in what students are taught. Inadvertently, teachers often failed to teach concepts that were tested on the TAKS test in sufficient depth. The result was low test scores, and teachers were blamed for not teaching students

what they needed to know. To improve TAKS test scores, many teachers simply resorted to teaching to the test rather than teaching concepts.

With increasing accountability pressures and awareness of instructional gaps, administrators began rethinking policies that required teachers to design their own curricular scope and sequence. As a result, districts began to assume the responsibility for the curricular scope and sequence of instruction (Davis, 2002; Johnson, 2006). This has proven to be an enormous challenge for districts, especially those with limited financial and/or human resources. To deal with this challenge, districts look for existing curricula that (1) provide specificity to the TEKS, (2) provide a scope and sequence based on this specificity, and (3) align the written, taught, and tested curricula. In short, districts want a SBC that accurately interprets the TEKS, encourages instructional rigor, and is aligned with the TAKS.

3. CSCOPE

CSCOPE was released in 2005 by the Texas Educational Service Center Curriculum Collaborative (TESCCC). As of May 2010, 19 of the 20 regional educational service centers (ESCs) in Texas have partnered with TESCCC and offer CSCOPE to the districts they represent. In total, these ESCs represent the 1235 public school districts across Texas and of these districts, over 700 have adopted CSCOPE (superintendent, interview I; Texas Education Agency, 2009a) .

3.1. The program

CSCOPE is an online SBC aligned with the TEKS. CSCOPE purports to incorporate current research on best practices based on the work of English and Steffy, Marzano, and Wiggins and McTighe (English & Steffy, 2002; Marzano, 2003; TESCCC, 2008; Wiggins & McTighe, 1998). TESCCC considers CSCOPE to be a living document that is continuously revised and updated. CSCOPE is described by the TESCCC as a "comprehensive, customizable, user friendly … system" focused on improving student performance through the instructional practices of teachers (TESCCC, 2008; 2010, p. 2). The CSCOPE curriculum consists of several documents: (1) the vertical alignment document (VAD), (2) the horizontal alignment document or year at a glance (YAG), (3) the instructional focus document (IFD), (4) the TEKS verification matrix, (5) exemplar lessons based on the 5E model (Bybee, et al., 2006), and (6) unit assessments. Each is explained in more detail below.

3.2. Vertical alignment document (VAD)

The vertical alignment document (VAD) provides the instructional plan for the year by grade level and by subject area. Content is divided into six-week segments. Each six-week segment identifies which of the TEKS are covered and the specificity needed to align those TEKS with instruction. At the most basic level, the VAD is the CSCOPE curriculum.

According to a representative for CSCOPE, some administrators choose to use only the VAD and ask their teachers to design their own lessons using the VAD. Administrators also use the VAD to (1) develop appropriate benchmark tests, (2)

monitor instruction to insure that the correct content is being taught at the appropriate time, and (3) give new teachers a document that details district expectations for what they are to teach and when they are to teach it (ESC science specialist, interview I). For teachers, the VAD (1) clarifies exactly what they are to teach and what their students are expected to learn, (2) allows them to see the relationship of concepts across grades, and (3) allows them to choose appropriate resources and instructional strategies. A sample VAD document can be found in Appendix A.

3.3. Horizontal alignment document (YAG)

The horizontal alignment document is the pacing document referred to as the YAG (year at a glance). This document provides a snapshot of the entire year's instructional sequence for a given subject (e.g., sixth grade science). Administrators and teachers like to use it because it (1) provides a concise outline of the instructional scope and sequence for the year, and (2) allows the instructional pace to be monitored (ESC science specialist, interview I). A sample YAG can be found in Appendix B.

3.4. Instructional focus document (IFD)

CSCOPE provides teachers with an Instructional Focus Document (IFD) for each unit in a given six week period. IFD's combine two or more TEKS into a logical sequence for instruction. TESCCC (2008) suggests that efficient bundling of related TEKS provides teachers with the time they need to thoroughly present concepts while also ensuring that students have the time they need to learn. Performance indicators included in the IFD assist teachers in designing lessons at the appropriate level of rigor. The IFD also contains several other pieces of information that teachers can use as they

design their own lessons. These include (1) how many instructional days the lesson should take, (2) common student misconceptions, (3) key student understandings, (4) guiding questions, (5) resources, (6) vocabulary, (7) links to professional development webcasts, and (8) links to the unit assessment, exemplar lessons, and related standards for other grade levels. A sample IFD can be found in Appendix C.

3.5. TEKS verification matrix

The purpose of the TEKS verification matrix is to ensure that all of the TEKS are covered for a given grade level in the instructional year. These documents are used by administrators and teachers to verify that all of the TEKS are covered, and to provide documentation for those who are concerned that all required state standards are addressed. TESCCC does not provide a sample TEKS verification matrix and because CSCOPE is copyrighted, no copy of a TEKS verification matrix can be provided.

3.6. Exemplar lessons

Exemplar lessons are the instructional component of CSCOPE. According to TESCCC, they are designed with three purposes in mind. First, they provide guidance on what effective lessons should look like. Second, they provide questions that emphasize critical thinking at the appropriate level of instructional rigor. Finally, they inspire creativity in the teacher as they see alternative instructional approaches in the exemplar lessons. Exemplar lessons are not intended to be the only lessons teachers use; rather they are designed to serve as examples and guides for teachers as they develop their own lessons (TESCCC, 2010b).

Exemplar lessons provide teachers with (1) background information, (2) the specific TEKS being covered, (3) necessary vocabulary, (4) a list of needed materials and resources, (5) instructions on how to prepare for the lesson, (6) rubrics, (7) links to web resources, and (8) a script of the lesson based on the 5E model. For a sample exemplar lesson, see Appendix D.

3.7. Unit assessments

Unit assessments are designed to measure student mastery of the concepts taught in a CSCOPE lesson. Although they are formatted as TAKS-like test questions, they are not specifically aligned with the TAKS test, so in that respect they do not serve as an indicator of success on the TAKS test. They are designed to be flexibly applied by school districts. For example, unit assessments can be used as a formative or summative assessment. They can be graded or ungraded, completed individually or completed in groups. TESCCC's position is that to realistically assess student performance educators must use assessments that go beyond the TAKS, such as the unit assessments and student portfolios. Further, students learn through rich experiences and opportunities to experiment, explain, interpret, apply, and self-assess. The function of the unit assessment is to assist teachers in evaluating the extent to which these goals are met. TESCCC does not provide a sample unit assessment.

3.8. The role of the teacher in CSCOPE

TESCCC values the teacher as an expert in the art of teaching. As such, teachers provide the expertise and knowledge to deliver effective instruction. Teachers use their creativity to craft lessons and make the many minute-to-minute decisions required to

orchestrate instruction. In short, the teacher's knowledge of (1) students, (2) pedagogy, and (3) content, allow her to design effective instruction (TESCCC, 2008). Teachers are also the pedagogy experts in the classroom; they (1) understand how students learn, (2) have the ability to construct a variety of learning experiences that target the needs and interests of their students, and (3) provide opportunities for students to construct their own meaning through experiences.

TESCCC acknowledges not only the critical role of the teacher in delivering instruction, but also that teachers have differing abilities and levels of expertise. In order to ensure that instruction is consistently and coherently implemented, TESCCC provides a variety of supports in CSCOPE for teachers from novices to veterans (TESCCC, 2010a). TESCCC acknowledges that the experienced teacher is usually aware of how their students make connections between concepts. These teachers can use this knowledge to (1) design relevant and challenging tasks, (2) pose thought-provoking questions, and (3) assist learners in conceptually understanding the content. They continuously monitor students in order to (1) adjust and accommodate the needs of students, (2) address misconceptions, and (3) teach appropriate metacognitive strategies. Finally, experienced teachers model learning when they (1) make their thought process visible through strategies such as think-aloud protocols, and (2) use a variety of learning strategies with their students (TESCCC, 2008). These teachers may only need the instructional scope and sequence portion of CSCOPE. At the other end of the professional continuum are teachers new to the profession or those teaching outside their field of expertise. These teachers often lack content and/or pedagogical skills. For these

teachers, TESCCC provides a number of supports in CSCOPE, including (1) background content knowledge, (2) scripted lessons, (3) activities and resource links, and (4) performance indicators.

TESCCC has provided a framework, through CSCOPE, that allows administrators and teachers the flexibility to use CSCOPE as they feel is appropriate. Administrators confident in the abilities of their teachers can opt to use only the VAD. Administrators who want to provide assistance to teachers who may be struggling have access to scripted exemplar lessons that will guide and support these teachers.

4. Method

This case study is a descriptive single-case case study organized in a linear-analytic manner (Creswell, 2007; Yin, 2003b). This study is bounded by (1) the events that led a small central Texas school district (referred to by the pseudonym Bluecat ISD) to adopt a SBC called CSCOPE, and by (2) the first year of implementation. In narrating this case study, pseudonyms are used rather than the participant's real names.

Data collected for this study included artifacts published on the TESCCC website, interviews with key Bluecat administrators including the superintendent, the elementary and middle school principals, six science teachers, the curriculum director, and the educational service center (ESC) science specialist (TESCCC, 2010). Two months after the initial interviews, follow-up interviews were scheduled with each of the

administrators. In addition, information gathered from a CSCOPE leadership conference and CSCOPE professional development (swap meet) was used.

I began this study by interviewing the curriculum director. I asked her to recall the events that led to the adoption of CSCOPE. I also asked her what the district policy was with respect to how the teachers were to use CSCOPE. Finally, I asked her to comment on the first year's implementation. Following the interview, I scheduled a series of classroom observations to learn how the teachers were using CSCOPE. I also wanted to understand the school culture and the people. I wanted to see and hear for myself how the CSCOPE adoption was unfolding.

5. The curriculum director's perspective

This section profiles the perspective of the curriculum director (pseudonym, Sarah). Her perspective was selected to provide an overview because, as the superintendent put it, "she was the catalyst in the process". Sarah also provided the most useful and complete accounting of issues and events related to the curriculum at Bluecat ISD. She recalls the problems that faced the district, and the events that ultimately led to the adoption of CSCOPE.

Three specific experiences convinced Sarah that Bluecat ISD had a systemic problem with curriculum and instruction. The first experience occurred in 2003 while Sarah was an English teacher on the middle school campus. The state of Texas was

transitioning from the Texas Assessment of Academic Skills (TAAS) test to the Texas Assessment of Knowledge and Skills (TAKS) test (TEA, 2009b). Sarah recalled,

> … all of our campuses began to see the need [to address our curriculum] when we moved from TAAS to TAKS. We were doing very well in the TAAS era, but the TAAS era didn't require the critical thinking skills that TAKS has required. … The first year of TAKS our scores were not great. I began to see a problem. … That was [also] when I began to realize how it [curriculum] all built on itself (Sarah, interview I).

The results from the first year TAKS test convinced Sarah, and the other administrators, that the current practice of allowing teachers to individually interpret and teach their grade level TEKS was inadequate. For students to be successful on the more challenging TAKS test as well as being prepared for the rigors of college, Sarah believed that the curriculum needed to be uniformly interpreted and taught kindergarten through twelfth grade.

The second event Sarah recalled involved her daughter, who was a middle school student at Bluecat ISD. Sarah was disappointed in her daughter's apathy toward learning. She was puzzled that her daughter could receive A's on her report card and do well on the TAKS test but conceptually understand so little. Sarah was disturbed by how much her daughter didn't know that she should know. A year would pass before Sarah would come to understand why her daughter was doing so well in school and on the TAKS test but had learned so little.

The third event involved a friend of Sarah's who had taken a teaching job in a large district. When the two got together, the friend showed Sarah a curricular alignment

document that she was given when she was hired. The document specified what the district expected her to teach in each six-week period. Sarah recalled,

> They had handed her this paper and it said, in this six weeks this is what you will cover. And that made me think, when we have teachers that come into [our district] we don't have anything to hand them. … It took away the guess work. … I really came to see that we are missing the boat here, we are not telling our teacher, by grade levels, what that student expectation means specifically. … I saw that the bigger districts had specificity for their teachers. Whereas, when I was in the classroom here, it was best guess for me. It was like, you are on your own, figure it out (Sarah, interview II).

In 2004, on the heels of the first released TAKS test, the teachers at Bluecat ISD began to look for ways to improve their TAKS scores. The elementary campus took steps to begin to vertically align their curriculum. Sarah recalled that this proved to be extremely time consuming and difficult and ultimately was unsuccessful. The following year (2005-2006 school year), Sarah became the curriculum director. Sarah thought back,

> As I began to work and train in curriculum and learn about curriculum, I became concerned that we had some real gaps in our alignment. Sometimes there were gaps in [the] vocabulary used. Also, in not knowing what specifically was supposed to be presented in each grade level, because the TEKS are very vague. I began to realize that even though our teachers were teaching the student expectations, they might be leaving something out and the low socio-economic students have trouble with those gaps. One teacher teaches something and the next teacher may present it another way and many of the kids couldn't handle that (Sarah, interview I).

To begin to address this concern, Sarah focused first on the reading program in kindergarten, first, and second grade. At that time, each of these grades was using a

different phonics program. She got the teachers together and as a whole they decided to use the same program. Sarah remembered,

> The success of that program led me to really see what can happen when you take the gaps out, when you get vertically aligned. The success of that program really made me want to find a way to vertically align the others. … I began to get an idea of what I wanted to see happen, and that was to add specificity to each student expectation…. So we tried to take those steps that elementary had started … we made plans that summer to … vertically align the curriculum district wide (Sarah, interview I).

However, Sarah realized that many of her teachers did not know how to add specificity to the TEKS. She looked for examples to show her teachers what it meant to add specificity to the TEKS and in the process found CSCOPE's website. Sarah tried to buy only the curriculum portion of CSCOPE (the VAD), but TESCCC only sold CSCOPE as a complete system and the cost was prohibitive for Bluecat ISD.

In the 2006-2007 school year, the elementary teachers continued their struggle to vertically align their curriculum. The middle school campus, on the other hand, adopted the Kilgo curriculum (Kilgo, 2010). This curriculum consisted of a scope and sequence aligned to the TEKS. On the middle school campus, teachers created notebooks where they compiled lessons that fit with Kilgo's scope and sequence.

Also during the 2006-2007 school year, Sarah attended a curriculum audit workshop. As a result of this workshop, she realized that in spite of all the efforts being made to align their curriculum, they were still coming up short. "I began to see, we don't have what we need here. We are just scratching the surface. If we were to be audited they would say, 'you are lacking so much.'" That same year, Sarah also attended a curriculum boot camp given by John Craine. Sarah recalled,

> He made me realize that the biggest thing we were lacking was the specificity in the student expectations. What does this mean for a first grade teacher? What does this mean for a second grade teacher? That was what I began to look for. I would like to have bought it [John Craine's curriculum specificity] but we didn't have the money (Sarah, interview I).

Sarah went on,

> Instead, I began to have my teachers, for two years in a row, pick three student expectations, 'here is a sample, and I want you to write specificity for it [the student expectations]'. And they were really trying, but I realized that we were spinning our wheels. And I got really frustrated. That's when I wrote a letter to the service center and said, 'I feel like we have a real need, small districts can't do this alone (Sarah, interview I).

Sarah began to realize that in addition to the curriculum problems, the district also had instructional problems. "I felt like instructionally we were missing out by not teaching concepts. We were missing out on students learning conceptually." Sarah recalled hearing Lynn Erickson, a curriculum design specialist, speak at a conference given by the Texas Association of Supervision and Curriculum Development:

> When I heard Lynn Erickson speak about conceptual teaching, the light bulb went off and I thought this is what my kid missed, [referring to her daughter] this is why she doesn't understand what science really is. … As far as science was concerned, she saw science as a bunch of facts that she had to spit out for a test and then forget (Sarah, interview II).

Enthusiastically, Sarah brought in speakers to try to help her teachers understand what it meant to teach conceptually, but they just were not getting it. Sarah recalled one comment made by a frustrated teacher, "Just tell me what you want me to say, and I'll say it." Sarah realized she needed to tackle the two problems one problem at a time. She decided to start with the curriculum.

As mentioned earlier, Sarah had contacted the ESC to help solve their curriculum problem. In response, the ESC gathered all of the curriculum directors in the region together for a meeting. At that meeting, it became obvious that all of the districts were facing the same problem. The ESC then brought in samples of three standards-based curricula as well as representatives from each of the curricula for the district curriculum directors to review: CSCOPE was one of them. After listening to the CSCOPE presentation, Sarah realized that CSCOPE addressed both the curricular and instructional problems that faced her district. At the conclusion of the meeting, the curriculum directors made the decision that, if they were going to adopt one curriculum region-wide, they wanted it to be CSCOPE. As a result, the ESC made the decision to partner with TESCCC. As a partner, the ESC was able to offer CSCOPE at a reduced cost. This made CSCOPE affordable for the districts in their region.

Once the district had tentatively decided on CSCOPE, the superintendent and the curriculum director looked for districts to visit that were currently using CSCOPE. They chose the first district for two reasons. First, it had a similar demographic make up to the Bluecat district. Second, after using CSCOPE for one year the state rating of the district had improved from unacceptable to recognized. The second district they visited was recommended to them as a district that had used CSCOPE for three years and was successful despite a number of mistakes. For example, this district handed CSCOPE to their teachers during in-service, a week before the teachers were expected to use it. They made implementation of CSCOPE optional for campuses that had a rating of recognized, resulting in a number of problems for the district. Finally, this district did not make the

necessary budget allowances when they adopted CSCOPE. Clearly, Bluecat ISD had much to learn from the mistakes that district had made.

The superintendent and curriculum director delayed making an announcement about their interest in CSCOPE. They understood that teacher buy-in was essential. They believed that, as Loucks- Horsley (1998; 1999) reported, teachers are more likely to buy into a reform if they are included in the decision-making process. To that end, they invited some of their teachers to visit schools where CSCOPE was being used. They wanted to give their teachers an opportunity to see CSCOPE for themselves and to talk to other teachers. As Mundry (2003) pointed out, teachers need to be given opportunities to work through the kind of dissonance that a radical change in curriculum can bring about.

> We never did come right out and say, 'this is what we are going to do' until we had taken some teachers to various campuses to see CSCOPE in use [and] so that they could talk to teachers. … When we determined that this was something we were definitely going to do, we had a night where we asked all of our teachers to come up in the evening and we also opened it to parents and the community and [a district using CSCOPE] came and did a program on CSCOPE. I also did a program on CSCOPE for every civic organization just to get the word out to the community, so that people would know that this was a really big thing (Sarah, interview II).

When they made the decision to implement CSCOPE in all core subjects and at all levels kindergarten through twelfth grade, they also decided to mandate that teachers use the CSCOPE exemplar lessons as they were written. Sarah explained the reason for that decision this way,

> If your teaching … is at a certain level then you have the luxury to play around with the lessons. … We did not have the luxury to allow latitude the first year. … Our teachers came at the end of the

> first six weeks [after they had used CSCOPE for six weeks] … and said, 'I understand what you mean, I see now, I have not been teaching with this level of rigor, I don't know how to teach like this (Sarah, interview II).

In effect, the district used the CSCOPE exemplar lessons as a training tool to teach their teachers how to teach on a more conceptual level. Sarah went on to explain the district policy with respect to how teachers were to use CSCOPE during this first year.

> We have made CSCOPE, the total package, non-negotiable. We expect our teachers to go into it lock, stock, and barrel. Because, I think they need to learn to teach for 21st century learning and CSCOPE forces a 21st century classroom. So we have asked our teachers to go into it totally, so that they can learn. … This is not necessarily how teachers were taught to teach. It's kind of a relearning kind of thing. … We are asking them, at least for the first couple years, to use the script until they learn how to teach like this. Then in a year or two we won't have to be so strict (Sarah, interview I).

Sarah explained further,

> We knew it [using CSCOPE] would be a scary thing, especially for our teachers in tested years. The gaps really show up the first year; it's not until the second year that those gaps really start closing so it's a scary thing. Also we have teachers who have always traditionally stopped what they are doing in February and done only TAKS review after that. With CSCOPE you shouldn't have to do this (Sarah, interview I).

Sarah explained that she expected her principals to communicate the district expectations to the teachers in this way,

> You are first of all responsible to do what you are asked to do, and you are asked to do CSCOPE. And so if you have done CSCOPE correctly then at the end of the year when test scores come out and they are not good then [you'll be okay]. I think we have communicated also that it's your classroom, you are responsible for the test, you give benchmarks, you know where your kids are. Just

> because we are doing CSCOPE, that doesn't take away from your responsibility to know where your kids are and if they need remediating (Sarah, interview I).

In reflecting back over the first year implementation, Sarah expressed satisfaction with how the CSCOPE implementation had gone. Though the changes were too late to affect her daughter (who graduated that spring), Sarah was confident that CSCOPE was the right move for her district.

> I think we did the right thing, first of all. We were very well aware when we went into this that we would see gaps. Gaps were going to show up. But that needed to happen. Teachers needed to see that what they were doing was causing gaps. …We knew that it would be two or three years down the road before those gaps would really close. …We had some real improvement in scores [on the TAKS test]. In some areas we had 100% passing. That's phenomenal! We had some high percentages in our commended scores as well. … All in all, I have to say I am very pleased with what CSCOPE has done and how things are going so far. But along with that you have to understand, never did I think this was an end. We chose CSCOPE on the basis of the curriculum it offers, but in order for us to get where we needed to be, we had to include the instruction. This year what we have to do is go back to the curriculum, to the vertical alignment. [We need] to understand the specificity and to see how the concepts progress from year to year. We still have work to do. They need to learn to plan from the vertical alignment document (Sarah, interview IV).

Sarah went on to explain the indicators that she used to draw her conclusions about the district's first year using CSCOPE.

> I am pleased with what I have seen in the students. Students are engaged in learning. When I go into the classroom and see students learning and asking questions, I'm pleased. I am pleased with teachers who at the beginning of the year in staff meetings after school said that their students couldn't pass the unit assessments and in January they are saying 'they are getting it, they are getting it'. I am pleased when I see special-ed students engaged in learning (Sarah, interview IV).

The preliminary results for the fifth grade and eighth grade TAKS scores for the district showed considerable improvement in all but one area, sixth grade math. Sarah explained that 60 percent of the content in sixth grade math is presented and tested in the same year. She felt that the scores suffered, in part, because they had two first year teachers teaching sixth grade math this year and their classroom management wasn't where it needed to be.

On the fifth grade science TAKS test, the overall district scores went from 83 percent passing in 2009 to 94 percent passing, with 34 percent of the students scoring commended in 2010. On the eighth grade science TAKS test, the scores went from 68 percent passing in 2009 to 93 percent, with 31 percent of the students scoring commended in 2010. Sarah was quick to point out that some of those differences have to do with changes in scoring at the state level, and that some of the differences may have resulted from differences in students from one year to the next. However, the increases in the district's scores were significant enough to satisfy Sarah that CSCOPE was making a difference.

The next two sections expand on Sarah's perspective through the voices of the superintendent, the elementary principal, and middle school principal. These sections are organized around four themes. The first section (Section 6) identifies the issues that led Bluecat ISD to search for a standards-based curriculum. The second section (Section 7) chronicles the implementation of CSCOPE.

6. Issues that led to the search for a standards-based curriculum

Administrators at Bluecat ISD had been aware for some time that curricular changes needed to occur. They were concerned that their most promising students struggled with the academic rigor of college and often found themselves unable to pass their college classes. Teachers, for the most part, were left to determine what content to teach, how to teach that content, and when to teach that content. Teachers did not coordinate between grade levels. Gaps in students' knowledge became obvious as state accountability standards increased. The district instituted a number of measures to try to align the curriculum, but ultimately they were unsuccessful.

The discussion begins with the thoughts of the superintendent (pseudonym, Gerard). When Gerard became superintendent in 2004, the school board had already made it a district goal to develop an aligned curriculum kindergarten through twelfth grade. Gerard recalled, "Most of these board members had kids that were in school, and some of those kids were struggling with concepts especially when they got to high school; particularly in math and science". Looking back, Gerard recalled some additional reasons,

> We really felt like we didn't have any vertical alignment and we were searching for ways to find that. We looked at different programs, but none … seemed to satisfy …. The board felt like teachers were doing their own thing and when kids moved from one grade level to another we saw gaps. We were seeing more and more gaps as time went on. And as accountability standards tightened, we felt we had to work way harder on the secondary level to get the kids to a level where they could pass and meet those accountability standards. It wasn't that we felt like elementary was doing a bad job, it was just that we felt like the gaps were increasing as those

> kids went along; they were missing out on some things (Gerard, interview I).

Gerard recalled that there had been attempts in the past to align the curriculum, but these had been unsuccessful,

> The previous curriculum director had tried to get the teachers together [to vertically align the curriculum]. That tended to turn into a blame game [with one teacher blaming another teacher]. What it really did was seem to create some conflict and bad feelings between campuses. …We began to see a need to manage the curriculum at a district level instead of at a campus level (Gerard, interview I).

The elementary principal (pseudonym, Lynn), said that one of the biggest indicators they had that something needed to be done about the curriculum was the large number of students who went off to college and failed their classes and dropped out within the first semester.

> We looked at our college success rate, and our smart kids were failing out in one year. Our valedictorians and salutatorians were not being successful in college, so we knew that we had a problem. We had known for years that our curriculum was weak. Everyone still depended on the textbook. Even though we'd say only 40 to 60 percent of the TEKS are covered. That leaves a huge chunk not covered. But teachers tend to use the books, it's easy, it's safe, it's there, 'I don't have time to do anything else anyway'. Or they [teachers] give a whole bunch of TAKS worksheets. It drove me insane. They [Teachers] assumed that if they [used] the textbook that the TEKS would be covered (Lynn, interview II).

Lynn went on to point out that her campus performed well on the TAKS test, but she was just as quick to point out why.

> We had grade levels that were doing TAKS worksheets from day one… we had great scores; we were in the 90th percentile. We were teaching [students] how to be good test takers; we were using all kinds of skills to teach how to take a test. They [Teachers] taught

> them how to pass a test, but haven't taught them the concepts. … I'm willing to see our TAKS scores drop from recommended to acceptable if I know the kids are getting the concepts (Lynn, interview II).

Lynn addressed another problem that faced Bluecat ISD, which was the frequent transfer of students (for personal or economic reasons) from one district to another and then back. She suggested that not only would a district curriculum be helpful, but that a region-wide curriculum would be the best solution.

> We live in a society where kids are moving all the time from district to district to district. And if every district is using a different textbook there are huge gaps because most [teachers] start in chapter 1 and then go to chapter 2, and not every textbook follows that same concept in chapter one. So you've got kids that has huge gaps, because, bless their hearts, those kids didn't have any choice, mom and dad move every three weeks. They get evicted and move, they get evicted there and move, they get evicted and they move to the next town (Lynn, interview I).

The middle school principal (pseudonym, Debra) echoed many of the concerns that Lynn had expressed. Students on Debra's campus also transferred from district to district on a regular basis and students at the middle school also had huge knowledge gaps. These gaps in what the students knew made it difficult for them to master concepts at the middle school level and consequently students were not prepared for the rigors of the high school curriculum. Further, Debra believed it was impossible to close knowledge gaps when students were moving in and out of the district. She offered another reason why the district favored adoption of a SBC. Debra recognized the enormous amount of time that teachers on all campuses were investing in the horizontal and vertical alignment efforts. She recalled the difficulty that the teachers had in trying to put specificity to the TEKS (Debra, interview II). To ease the burden for the teachers on her

campus, Debra adopted the Kilgo curriculum in 2006-2007, but even that was ultimately unsuccessful in producing an aligned curriculum.

> [Lynn's] teachers worked really hard [at aligning the grade school curriculum], it was very labor intensive. … We adopted the Kilgo curriculum so we didn't have to do all that work upfront ourselves, but the teachers still had to create the lessons from the Kilgo objectives. … it was still very labor intensive for the teacher. One of the things we always had difficulty with was how do you tell that's sixth grade level and that's eighth grade level? How do you tell the difference? How do you tell where seventh grade starts and … I'm not an expert in [curriculum alignment]. I sure don't know and the teachers didn't feel comfortable doing that either [putting specificity to the TEKS] but that still was what they had to do. They had to do that and then make sure they were teaching, all the special-ed kids, and all the kids in between. We were asking brand new teachers to come in and write curriculum and that's not a good thing. So it was very hard and very labor intensive for them …We did that for a couple years. Then [the superintendent] said, 'we are still finding gaps'. … [The superintendent and Sarah] started working really hard on vertical alignment. My poor teachers had to meet with the elementary teachers and then they had to meet with the high school teachers. That was very labor intensive and very time intensive. We spent a lot of time and effort on that, but we were just doing an okay job on that. There were still a lot of gaps (Debra, interview II).

Developing a district curriculum in-house proved to be too big a task for Bluecat ISD. Despite their best efforts, they were unable to develop a curriculum and close the knowledge gaps in their students. The district made the decision to look for and adopt a SBC package (see Table 4 for a summary of the CSCOPE adoption process).

Table 4.
Adoption of CSCOPE**.**

Issues that led to the adoption of CSCOPE
1. Teachers were not teaching kids to think, they were teaching to pass the TAKS
2. Teachers relied on the textbook to cover the TEKS
3. Teachers did not know how to teach conceptually
4. Teachers were teaching the same concept differently and to differing levels of complexity; this created gaps
5. Teachers do not know how to develop curriculum and they did not have time to develop curriculum
6. Student transferred from district to district; this created gaps
7. Students were not successful in college

7. How the district implemented CSCOPE

When the administration adopted CSCOPE, they made the decision to implement it kindergarten through twelfth grade in all core subject areas. Further, they made the decision to mandate that all teachers use CSCOPE without modifying it for the first year. Debra recalled that principals from other districts cautioned them not to give teachers a choice with respect to using CSCOPE.

> They told us, 'you don't need to give them a choice, if we were smart we would have said, not here is a curriculum you can use if you want to, it's here's a curriculum you are to use. Period. We listened real closely to that, and I think that has helped a lot (Debra, interview II).

The administration knew that teachers would be concerned that TAKS scores would fall. To ease those concerns, the administration communicated to the teachers a shared responsibility for the TAKS test scores. This was done (1) by the superintendent during

in-service days at the beginning of the school year, (2) through departmental meetings with the curriculum director, and (3) in personal communications between the teachers and their principal.

TESCCC offers extensive professional development to administrators when they adopt CSCOPE. One of the purposes is to make administrators aware of potential roadblocks they will face as they implement CSCOPE. Administrators are advised about issues they should anticipate and prepare to address, such as the need to (1) increase the budget, (2) send teachers to professional development on a regular basis, (3) allow teachers adequate time to become familiar with CSCOPE, and (4) allocate additional preparation time for teachers to organize lessons. The next section outlines the proactive steps that Bluecat ISD took to ensure successful implementation of CSCOPE.

The administration was convinced that in order for CSCOPE to work, they needed teacher buy-in. They understood that to get teacher buy-in, the teachers had to see for themselves that CSCOPE was the right curriculum for the district. Gerard commented,

> This is not going to work if you don't have 100 percent buy-in. The gaps will continue. If you have the first and third grade teachers doing CSCOPE and not the second grade teachers, you are going to have gaps (Gerard, interview I).

To that end, before the administration ever announced their desire to adopt CSCOPE, they invited teachers to accompany them on site visits to districts where CSCOPE was currently being used. Teachers were encouraged to talk to the teachers at these districts and ask questions. Gerard recalled that resistant teachers were intentionally invited, as were teachers considered to be lead teachers on each campus. These teachers were also asked to attend district meetings and to provide their ideas with respect to the adoption

of CSCOPE. Debra recalled, "We all knew exactly what we looking at when we got it [CSCOPE]. The buy-in was basically already there. … [administrators] were very upfront ..." Lynn summed up the rationale for taking teachers on site visits.

> We all know that change is going to be hard for anyone. We wanted them [teachers] to buy into it and we also knew that they need to hear it from other teachers. Not just, 'we went and saw it and this is what we thought.' We honestly felt like the more information they had about it [CSCOPE], the more comfortable they would feel in implementing it (Lynn, interview I).

Another step that the administration took was to make CSCOPE available early, so that teachers had ample time to look at it and adjust to it. Administrators had been cautioned by other districts not to hand CSCOPE to the teachers in August and expect them to use it. Teachers would need time to become familiar with CSCOPE. This is consistent with what Mundry (2003) reported: teachers need time and support to resolve the kind of dissonance that results from a radical change in the curriculum. Sarah recalled that as soon as the district was able to purchase CSCOPE in the spring of 2009, she began to hold professional development for her teachers to familiarize them with the curriculum. The teachers were given access codes and encouraged to explore and use the exemplar lessons with their students before CSCOPE would be implemented in the fall. This too is consistent with Mundry's (2003) assertion that teachers, "need to have direct experience seeing how the method works with their own students" (p. 129).

The administration was cautioned about the costs associated with CSCOPE. There were a substantial amount of materials, supplies, and resources that the district needed to purchase. Gerard recalled,

> There are tons of manipulatives with this, tons of them. So what we tried to do was make sure we had a budget that would support any of the extra costs that would be associated with[CSCOPE, and they were fairly substantial. We had to go out and make all that stuff or have someone make it. We wanted to take it off the shoulders of the teacher. … From a financial standpoint, we received some stimulus money from the government. We earmarked that … for CSCOPE … for the supplies. … We've made sure we have enough subs [so teachers] can go to the swap meets at the service center. … We are encouraging teachers, again, to go to the summer convention … whether they went last year or not. If they want to go, we would like for them to go (Gerard, interview I).

Administrators anticipated that there might be concerns among parents and the community. CSCOPE was a drastic change from what they had come to expect. For example, textbooks would not be used on a regular basis, there would be very little homework, grades would be more subjective and be based in part on group work, and it would be more difficult to make up missed work. To prepare parents and the community, campus meetings were held and Sarah spoke to civic groups in the community. In addition, the principals fielded parental concerns throughout the school year rather than the teachers. Lynn recalled that she had parents come to her with concerns about their children. Some teachers who were resistant to CSCOPE had stirred parents up and told them that their children were not being prepared for the TAKS test. To address those concerns, Lynn held a meeting with the parents where she engaged the parents in a model CSCOPE lesson so that they could see what their child was expected to do (Lynn, interview I).

Finally, administrators were aware that CSCOPE would require a significant time commitment on the part of their teachers. To help offset this, the administration allowed the teachers to use all of the staff development days to plan the 1st six weeks (Sarah,

interview III). In addition, five early-out days were scheduled at the beginning of each six-week term for teachers to plan. Early-out days are days when students go home at noon and teachers have the rest of the day to work without interruption. Finally, on the elementary campus, an aide was assigned to help teachers copy, cut, laminate, and make sets of manipulatives. Table 5 provides a summary of the administrative actions.

Table 5.
Administrative actions.

Proactive administrative actions
1. Communicated shared responsibility for student achievement
2. Provided adequate financial support to purchase supplies and hire aides
3. Scheduled additional time for teachers to prepare lessons
4. Addressed concerns of parents and the community
5. Included teachers in the decision-making process
6. Provided teachers with adequate time to become familiar with and adjust to CSCOPE
7. Supported teachers at the campus level
8. Committed to send teachers to CSCOPE professional development

8. Conclusions

Bluecat ISD incorporated many of the suggestions found in the school reform literature related to the adoption of a new curriculum. Datnow and Stringfield (2000) summarized these suggestions into eight essential components of successful school reform: (1) All actors involved in the reform should have a well thought out and defined

set of shared goals for the reform. Bluecat ISD administrators shared a vision of improved student achievement through curricular alignment and enhanced instructional rigor; these were the goals of the SBC reform initiative that they adopted. (2) These goals should be long-term and have a whole-team focus. Bluecat ISD adopted CSCOPE reform knowing that it would take several years to accomplish their goals. Further, the district made it a priority to achieve buy-in not only from teachers, but also from the rest of the community. That is, they made an effort to include all actors who would be involved in the process (teachers, administrators, community, and reform designers). (3) Districts need a plan for disseminating information about reform implementation. Because Bluecat ISD is a small district, disseminating reform information was done through a series of campus and district level meetings, through the local newspaper and by word of mouth. (4) Schools must engage in a critical evaluation of what change is needed and why that change is important. Bluecat ISD had critically evaluated their needs over a period of years and had a clear vision of what reforms were needed and why. (5) Reform designers must build the reform to affect the whole school and fit within the local context of the school. They must see teachers as more than the implementers of reform, they must view teachers as assets and collaborators. The reform designers for CSCOPE (TESCCC) adopted by Bluecat ISD acknowledge the vital role of the teacher as an informed implementer of the curriculum, who must be depended on to make the necessary adjustments to the curriculum to meet the needs of diverse learners (TESCCC, 2010). (6) There must be ongoing support and leadership from the design team and the district. The designer for the Bluecat ISD's SBC provides ongoing

professional development for teachers and administrators in the form of swap meets held every six weeks, conferences, and on-line access. However, they leave it to the individual districts to determine how much of CSCOPE reform design is used. (7) School policies must be aligned with the reform. The adoption of CSCOPE did align with Bluecat ISD policy. (8) The success of the implementation depends of the flexibility of the design to adjust to local policy and teacher influences. The reform designer for CSCOPE encourages district administrations to use as much of the reform curriculum design as they deem necessary and encourages teachers to adjust lessons to meet their needs.

There is a movement in the United States toward developing national academic standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2009). Gerard and Sarah believe that Texas will adopt a state curriculum that will give specificity to the TEKS in the future. They suspect that CSCOPE is a likely choice for that state curriculum. One reason is that it has already been embraced state-wide**.** As of May 2010,over half the in Texas have adopted CSCOPE. Further, TESCCC intends to submit CSCOPE for state adoption as an approved online textbook (TESCCC, 2010). An obvious advantage of an online textbook is the ease with which it can be revised and updated. Bluecat ISD found it important to adopt the same curriculum as all of the other districts in their region because of the number of students that transfer in and out of these districts. It would be valuable to know just how large a concern student transfers are across Texas. If the numbers are significant, a strong case could be made in favor of a single statewide curriculum.

Debra indicated that Bluecat ISD was looking for a curriculum that (1) was vertically and horizontally aligned, (2) included instructionally rigorous lessons, (3) provided professional development for their teachers, and (4) would be used by all of the districts in their region. CSCOPE appears to be a more than satisfactory solution.

Gerard estimated that it will be two to three years before they are able to determine whether CSCOPE has solved their curriculum problems. He believes that the benefits will become evident at the elementary level before they are seen at the secondary level. Gerard commented,

> The ultimate evaluation will be when the kids get to high school, will we have to spend the amount of time we have had to spend in the past to try to accelerate those kids to the level where they can be successful in high school and college (Mr.Green, interview I).

In the meantime, Gerard indicated that they will monitor students' grades, motivation, and scores on the state assessment (TAKS is being replaced in the 2011-2012 school year with twelve end-of-course examinations collectively called STAAR, for State of Texas Assessment of Academic Readiness (TEA, 2010)) to assess the success of CSCOPE.

CHAPTER V

CONCLUSIONS

1. Introduction

The format of my dissertation is non-traditional. In this format, Chapter I (the introduction) and Chapter V (the conclusion) are similar to a traditional format, but Chapter II (traditionally a review of the literature), Chapter III (traditionally a research methodology), and Chapter IV (traditionally a presentation of results), differ significantly. These three chapters are replaced by three papers formatted as publishable journal articles. Each of these articles makes up one chapter of the dissertation and focuses on one aspect of the research. The first paper (Chapter II) identifies the factors that influence instructional decisions which are scattered throughout the educational literature and consolidates them into four categories.The second paper (Chapter III) examines the instructional decisions made by six science teachers in Bluecat ISD during their first year of using CSCOPE (TESCCC, 2010). The third paper (Chapter IV) is a case study chronicling the selection and adoption of CSCOPE by Bluecat ISD. Chapter V brings together the components of the dissertation into one cohesive whole. My personal reflections and thoughts are also included in this chapter. Chapter V is divided into the following sections: (1) tying it all together, (2) changes to the study, (3) curious contradictions, (4) significance of the study, (5) further research, and (6) concluding remarks.

2. Tying it all together

This section revisits the research questions presented in Chapter I.

2.1. Research question #1

Can the factors that influence instructional decisions which are scattered throughout the educational literature be consolidated into manageable, representative, and useful categories? Prior research suggests that at least four categories of factors (working conditions, pedagogical content knowledge (PCK), prior experience, and beliefs) influence teachers as they make instructional decisions (these factors are discussed in more detail in Chapter II). Decisions are often the result of a complex interaction between factors. This interaction and the resultant decisions are often context-specific. Given the prominence of the standards-based reform movement and the trend toward district adoption of SBCs, it is important to identify not only what instructional decisions teachers make within this context, but also what factors influence those decisions. If administrators know what factors influence teachers' decisions, they can anticipate and identify areas in which teachers are likely to need support.

I found evidence that the four categories of factors identified in Chapter II (working conditions, PCK, prior knowledge, and beliefs) were influential in the decisions of these teachers. Time constraints (a working condition) proved to be one of the most prominent factors in the instructional decisions these six teachers made. More often than not, time constraints led directly to teachers' decisions to omit significant portions of CSCOPE lessons. Even though the teachers intended to use CSCOPE without modifications, as the

district asked them to, when they began to be afraid that they would not have time to (1) cover the material, and (2) prepare students for the TAKS test, they opted to prepare students for the TAKS test and made significant modifications to CSCOPE.

However, the influence of teachers' (1) epistemological beliefs, (2) beliefs about their role as teachers, and (3) beliefs about the goal(s) of education, sometimes overrode the influence of working conditions. For example, even though teachers were behind and felt pressure to get caught up, they chose to add content to the SBC that they believed their students needed to know. They also replaced activities that they believed were too difficult for their students, despite the fact that the new activities took more class time to complete. Beliefs about what students need to know and what students are able to do were powerful determinants in teachers' instructional decisions in this study.

There was also evidence that the successes teachers experienced with CSCOPE altered their epistemological beliefs. As a result of those successes, teachers were willing to give CSCOPE the benefit of the doubt and stick with a lesson even when they had reservations about the lesson. This has important implications for those interested in changing the epistemological beliefs of teachers. This study suggests that successful experiences are effective in changing the epistemological beliefs of teachers.

2.2. Research question #2

What decisions did six science teachers in a rural central Texas school district make when using the SBC, CSCOPE? This study confirms that these teachers made instructional decisions in the context of CSCOPE. In some cases, they chose to use the CSCOPE lessons as written. In other cases, they changed the lessons despite the

administrative mandate not to alter CSCOPE. In general, the decisions these teachers made were based on what they believed their students needed in order to be successful. Teacher interviews suggested that teachers defined student success as: (1) being prepared for the state assessment, (2) being prepared for future grades, (3) improving self-esteem, and (4) developing the skills needed to be successful in college.

Even though modifying the curriculum went against administrative policy, many of the changes made were in alignment with the intent of CSCOPE. Each CSCOPE lesson clearly states,

> Instructors are encouraged to supplement, and substitute resources, materials, and activities to differentiate instruction to address the needs of learners. The Exemplar Lessons are one approach to teaching and reaching the Performance Indicators and Specificity in the Instructional Focus Document for this unit (TESCCC, 2009, p. 1).

CSCOPE lessons are designed with the expectation that the teacher is the pedagogical expert in the classroom. As the expert, the teacher knows the individual needs and abilities of his or her students. Therefore, the teacher is uniquely qualified to make instructional decisions about adjusting, omitting, and supplementing CSCOPE lessons. Finally, this study demonstrated that when a SBC such as CSCOPE conflicted with what these teachers believed was in the best interests of their students, they abandoned strict adherence to it and did what they believed was best for their students.

With the exception of the kindergarten teacher, all of the teachers in this study were behind in the instructional scope and sequence of CSCOPE (some by as much as four weeks). As the date of the TAKS test approached, these teachers became increasingly

concerned (1) that they had not covered enough material, and (2) that students were not properly prepared for the test. Consequently, alterations to CSCOPE lessons occurred.

Teachers were behind for a number of reasons. One reason was that they supplemented CSCOPE lessons in order to: (1) fill students' knowledge gaps, (2) accommodate students' special needs, (3) review, (4) remediate, and (5) prepare students for the TAKS test. Although these are justifiable and important reasons to modify, they are potentially harmful. When teachers make independent judgments about what students need to know and be able to do, knowledge gaps may continue to occur and student success may continue to be compromised (Squires, 2005, 2009). This is especially true in the context of a vertically and horizontally aligned SBC such as CSCOPE, which builds on concepts taught in preceding grades. If teachers omit content, whether to get caught up or because they do not think it is important, students may not have the prerequisite knowledge that the CSCOPE curriculum assumes that they have. These independent decisions can also result in instructional differences from teacher to teacher which then result in knowledge gaps within the same grade and from year to year. In this scenario, teachers will be unable to assume that students have the prerequisite skills that they are suppose to have and consequently, they will continue to supplement the curriculum to revisit concepts that should have been covered in previous grades. One benefit of standardizing the curriculum is that it reduces gaps in instruction and consequently minimizes student knowledge gaps. In theory, as teachers use a SBC like CSCOPE from year to year, instructional consistency will increase, knowledge gaps

will decline, and students will become more successful. However, this can only happen if teachers adhere to the SBC in its entirety.

2.3. Research question #3

What steps did Bluecat ISD take to find and adopt the SBC, CSCOPE? One reason that the administration adopted CSCOPE was their desire to stop the practice of teaching to the TAKS test. Administrators had become aware that many of their graduates were not successful in college. Some performed so poorly that they were back at home within two months after the semester began (Sarah, interview I). It was clear to the administration that even though their students performed adequately on the TAKS test, they had not learned what they needed to know in order to succeed in college.

The administration believed that in order for their students to be successful, the district needed to reduce instructional gaps through vertical and horizontal alignment of the curriculum. They were also aware that many of their teachers did not have the pedagogical skills needed to teach with instructional rigor. With these issues in mind, the curriculum director began to search for a curriculum that would be horizontally and vertically aligned kindergarten through twelfth grade, comply with the state standards, and be instructionally rigorous. The curriculum they chose was CSCOPE. A more extensive discussion of CSCOPE can be found in Chapter IV.

When the administration adopted CSCOPE as the district curriculum, they instructed their teachers to adhere to it strictly for the first year. They hoped that in the process of teaching the new, more rigorous curriculum, those teachers whose practice had lacked instructional rigor would learn the necessary techniques. Most, if not all, of

the science teachers in this study were already teaching with the instructional rigor that administrators wanted to achieve, and therefore their principals allowed them some latitude in making modifications to CSCOPE. Analysis of teacher and administrator interviews suggested that this worked. Five of the six science teachers commented that CSCOPE made them better teachers. They were seeing students learn in ways they had not seen before, and they were learning new instructional strategies that encouraged students to analyze, evaluate, critique, reason, infer, and predict.

The superintendent estimated that district-wide, 80 to 90 percent of the teachers were using CSCOPE (Gerard, interview I). The reason for the high percentage of teacher compliance may be a result of the fact that Bluecat ISD implemented many of the suggestions found in the school reform literature . Datnow and Stringfield (2000) summarized these suggestions into eight essential components of successful school reform: (1) All actors involved in the reform should have a well thought out and defined set of shared goals for the reform. Bluecat ISD administrators shared a vision of improved student achievement through curricular alignment and enhanced instructional rigor; these were the goals of the SBC reform initiative that they adopted. (2) These goals should be long-term and have a whole-team focus. Bluecat ISD adopted the SBC reform knowing that it would take several years to accomplish their goals. Further, the district made it a priority to achieve buy-in not only from teachers, but also from the rest of the community. That is, they made an effort to include all actors who would be involved in the process (teachers, administrators, community, and reform designers). (3) Districts need a plan for disseminating information about reform implementation.

Because Bluecat ISD is a small district, disseminating reform information was done through a series of campus and district level meetings, through the local newspaper and by word of mouth. (4) Schools must engage in a critical evaluation of what change is needed and why that change is important. Bluecat ISD had critically evaluated their needs over a period of years and had a clear vision of what reforms were needed and why. (5) Reform designers must build the reform to affect the whole school and fit within the local context of the school. They must see teachers as more than the implementers of reform, they must view teachers as assets and collaborators. The reform designers for the SBC adopted by Bluecat ISD acknowledge the vital role of the teacher as an informed implementer of the curriculum, who must be depended on to make the necessary adjustments to the curriculum to meet the needs of diverse learners (TESCCC, 2010). (6) There must be ongoing support and leadership from the design team and the district. The designer for the Bluecat ISD's SBC provides ongoing professional development for teachers and administrators in the form of swap meets held every six weeks, conferences, and on-line access. However, they leave it to the individual districts to determine how much of the SBC reform design is used. (7) School policies must be aligned with the reform. The adoption of the SBC did align with Bluecat ISD policy. (8) The success of the implementation depends of the flexibility of the design to adjust to local policy and teacher influences. The reform designer for the Bluecat ISD's SBC encourages district administrations to use as much of the reform curriculum design as they deem necessary and encourages teachers to adjust lessons to meet their needs (details on these administrative actions can be found in Chapters III and IV).

The administration understood that teachers make day to day instructional decisions with respect to what and how students are taught. For that reason, they knew that teacher buy-in was essential to the success of CSCOPE.

3. Changes to the study

When doing qualitative studies it is often necessary to make changes to the research design as the study evolves. This section documents the changes I made during my research. Originally, I proposed to observe four lessons for each teacher. Two of these observations were to be of classroom instruction and two were to be of laboratory activities. During the first few scheduling interviews with teachers, it became apparent that this design would not work with CSCOPE. The original design assumed that teachers began and ended a lesson on the same day. However, CSCOPE lessons are designed using the 5E model (engage, explore, explain, elaborate, and evaluate), and each lesson covers between four and twenty-eight instructional days (Bybee, et al., 2006; TESCCC, 2009). According to the ESC science specialist, the average lesson spans fourteen instructional days (ESC science specialist, interview I). Many lesson segments (such as the engage portion of a lesson) begin on one day and continue into the next day. As lessons in CSCOPE rarely start and end the same day, I felt that I needed to observe a series of successive days in order to gain the contextual understanding that I needed. Therefore, I abandoned the original plan and replaced it with a series of sequential observations. Four to five days of a lesson were observed for each teacher. During the

pre-observation interview, I made sure that I understood what portion of the lesson sequence I would be observing. I familiarized myself with the lesson and with the material that preceded and followed it before doing my observation. Whenever possible, I scheduled the sequence of observations to coincide with the beginning of a CSCOPE lesson.

About three weeks into my observations, I noticed that the teachers were becoming more open with me. They had become comfortable with me and they trusted me. It appeared to me that they had let their guard down and didn't seem to notice that I was in the room observing them. In addition, the interviews that I had with these teachers took on a more conversational tone. I realized that I had come to the place in my study where all qualitative researchers want to be. I had gained the trust of my teachers and was collecting reliable data. In order to take advantage of this, I asked the teachers if I could schedule a second set of observations and interviews. They agreed, and I observed another lesson series (four or five sequential days for each teacher). During this second round of observations and interviews, I came to the point where I was no longer uncovering new information. I concluded that I had documented as many of the decisions and the factors that influenced these teachers as they were going to reveal to me. Observing a second lesson series and completing a second set of interviews doubled the number of proposed observations and interviews from my original proposal, but I know that I collected very good data as a result.

Originally, the curriculum director was the only member of the administration that I intended to interview. I wanted to explore (1) how the district came to adopt CSCOPE,

and (2) how the district expected their teachers to use it. However, during the interview with the curriculum director I noticed inconsistencies between what she told me and what the teachers had told me about how CSCOPE lessons were to be used. The curriculum director insisted that all teachers had been instructed not to deviate from the CSCOPE lessons and that there were no exceptions. The teachers, on the other hand, told me that they understood that they were to adhere as closely as possible to the lessons, but that they were free to modify the lessons if they felt that it was in the students' best interests to do so. It was clear to me that the teachers had received a different message than the one the curriculum director conveyed to me. During interviews with the teachers, I began to understand that they were getting this message from their principals and their educational service center (ESC) science specialist. I decided that I should interview the elementary and middle school principals and the ESC science specialist, and listen to their positions on how the teachers were supposed to approach CSCOPE.

The ESC science specialist's name came up repeatedly in interviews with the curriculum director and the teachers. It became clear to me that she was an important part of the district's story, and a pivotal influence in many of the decisions these teachers made. Because the ESC was a partner in the CSCOPE collaborative, this ESC science specialist was also a CSCOPE representative. In this dual capacity, she provided professional development every six weeks for all elementary and middle school science teachers (CSCOPE lessons are grouped into six week segments). At these professional development sessions, she went through each of the upcoming lessons in detail, suggested alternative approaches, explained confusing instructions, and provided the

teachers with a large number of the copies and foldables which they would need for the upcoming six weeks. She was clearly a valuable resource regarding the structure of CSCOPE and the professional development that these teachers received. I observed that the professional development these teachers attended was fundamental to how they used CSCOPE. With this in mind, I asked for and received permission to attend one of the professional development sessions. When the third grade teacher went, I accompanied her and observed the professional development she received. To conclude, I interviewed three people who were not included in my original proposal (the two principals and the ESC science specialist), and I attended one of the CSCOPE professional development events hosted by the ESC.

As I looked at my data and tried to decide how I would present my study, I decided that I should tell the district's story as a case study. However, I did not have all of the information I needed for a case study, so I requested additional interviews with the curriculum director, the elementary and middle school principals. I also requested and was granted an interview with the superintendent. I provided the interview questions to each of them in advance. It had been almost two years since some of the events I was interested in had taken place, and I thought that I should give them time to reflect on those events so that I could collect more accurate and complete data.

In my original proposal, I had identified CSCOPE as a curriculum management system. I based this on my preliminary examination of CSCOPE and the literature. However, as I became more familiar with CSCOPE I realized that it is not a curriculum management system, but a vertically and horizontally aligned SBC for kindergarten

through twelfth grade. As result, I abandoned the curriculum management aspect of my study and turned my attention to the literature on SBCs.

Finally, because only one kindergarten teacher consented to participate in my study and none of the first or second grade teachers was willing to participate, I had to revise my population of teachers. Originally, I had proposed to study at least one teacher in each of the elementary grades, kindergarten through fifth grade, and both of the middle school science teachers. As it turned out, my actual study population included one kindergarten teacher and one teacher in each of the third, fourth, and fifth grades. Both of the middle school science teachers participated. Between them, they cover all of the middle school science classes, sixth through eighth grade. Changes to the study are summarized in Table 6.

Table 6.
Changes to the study.

Initial proposal	Modification to initial proposal
1. Four observations per teacher	1. Eight to ten observations per teacher
2. Observe lesson in its entirety – lessons begin and end on the same day – Four lesson observations per teacher	2. Four to five observations done on sequential days – lessons span several days – Two observation sequences per teacher
3. Interview curriculum director	3. Interview curriculum director, elementary school principal, middle school principal, ESC specialist, and superintendent
4. No observation of CSCOPE professional development	4. Observation of one CSCOPE Professional development (3rd Grade)
5. Include one teacher for each grade K-8 (total of eight teachers)	5. Include kindergarten, 3rd - 8th grade teachers (total of six teachers)
6. CSCOPE as a curriculum management system aligned K-12	6. CSCOPE as a standards-based curriculum aligned K-12

4. Curious contradictions

In my study I observed several contradictions between what teachers said and what they did. For example, some teachers complained that CSCOPE did not provide for review of content taught earlier in the year, nor did CSCOPE lessons revisit content taught in previous years. Yet these same teachers omitted what they considered to be redundant material because they were behind. I suspect that these teachers were consumed with the idea of getting caught up and fixated on finding segments of lessons that they could eliminate. I also think that these teachers were actually only concerned with revisiting tested concepts. They did not want to spend time on concepts that were not going to be tested on the TAKS test. I do not think that they realized that when they omitted redundant material they were actually removing the embedded review in the CSCOPE lessons.

Teachers often mentioned the importance of adhering to the instructional scope and sequence of CSCOPE. They said that they understood that the scope and sequence in CSCOPE built on itself from year to year, and that altering this scope and sequence could create gaps in their students' knowledge. Nonetheless, they cut sections out of lessons and sometimes omitted entire CSCOPE lessons. I believe that concerns about covering content, having time to review, and preparing students for the TAKS test outweighed the importance of adhering to the instructional scope and sequence of CSCOPE in the minds of the teachers.

I found it interesting that the teachers continued to supplement CSCOPE even though they expressed alarm at how far behind they were. When I asked teachers why they were adding material to CSCOPE when they were obviously behind, they said that it was more important to respond to the needs of students than to adhere to a timeline. Clearly, these teachers were more concerned about not leaving students behind than they were about covering all of the required material.

The first year of implementation posed a unique set of problems that will become less significant over time. After CSCOPE has been used for a few years, I believe that the time conflicts teachers are currently experiencing will become less of an issue. Once teachers become more familiar with the CSCOPE lessons, they will not need to spend time trying to understand the lesson while they are also trying to teach it. In addition, as student knowledge gaps begin to close, teachers will not have to spend as much time remediating. In conclusion, once teachers are more familiar with CSCOPE and once they no longer need to supplement CSCOPE, they will not have as much trouble adhering to the suggested time lines. In this first year of implementation, time conflicts appear to be the greatest threat to the success of CSCOPE.

5. Significance of the study

This study contributes to an area of the educational literature where there is a clear need for information. Little is known about what instructional decisions teachers make within the context of a SBC, or why they make the decisions that they do. With this

information, administrators may be able to anticipate how teachers are likely to use a SBC. They will be better able to identify situations in which teachers are likely to deviate from the curriculum or to be inconsistent in its use. Better understanding will allow administrators to proactively address these situations, and perhaps facilitate more effective interventions. For example, if this administration had known in advance that teachers would drastically alter CSCOPE when they fell behind, then they could have taken more effective measures to prevent that from happening. Administrators would have known that it would be ineffective to simply warn the teachers that they would fall behind in the instructional scope and sequence of CSCOPE, and not to worry when it happened. Instead, they would have been able to take proactive actions to reduce the number of non-instructional classroom interruptions that use up valuable instructional time thereby giving teachers as much instructional time as possible. If this had happened, perhaps the occasions when teachers resorted to making independent decisions about what to cover and what to omit would have occurred less often. If administrators know what decisions teachers are likely to make and what factors influence those decisions, then they are empowered to provide the support and assistance that teachers need to use a SBC as it is intended to be used.

Further, administrators who do not understand the instructional decisions made by teachers and the factors that influence those decisions will find it difficult to (1) accurately assess the strengths and weaknesses of their program, and (2) determine the value of a SBC in improving student achievement. For example, how would an administrator know if student successes or failures were the result of the SBC or the

instructional decisions of teachers? Districts that are not aware of how their teachers are using a SBC are limited in their ability to assess its value.

This study identified several steps that the administration took to support their teachers as they adjusted to CSCOPE. These steps were largely successful in gaining teacher support for CSCOPE and getting teachers to use CSCOPE as instructed. Other administrators may find this review useful as they consider what they can do to successfully introduce a SBC into their schools (details of these administrative steps can be found in Chapters III and IV).

Jones and Carter (2007) noted the need to organize the factors that influence instructional decisions which are scattered throughout the educational literature. Further, they suggested that because there is no useful categorization of these factors, it is difficult for educational researchers to know what factors may be acting as confounding variables in their studies. In Chapter II I began the process of categorizing those factors. I do not claim to have accounted for all of the factors that influence instructional decisions, but I provided a framework on which to build (more information on these factors can be found in Chapter II).

This study is one of the first to use CSCOPE as its context. Even though this study did not specifically study or evaluate CSCOPE, it does provide insight into how this district and these teachers used CSCOPE. This study is timely, in that CSCOPE It has been adopted by more than 700 of the 1235 school districts in Texas. As of June, 2010, 19 of the 20 regional ESCs have partnered with the CSCOPE collaborative to offer CSCOPE to the districts that they represent (ESC science specialist, interview I).

Further, the Texas State Board of Education will soon begin to accept e-books as viable curricula eligible for adoption as state approved textbooks. Plans are currently underway by the CSCOPE collaborative to submit CSCOPE as an e-book for state textbook adoption approval. If this happens, it would make CSCOPE an even more appealing option for school districts in Texas (ESC science specialist, interview I). Further, because the textbooks adopted in Texas have traditionally influenced textbook selections in other states, if CSCOPE were to be approved as a state e-book, it is not too difficult to imagine that CSCOPE could become a nationwide SBC. The superintendent for the district in this study suggested that if Texas were to adopt a state curriculum, CSCOPE would be the likely choice (Gerard, interview I). Without a doubt, CSCOPE is poised to become a prominent player in the standards-based reform movement. The contributions of this study are summarized in Table 7 below.

Table 7.
Significance of the study.

Knowledge gains
1. Created a categorization of factors that influence instructional decisions
2. Identified factors that influenced teachers' instructional decisions
3. Identified instructional decisions teachers make using CSCOPE
4. Contributed knowledge of how teachers use a standards-based curriculum like CSCOPE
5. Identified steps administrators can use to support teacher implementation of CSCOPE

6. Further research

This study is very limited in scope. It investigates one subset of teachers (elementary and middle school science teachers) in a central Texas school district. The context of this study is one specific SBC, CSCOPE. CSCOPE is only one of several SBCs that school districts can adopt. This study was conducted in a rural school, and does not address the urban school environment. There is much that still needs to be studied with respect to the instructional decisions that teachers make in the context of a SBC and the factors that influence those decisions.

Studies that further explore and catalog factors that influence instructional decisions are needed. In reviewing my interviews and transcripts, I found evidence that a fifth category of factors may exist: teacher disposition. Further studies are needed to determine if the disposition of the teacher is a factor that influences instructional decisions. These additional studies should include (1) a larger population of teachers, (2) teachers in all grade levels, (3) teachers in all content areas, and (4) teachers in different demographic areas.

Longitudinal studies that look at student performance over time are also needed to address the issue of student achievement in the context of a SBC. Bluecat ISD was concerned that their students were unsuccessful in college. Studies should be done to determine if students are more successful in college as a result of CSCOPE. Studies should also be done to investigate what evidence there is to support the claim that a SBC improves student learning. Studies that focus on the level of teacher implementation of a

SBC are needed. In addition, studies that evaluate and compare different SBCs would be a valuable contribution to educational literature.

Studies that focus on district implementation of a SBC also need to be completed. For example, what strategies have districts found to be effective in the successful implementation of a SBC? Do these strategies vary depending on school size, school location, demographic make-up, students, content area, or experience level of the teacher? Studies comparing student achievement, teacher buy-in, degree of implementation, and teacher retention rates between districts that support their teachers and districts that provide limited support are also needed. Studies that investigate the role of administrators in affecting teachers' attitudes toward district implementation of a SBC would be useful. CSCOPE as one SBC warrants considerable study in many areas. For example, what is the impact of CSCOPE on instruction and on student achievement? The list of areas in need of research with respect to SBCs, instructional decisions, and factors that influence instructional decisions offers numerous opportunities for educational research.

7. Concluding remarks

The adoption of a SBC should be viewed as a partnership between the district and the teachers. Research has suggested that successful reform efforts included the teachers in the process (Datnow, et al., 2000; Datnow & Stringfield, 2000; Ross, et al., 2003; Stringfield, et al., 2008). If teachers were included in the process, maybe they would be

more willing to leave their comfort zone and embrace the challenges inherent in a reform such as the one adopted by Bluecat ISD. Based on the findings of this study, in these partnerships districts should: (1) share responsibility with the teachers for the success of the curriculum, (2) provide the necessary resources, (3) assist teachers as they adjust to the SBC, and (4) value the teacher as the expert in the classroom, that is, as the person who is able to make the student successful. In these partnerships districts should provide the SBC framework along with specifications for what students need to know and be able to do, and teachers should use their expertise to flexibly implement the SBC so that all students are as successful as possible. If districts choose to mandate using the SBC as a script, they should be aware that studies have clearly shown that when teachers were constrained by a curriculum that they did not agree with the curriculum was not implemented in the way the administration intended. Teachers may give lip service to it in public, but when they shut the door they will teach in the way they believe best serves the needs of their students. As one teacher in our study noted, "The success of the curriculum ultimately depends on the teacher. The district is only going to be as effective as the individual teacher" (fifth grade teacher, interview IV).

As a result of this study, I have gained a clearer understanding of several things. First, I am more aware of the need for long-term administrative support with respect to the successful implementation of a SBC. This is especially true when the new curriculum is radically different than past practices, as CSCOPE was for this district. Second, I have gained a better understanding of the connection that exists between student achievement and the use of a cohesive and coherent curriculum aligned

kindergarten through twelfth grade. Third, I was impressed with what initially motivated this district to seek CSCOPE. I had assumed that school districts were primarily interested in student achievement only in so far as it related to acquiring funds. This study demonstrated that not all districts measure student excellence by test scores and not all districts are wholly motivated by money. This district recognized that their students were not learning what they needed to know in order to be successful in college. As is the case with many small districts, the school administrators in this study are also the parents of these students. They were deeply concerned that their children were not being adequately prepared for the future. Finally, this study has given me the opportunity to (1) become more familiar with standards-based reform initiatives, and (2) develop a sustainable research agenda.

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APPENDIX A

VERTICAL ALIGNMENT DOCUMENT (TESCCC, 2009c)

SCIENCE VERTICAL ALIGNMENT DOCUMENT - SIXTH, SEVENTH, EIGHTH
PROPERTIES, PATTERNS AND MODELS

SIXTH GRADE		SEVENTH GRADE		EIGHTH GRADE	
				8.8	***The student knows that matter is composed of atoms.***
				8.8A	**Describe the structure and parts of an atom.** Describe ATOMIC STRUCTURE AND PARTS Including, but not limited to: • size comparison and location of sub-atomic parts • nucleus • protons • neutrons • outer shell/electron shell • electrons • valence electrons
				8.8B	**Identify the properties of an atom including mass and electrical charge.** Identify PROPERTIES OF AN ATOM Including, but not limited to: • mass number • electrical charge • introduce ions • atomic number and atomic mass relationship to subatomic particles • introduce isotopes • atomic number (protons) • atomic mass (protons plus neutrons) • stable atom = neutral atom

TEXT— *TEKS: Bolded Black and Italics Knowledge Statement (TEA);* Bolded Black – Student Expectations (TEA); Blue – Supporting Information Clarifications from CSCOPE
CELL SHADING — BEIGE: Student Expectations that are tested at current and/or other grade levels

SCIENCE VERTICAL ALIGNMENT DOCUMENT - SIXTH, SEVENTH, EIGHTH
PROPERTIES, PATTERNS AND MODELS

SIXTH GRADE		SEVENTH GRADE		EIGHTH GRADE	
6.7	*The student knows that substances have physical and chemical properties.*	7.7	*The student knows that substances have physical and chemical properties.*	8.9	*The student knows that substances have chemical and physical properties.*

6.7A	**Demonstrate that new substances can be made when two or more substances are chemically combined and compare the properties of the new substances to the original substances.**
	Demonstrate
	HOW NEW SUBSTANCES WITH DIFFERENT PROPERTIES EMERGE FROM CHEMICAL REACTIONS
	Including, but not limited to:
	• evidence of a chemical reaction
	  • color change
	  • release of gas
	  • release of light/heat
	  • temperature change
	• compare differences between products and reactants
		7.7A	**Identify and demonstrate everyday examples of chemical phenomena such as rusting and tarnishing of metals and burning of wood.**
			Identify, Demonstrate
			EXAMPLES OF CHEMICAL PHENOMENA
			Including, but not limited to:
			• rusting and tarnishing of metals (oxidation)
			• burning of wood
			• corrosion
				8.9A	**Demonstrate that substances may react chemically to form new substances.**
					Demonstrate
					SUBSTANCES MAY REACT CHEMICALLY TO FORM NEW SUBSTANCES
					Including, but not limited to:
					• recognize that formulas and equations express what happens in a chemical reaction
					  • rearrangement of atoms
					  • breaking and reforming of bonds
					• observe and recognize signs of chemical change:
					  • color change
					  • energy change
					  • odor change
					  • new substance produced
					  • precipitate formation
					  • release of a gas
					  • odor
					  • bubbling

TEXT— ***TEKS: Bolded Black and Italics Knowledge Statement (TEA)*; Bolded Black – Student Expectations (TEA); Blue – Supporting Information Clarifications from CSCOPE**
CELL SHADING — BEIGE: Student Expectations that are tested at current and/or other grade levels

APPENDIX B

YEAR AT A GLANCE (TESCCC, 2009d)

CSCOPE

Year at a Glance
Eighth Grade – Science

First Semester	Second Semester
1st Six Weeks	**4th Six Weeks**
Unit 01: Atomic Structure (6 Days) 8.8AB **Unit 02: Physical and Chemical Properties** (8 Days) 8.9BD **Unit 03: Interactions of Matter and Energy** (10 Days) 8.9AC; 8.10AC Applicable process TEKS are identified on the TEKS Verification document.	**Unit 08: Changes over Time** (15 Days) 8.12A; 8.14AB **Unit 09: Interactions within the Environment** (10 Days) 8.10B; 8.12B Applicable process TEKS are identified on the TEKS Verification document.
2nd Six Weeks	**5th Six Weeks**
Unit 04: Interdependence among the Systems of the Human Body (11 Days) 8.6AB **Unit 05: Heredity and the Environment: Traits and Genetics** (11 Days) 8.11BC Applicable process TEKS are identified on the TEKS Verification document.	**Unit 10: Force and Motion** (10 Days) 8.7A **Unit 11: Waves** (9 Days) 8.7B **Unit 12: Universe: Stars and Galaxies** (5 Days) 8.13A Applicable process TEKS are identified on the TEKS Verification document.
3rd Six Weeks	**6th Six Weeks**
Unit 06: Heredity and the Environment: Traits and the Ecosystem (14 Days) 8.6C; 8.11A **Unit 07: Changes in the Earth** (11 Days) 8.12C; 8.14BC Applicable process TEKS are identified on the TEKS Verification document.	**Unit 13: Universe: Explorations** (15 Days) 8.13BC **Unit 14: Experimental Design** (7 Days) 8.2ABCDE; 8.3AE Applicable process TEKS are identified on the TEKS Verification document.

APPENDIX C

INSTRUCTIONAL FOCUS DOCUMENT (TESCCC, 2009b)

INSTRUCTIONAL FOCUS DOCUMENT
Eighth Grade Science

UNIT: 05 **TITLE: Heredity and the Environment: Traits and Genetics** **SUGGESTED DURATION:** 11 days

Exemplar Lesson 01: Inherited Traits and Learned Behaviors
Exemplar Lesson 02: Genetics

State Resources:
Xtreem Science – Teacher Quality Grant 8th Grade
http://www.tcet.unt.edu/tegs/index-html.html

Science TEKS Toolkit: http://www.utdanacenter.org/scienceteoolkit/

RATIONALE:

These unit bundles student expectations that address the concept that traits of species can change through generations and the instructions for traits are contained in the genetic material of the organisms in order to identify patterns of inheritance.

Prior to this unit, in 6th and 7th grades, students were introduced to the idea of dominant and recessive traits. In the 8th grade, the study of how these traits were inherited and the prediction of the traits of possible offspring through the use of Punnett squares are introduced. This is an important skill that the student's will need in biology.

MISCONCEPTIONS/UNDERDEVELOPED CONCEPTS:

- Daughters inherit most of their characteristics from their mothers. Sons inherit most of their characteristics from their fathers.
- Students can apply chance and probability to assigned genetics problems, but not to human situations in families.

PERFORMANCE INDICATORS	CONCEPTS	KEY UNDERSTANDINGS FOR LEARNERS
Identify inherited traits in a scenario and create a Punnett square to predict possible outcomes from events in the scenario. (8.11B, 8.11C) ELPS: 1C, 1E, 1H, 2E, 2I, 3D, 3H, 4E, 5B, 5G	Change – Properties Nature of Science	An organism survives in its environment through its learned behaviors and inherited traits. Genetic combinations result in patterns of inherited traits. Inherited traits are dependent on the genetic information inherited from each parent.

KEY ACADEMIC VOCABULARY SUPPORTING CONCEPTUAL DEVELOPMENT

- Trait –a genetically determined characteristic or condition; a distinguishing feature

TEKS# / SE#	TEKS	SPECIFICITY
8.11	*The student knows that traits of species can change through generations and that the instructions for traits are contained in the genetic material of the organism.*	

8.11B	**Distinguish between inherited traits and other characteristics that result from interactions with the environment.**	Distinguish
		
		INHERITED TRAITS AND OTHER CHARACTERISTICS
		
		Including, but not limited to:
		• inherited traits
		  ◦ plants
		  ◦ animals
		• behaviors
		  ◦ inherent/instincts (innate)
		  ◦ learned

8.11C	**Make predictions about possible outcomes of various genetic combinations of inherited characteristics.**	Predict
		
		POSSIBLE OUTCOMES OF VARIOUS GENETIC COMBINATIONS
		
		Including, but not limited to:
		• use Punnett squares to predict phenotype and genotype of monohybrid crosses
		  ◦ probability
		  ◦ ratios/percentages
		• distinguish between dominant ad recessive traits

APPENDIX D

EXEMPLAR LESSON (TESCCC, 2009a)

Eighth Grade
Science
Unit: 05
Lesson: 01
Suggested Duration: 3 days

Inherited Traits and Learned Behaviors

Lesson Synopsis:

Students will distinguish between learned behaviors and inherited traits through activities such as word sorts, and charades.

TEKS:

8.11	***The student knows that traits of species can change through generations and that the instructions for traits are contained in the genetic material of the organisms.***
8.11B	**Distinguish between inherited traits and other characteristics that result from interactions with the environment.**

PROCESS TEKS:

8.2	***The student uses scientific inquiry methods during field and laboratory investigations.***
8.2B	**Collect data by observing and measuring.**
8.2C	**Organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence.**
8.2D	**Communicate valid conclusions.**

GETTING READY FOR INSTRUCTION

Performance Indicator(s):

- Identify inherited traits in a scenario and create a Punnett square to predict possible outcomes from events in the scenario. (8.11B, 8.11C)
  ELPS ELPS: 1C, 1E, 1H, 2E, 2I, 3D, 3H, 4E, 5B, 5G

Key Understandings and Guiding Questions:

- An organism survives in its environment through its learned behaviors and inherited traits. 8.11B
  - What is the key difference between inherited traits and learned behaviors?
  - What are some examples of behaviors that are learned?
  - What are examples of traits that are inherited?

Vocabulary of Instruction:

- dominant trait
- inherited trait
- interaction
- learned behavior
- recessive trait

Materials:

- highlighter
- glue

Resources:

- **STATE RESOURCE**
  - Xtreem Science – Teacher Quality Grant 8th Grade – To Be or Not to Be

Advance Preparation:

1. Run copies of the following handouts:
   - **Inherited Traits-Class Survey** (1 per pair of students)
   - **Inherited Traits Survey Graph** (1 per pair of students)
   - **Inherited Traits Survey Rubric** (1 per pair of students)
   - **A Family's History** (1 per student)
2. Prepare:
   - **Charades:** cut them apart and place in a container to draw from.

- Card set: **Learned Behaviors and Inherited Traits** by printing a class set, cutting them apart, and laminating them.

Background Information:

Organisms must respond and adapt to their environment in order to survive as a species. Responses are part of an organism's behavior. Adaptations occur over time. Adaptations are passed from parent to offspring as inherited traits. Some inherited traits are dominant, while others are recessive. We use symbols to represent traits. Traits can also be traced through several generations using a pedigree chart.

GETTING READY FOR INSTRUCTION SUPPLEMENTAL PLANNING DOCUMENT

Instructors are encouraged to supplement, differentiate and substitute resources, materials, and activities to address the needs of learners. The Exemplar Lessons are one approach to teaching and reaching the Performance Indicators and Specificity in the Instructional Focus Document for this unit. A Microsoft Word template for this Planning document is located at www.cscope.us/sup_plan_temp.doc. If a supplement is created electronically, users are encouraged to upload the document to their Lesson Plans as a Lesson Plan Resource for future reference.

INSTRUCTIONAL PROCEDURES

Instructional Procedures	Notes for Teacher
ENGAGE **Inherited/Learned T-chart** 1. Using their journals, ask students to fold a page in half vertically. 2. On one side, have them write the title "What I've Inherited" and write "What I've Learned" on the other side. 3. Give students 5 minutes to write their responses in the two columns. 4. Have students share their results with the class, comparing each other's similarities. 5. Discuss the difference between inherited traits and learned behaviors.	**NOTE:** 1 Day = 50 minutes Suggested time: Day 1  Fold page in half vertically and put titles on each side to record responses.
EXPLORE **Learned Behavior Charades** 1. Divide the class into two groups and have the slips of paper from the **Charades** handout cut and ready. 2. One person from each group will have a chance to select a slip of paper with a behavior for them to act out for the class. While acting it out, no words may be used. 3. That student's group will have one minute to correctly identify the behavior. If correct, the team is awarded one point. 4. If the team is incorrect, the opposing team will have a chance to guess. If correct, they get the point. 5. The second team then gets to act out their selected paper. 6. The group with the most points at the end of the period wins. 7. Have students add to the T-chart any new learned behaviors.	Suggested time: Day 1  **MATERIALS** • Card Set: **Charades** Keep time for each group. This game should be fast-paced! Alternative activity: In their journals, students identify the topic on the card as inherited or learned and give evidence to support their choice.  Add any new learned behaviors to the T-chart.

Instructional Procedures

EXPLORE

Inherited Traits Survey

1. Allow students to choose a partner.
   Ask:
   - **What are some examples of traits that are inherited?** *Answers may vary.*
2. In pairs, they will complete the first two columns on the data table on the handout: **Inherited Traits-Class Survey** by observing each other's traits.
3. Once everyone has a chance to finish, as a class, complete the Group Data table.
4. After both parts of the Group Data table have been filled out, students will use the results from the Group Data table to construct a bar graph of their findings. Graph paper is provided on the handout: **Inherited Traits Survey Graph**.
5. Remind students that graphs must have a relevant title, properly labeled axes, and a key. Use the handout: **Inherited Traits Survey Rubric** as needed.
6. Tell students that when graphing, they need to try to use as much of the graph paper as possible. This means that the graph should not be on one corner of the paper. It should cover most, if not all, of the graph paper.

Notes for Teacher

Suggested time: Day 2

MATERIALS

- Handout: **Inherited Traits-Class Survey** (1 per pair of students)
- Handout: **Inherited Traits Survey Graph** (1 per pair of students)
- Handout: **Inherited Traits Survey Rubric** (1 per pair of students)

MISCONCEPTION

- Daughters inherit most of their characteristics from their mothers and boys inherit most traits from their fathers.

Note:
The purpose behind both of these activities is to give students more everyday examples of inherited traits and learned behaviors. While these activities are taking place, the teacher needs to monitor student's train of thought by walking around the room, ensuring that everyone understands the difference between inherited traits and learned behaviors.

EXPLAIN

Notes: Symbols Used in Genetics

1. In their journals, have students revisit the list they made during the Engage portion of this lesson.
2. Have them highlight the learned behaviors in one color and the inherited traits in another.
3. Using the class survey table of their inherited traits, identify those traits that show up most often in the group. These are probably dominant traits. The traits that show up least often are probably recessive.
4. Remind students that inherited traits usually are paired (tall/short, brown eyes/not brown, left handed/right handed).
5. Ask them to identify the complementary trait to the one they inherited. Have them write it next to their inherited trait.
6. Say to the students: **In science, we use symbols to represent ideas.** Remind students of representing atoms with letters.
7. We use letters to represent traits so we can trace them through several generations.
8. In your journals, record that a capital letter represents a dominant trait and

Suggested time: Day 2

MATERIALS

- highlighters

Revisit the list made in the Engage activity.

Note:
In 6th and 7th grade, students investigated dominant and recessive traits.

Example: Tall/ short
T / t

RR Rr rr
RR - homozygous dominant
rr - homozygous recessive
Rr - heterozygous

Instructional Procedures

the lower case of the same letter is used to represent a recessive trait.

9. The genes for traits are inherited in pairs, one from the mother and one from the father. In your journals, write down as many combinations of genes that are possible for a single trait. (Suggest right handed/left handed).

10. If both letters are capital, we refer to that as a homozygous dominant genotype. If they are both lower case, it is called homozygous recessive. If there is one capital and one lower case letter, it is called heterozygous. Record these terms in your journals.

11. We also use symbols to create a family tree. In science, a family tree that is used to trace traits is called a pedigree. Write this in your journal.

12. On a pedigree, a circle represents a female, a square represents a male. If the figure is shaded completely in, that individual has the trait that is being traced. If the figure is half-shaded, that individual is hybrid (heterozygous) for the trait. If the figure is not shaded, the individual does not have the trait.

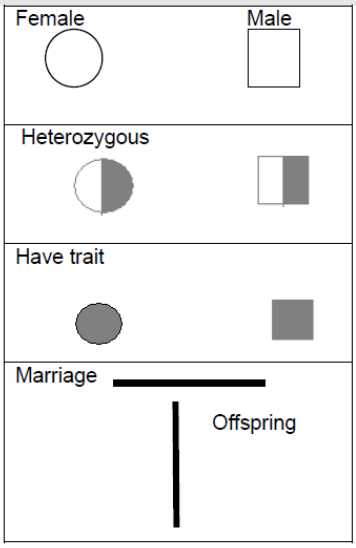
13. Unions are represented by horizontal lines, and offspring are represented by vertical lines.

14. In your journals, create a pedigree for your family. Do not include a trait right now; just show your parents and siblings.

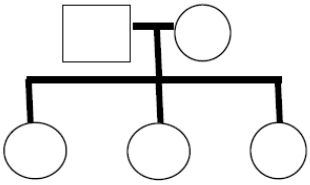
15. If we were tracking a dominant trait like tongue rolling, we would shade the family members who could roll their tongue. Using this information we learn about the genetic make-up of the family.

16. We can use this information to track more serious genetic disorders through a family.

Notes for Teacher



My Family Pedigree: (complete your own as an example for students)



Walk around checking their pedigrees. It is fun to see where they are in the family and it provides a personal link.

For enrichment, you may have students investigate genetic traits such as hemophilia, Tay Sachs, or Sickle cell anemia.

ELABORATE

Suggested time: Day 3

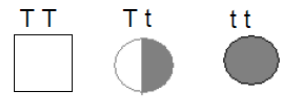
A Family's History

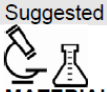
1. In this activity, have the students create a pedigree from the information they read in **A Family's History**.

2. Have them fill in as much detail about each family member as possible. Have them record the genotype above each shape.

MATERIALS

- Handout: **A Family's History** (1 per student)
- glue



Instructional Procedures	Notes for Teacher
EVALUATE **Learned Behaviors and Inherited Traits Card Sort** 1. Have the students sort the set of cards into two stacks, "learned behaviors" and "inherited traits." 2. Tell them to create a data table to show their results in their journals. 3. Under the data table, have the students explain the difference between a learned behavior and an inherited trait.	Suggested time: Day 3  **MATERIALS** • Card set: **Inherited Traits and Learned Behaviors**  Create data table to show results.

Charades

Biting your fingernails
Checking both ways before crossing a street
Tying your shoelaces
A lion hunting for food
Taking a bath
Birds building a nest
Cats bathing their young
Swimming
Squirrels burying acorns
Dogs recognizing their food and water bowls

Inherited Traits-Class Survey

Directions:

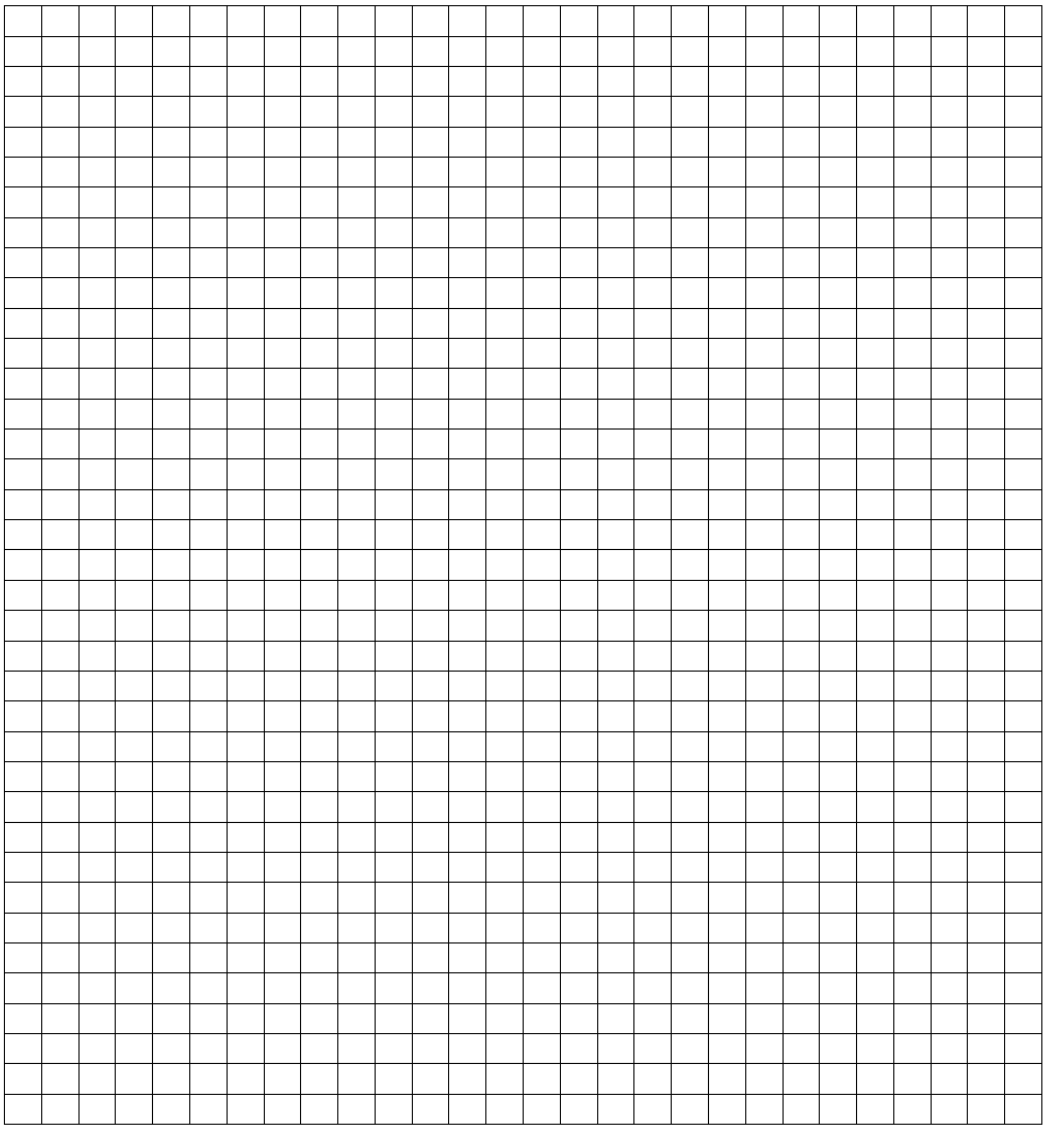
1. Choose a partner.
2. Complete the first two columns of the data table by looking at each other's traits.
3. Once everyone has a chance to finish, you will complete the last column of the data table "Group Data," together as a class.
4. After both parts of the data table have been filled out, use the results from the "Group Data" table to construct a bar graph of your findings. (Graph paper is attached)
5. Remember graphs must have a relevant title, properly labeled axes, and a key.
6. When graphing, try to use as much of the graph paper as possible. This means that the graph should not be on one corner of the paper. It should cover most, if not all, of the graph paper.
7. The rubric that will be used to grade your graph is included.

Pair Data

Trait	You		Your Partner		Group Data	
	YES	NO	YES	NO	YES	NO
Are you Female?	-	-		-	-	
Are you Right Handed?	-	-		-	-	
Do you have Attached Ear lobes?	-	-		-	-	
Can you roll your tongue?	-	-		-	-	
Do you have a Widow's Peak?	-	-		-	-	
Do you have a Cleft Chin?	-	-		-	-	
Do you have a Hitch Hiker's Thumb?	-	-		-	-	
Do you have Cheek Dimples?	-	-		-	-	

Total Number of Participants in your group:

Inherited Traits Survey Graph



Inherited Traits Survey Rubric

Criteria						Value
	0	5	10	15	20	
Title	Category not attempted	A title is not present.	A title is present at the top of the graph.	Title clearly relates to the problem being graphed (includes dependent and independent variable) and is printed at the top of the graph.	Title is creative and clearly relates to the problem being graphed (includes dependent and independent variable). It is printed at the top of the graph.	
Units		Units are neither described nor appropriately sized for the data set.	All units are described (in a key or with labels) but are not appropriately sized for the data set.	Most units are described (in a key or with labels) and are appropriately sized for the data set.	All units are described (in a key or with labels) and are appropriately sized for the data set.	
Labeling of X Axis		The X axis is not labeled.	The X axis has a label.	The X axis has a clear label that describes the units used for the independent variable.	The X axis has a clear, neat label that describes the units used for the independent variable (e.g., days, months, participants' names).	
Labeling of Y Axis		The Y axis is not labeled.	The Y axis has a label.	The Y axis has a clear label that describes the units and the dependent variable (e.g., % of dog food eaten; degree of satisfaction).	The Y axis has a clear, neat label that describes the units and the dependent variable (e.g., % of dog food eaten; degree of satisfaction).	
Neatness and Attractive-ness		Appears messy and "thrown together" in a hurry. Lines are visibly crooked.	Lines are neatly drawn, but the graph appears quite plain.	Neat and relatively attractive. Ruler and graph papers (or graphing computer program) are used to make the graph more readable.	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. Ruler and graph paper (or graphing computer program) are used.	
Teacher Comments: Total						____

A Family's History

This is the unofficial lineage of a family, recorded in an effort to track the recessive trait allowing a person to have super powers. This history will cover three generations of this super-powered family. Unfortunately, this is a transcript of a conversation between myself and an old historian. It is in text form, but needs to be represented symbolically on a pedigree.

It is your task to create a pedigree for this family and label each name below their shape, shading those members who have super powers, half shading those who are heterozygous for the trait, and identifying the genotype of as many family members as possible. Be very thorough in this endeavor, because you will need this information in the future. (Cut this out and glue it into your journal)

The lineage begins back in obscurity, before official records were kept to show marriages and births. The oldest generation that I was able to trace had the young hero Wilberforce as its patriarch. As a young man, he caught the eye of Runion, who gladly consented to be his wife. Runion worked hard everyday to do dishes, keep the garden, and do laundry. In time, they were blessed with four children.

The oldest was a strapping lad named Pinckney. As Pinckney grew, he took over tasks like gardening for his mother because it was hard work. Pinckney was able to farm much more than his mother, but still had to toil. The second child was rather frail and sickly. Imogene never was able to get outside to help with the chores, but her super strength helped her mother with the drudgery of lifting laundry baskets and feed sacks. The twins, Rufus and Ralph, were born next. Rufus and Ralph were not identical twins, but they did have bright yellow hair, which stood on end. If anyone teased Rufus about his hair, they would regret it because he would mutter under his breath and run around them so fast their hair would stand on end. Ralph however had to settle things the old fashioned way…but over time he learned to simply ignore the insults.

In time, this generation grew old enough to establish their own homes. Pinckney met a hard working lady with brilliant auburn hair. Grenoch worked the fields right alongside her husband, not thinking of the blisters and aches each day brought. Grenoch was the only daughter of the most powerful hero in the area. Pinckney and Grenoch had two non-super powered boys, Casper and Credence. Imogene never married; she stayed with her parents until her untimely death from a sneeze that caused her to loose her balance while she was helping hold up the house to level it. Rufus married a skilled heroine from a town three days travel from his home village. Together they had one girl, Dynemia. Ralph also married a heroine and had five children. The two oldest were girls, Blanche and Ambrosia, the youngest boys, Rubeus, Ruddy, and Horatio. Of these five, only Blanche was sent off to school to perfect her power of x-ray vision.

Learned Behaviors and Inherited Traits KEY

Learned Behaviors	Inherited Traits
Avoiding bad-tasting prey	Shape of nose
Speaking with an accent	Shoe size
Ability to hit a baseball	Eye color
Hunting	Shape of a bird's beak
Type of music one enjoys	Shape of leaves
	Cactus spines
	Color of feathers

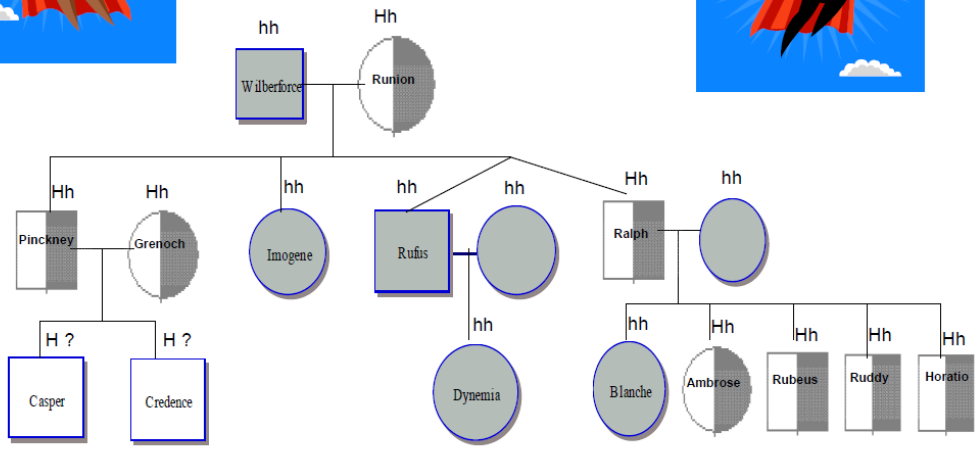
Learned Behaviors and Inherited Traits (pp. 1 of 2)

 Shape of your nose	Speaking with an accent	 Ability to hit a baseball
 Your shoe size	 Type of music you enjoy	 Eye Color

Learned Behaviors and Inherited Traits (pp. 2 of 2)

Shape of a bird's beak 	Avoiding predators by flying 	Hunting 
Cactus spines 	Color of feathers 	Shape of leaves 

A Family History KEY



APPENDIX E

AUDIT TRAIL OF INTERVIEWS

January – March 2010	**Interview & Observation Schedule**			
This schedule is included to document the research plan and provide the reader with an audit trail.	Observation designations refer to grade level. 8:30 – 9:30 observe 4th Means a 4th grade class was observed from 8:30 to 9:30		January 7 8:30 – 11:35 4th grade teacher, interview I 3:00- 4:00 5th grade teacher, interview	January 8 11:00 – 11:50 – Sarah, interview I 12:45 -2:45 – observe two 5th 3:30 – 4:30 6th - 8th grade teacher, interview I
January 11 3:00 -5:00 – ESC science specialist, Interview I	January 12 8:30 – 9:30 observe 4th 9:25- 10:30 observe 5th 1040-11:35 3rd grade teacher, interview I 12:45- 1:45 observe 5th 2:00 – 3:00 observe 3rd	January 13 8:30 – 9:30 observe 4th 9:35 – 10:30 observe5th 10:40 – 11:35 observe 4th 12:45 – 1:45 observe 4th 1:45 – 2:45 observe 5th 2:00 – 3:00 observe 3rd	January 14 8:30 – 9:30 observe 4th 9:35 – 10:30 observe 5th 10:40 – 11:35 observe 4th 12:45 -1:45 observe 5th 2:00 – 3:00 observe 3rd.	January 15 8:30 – 9:30 observe 4th 9:35 – 10:30 4th grade teacher, interview II 10:40 – 11:35 observe 4th 12:45 -1:45 observe 5th 2:00 – 3:00 observe 3rd 3:30 – 4:00 5th grade, interview II
January 18 STAFF DEVELOPMENT DAY 10:00-10:45 7th grade teacher, interview I	January 19 EARLY RELEASE DAY	January 20	January 21	January 22 8:53 – 9:00 observe 7th 9:45-10:35 6th - 8th grade teacher, interview II 10:40- 11:35 3rd grade teacher, interview II 3:30-4:00 3rd grade interview III
January 25 8 – 9:30 observe 7th (1,2) 9:30-10:30 observe 3rd 10:39 –11: 28 observe 7th 1:00- 2:00 – observe 3rd	January 26 8 – 9:30 observe 7th (1,2) 9:30 – 10:Lynn, interview I 10:39- 11:28 observe 6th 11:32 – 12:21–observe 8th 1:00 – 2:00 – observe 3rd 2:00 – 3:00- Debra, interview I 2:51 – 3:40 – observe 8th	January 27 8:00 – 9:30 observe 7th (1,2) 10:39- 11:28 observe 6th 11:32 – 12:21 –observe 8th 1:00- 2:00 – observe 3rd 2:00-3:00 – observe 3rd 2:51 – 3:40 – observe 8th	January 28	January 29 8:00 – 9:30 observe 7th (1,2) 9:45 – 10:30 7th grade teacher, interview II 10:39 -11:28 observe 6th 11:32 – 12:21 observe 8th 12:30-1:00 kindergarten, interview I 1:35 – 2:30 Observe kinder 2:51 – 3:40 observe 8th
February 1 9:30 – 10:30 3rd 1040-11:35 3rd grade teacher, interview IV 1:35 – 2:30 Observe Kinder 2:51 – 3:40 – observe 8th	February 2 Swap meet in San Angelo with 3rd grade teacher - 7:30 – 1:30 1:35 – 2:30 Observe Kinder 2:51 – 3:40 – observe 8th	February 3 9:45-10:35 7th grade teacher, interview III 10:39- 11:28 observe 6th 1:35 – 2:30 Observe Kinder	February 4	February 5 1040-11:35 6th -8th grade teacher, interview III 12:30-1:00kindergarten, interview II & III 1:35 – 2:30 Observe Kinder 3:40 – 4:00 6th – 8th grade teacher interview IV

January – March 2010	**Interview & Observation Schedule**			
February 8	February 9	February 10	February 11	February 12
February 15 5th 6 weeks begins 8:30 – 9:00 – observe 3rd. 9:00- 9:42 – 5th grade teacher, interview III 10:39-11:28 – observe 6th 11:32-12:21- observe 8th 12:40- 1:20 – observe 5th 1:35-2:30 – observe Kinder	February 16 8:30 – 9:25 – observe 3rd 9:25 – 10:30 – observe 5th 10:39-11:28 – observe 6th 11:32-12:21- observe 8th 12:40- 1:20 – observe 5th 1:35-2:30 – observe Kinder 2:51-3:40 – observe 7th	February 17 8:30 – 9:25 – observe 3rd 9:25 – 10:30 – observe 5th 10:39-11:28 – observe 6th 11:32-12:21- observe 8 th 12:40- 1:20 – observe 5th 1:35-2:30 – observe Kinder 2:51-3:40 – observe 7th	February 18	February 19 8:30 – 9:25 – observe 3rd 9:25 – 10:30 - observe 5th 10:39-11:28 – observe 6th 11:32-12:21- observe 8th 12:40- 1:20 – observe 5th 1:35-2:30 – observe Kinder 2:51-3:40 – observe 7th 3:40-4:30 – 6th - 8th grade teacher, interview V
February 22 8:30-9:30 – 5th grade teacher, interview IV 9:35-10:30 4th grade teacher, interview III 10:40- 11:30 – 3rd grade teacher, interview V 2:51-3:40 – observe 7th 3:40 – 4:15 7th grade teacher, interview IV	February 23	February 24	February 25	February 26 8:30 – 9:30 observe 4th 10:40 – 11:35 observe 4th 12:30- 1:00 –kindergarten teacher, interview IV 1:20-2:00 - Sarsh, interview II
March 1 8:30 – 9:30 observe 4th 10:40 – 11:35 observe 4th 12:45 -1:45 observe 5th	March 2 8:30 – 9:30 observe 4th 10:40 – 11:35 observe 4th 12:45 -1:45 observe 5th 3:00-3:45 4th grade teacher, interview IV		March 4	March 5 8:00-8:40 – 5th grade teacher, interview V

March 30th – Gerard, the superintendent Interview I
March 29th – Lynn, the elementary principal interview II

March 26th – Sarah, the curriculum director interview III
March 31st – Debra, the middle school principal interview II

VITA

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EDUCATION

Texas A&M University	Ph.D. in Curriculum & Instruction	2010
Texas A&M University	M.S. in Curriculum & Instruction	2006
Stephen F. Austin University	Secondary Teacher Certification	2002
Stephen F. Austin University	B.S Biology	1981

PROFESSIONAL HISTORY

Graduate Assistant	Texas A&M University	2007 – 2010
Project Manager e-BAT - RET	Texas A&M University	2007
PRISE	Texas A&M University	2005 – 2007
ITS – Educational Consultant	Texas A&M University	2004 – 2006

PROFESSIONAL SERVICE

Consultant - Gear Up Grant/ PLC-METS/PLCMAP/ABA	2010
Consultant/Instructor Science Methods Boot Camp	2009
Analysis of TAMU Student Teacher Program	2008
Phi Delta Kappa – Guest Speaker	2007 - 2009
Sigma Xi – Executive Committee/Chair of Awards	2006- current
Program Manager - RET Grant - Dr. Chris Quick	2006- current
Committee - Science Methods Restructure	2006- 2007
Consultant - Center for Distance Learning	2005
Consultant – ASAP Grant Cameron ISD	2005
Advisory Board – NSF Grant	2005

PROFESSIONAL INTERESTS

Authentic Scientific Inquiry
Scientist- Teacher Partnerships
Standards-Based Curriculum

PUBLICATIONS/UNPUBLISHED MANUSCRIPTS

Metty, J., & Stuessy, C. (2007). Facilities, materials, and safety. *PRISE White Paper*.

Metty, J., & Ivey, T. (2007). Working Conditions. *PRISE White Paper*.

Stuessy, C., & Metty, J. (2007). The learning research cycle: Bridging the gap between research and practice. *Journal of Science Teacher Education, 18*, 725-750.

Metty-Scallon, J. (2006). *Comparative study of authentic scientific research versus guided inquiry in affecting middle school students' abilities to know and do genetics*. Unpublished manuscript.