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The Relationship between Components of Effective Organizations and Teachers' Instructional Practice

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by

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(Rick Eigenbrood, PhD., Dean, School of Education)

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Table of Contents

List of Figures

List of Tables

List of Appendices

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Seattle Pacific University

Abstract

The Relationship between Components of Effective Organizations and Teachers' Instructional Practice

By Miriam E. Tencate

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This purpose of this study is to determine whether the components of effective organizations are significantly related to teachers' instructional practice as perceived by the teacher using data from the Program Capacity Survey (PCS) gathered during Year Two and Three of the STEM Career Awareness Program reform initiative. The PCS utilized Leithwood, Aitken and Jantzi's (2001) monitoring tool and is based upon both Organizational Learning Theory and the Theory of Sustainability (Coburn, 2003). This study utilized selected questions from the PCS which were categorized into components of effective organizations. A factor analysis was used to establish the validity of the categorization. Using an ordinal logistic regression, data was analyzed to determine whether the components of effective organizations are significantly related to teachers' instructional practice. In addition, the relationship and strength of association between the level of involvement in the decision making process and teachers' perception of their instructional practice was analyzed. While the results of the ordinal regression were statistically nonsignificant, there was a statistically significant relationship based upon Cramer's V for all five of the components of effective organizations at various collection periods throughout the reform implementation. There also was a statistically significant

association between the level of involvement in the decision making process to adopt a new reform initiative and teachers' instructional practice as perceived by the teacher. The findings support attending to and addressing components of effective organizations to create the conditions necessary to ensure a more successful reform implementation and increase the likelihood of sustainability.

Chapter One

Introduction

Since the mid-nineteenth century, reform initiatives have been introduced into the American education system to address the perceived failure of public education or to better align the system to changing societal context. These reforms have ranged from incremental to fundamental (Cuban, 1992) and focused on altering the curriculum, classrooms, governance and structure (Cuban, 1990; Kirst & Meister, 1985; Tyack & Tobin, 1994). Whether these reforms corrected the identified failure of public education or better aligned the system to the changes in society to the extent intended is debatable. Countless external and internal variables influence reform implementation and effectiveness. These include, but are not limited to, the effectiveness of the reform itself, teacher instructional capacity, leadership proficiency, staff collaboration, goal clarity, resource management and allocation, curriculum alignment, professional development, materials availability, facility adequacy, technology availability, transportation coordination, community support, political and societal factors, as well as student and family circumstances. The list is endless and may seem insurmountable without a systematic approach to identifying and addressing components within the school or district's control that may influence the implementation, effectiveness and sustainability of a reform initiative.

Reform implementation can consume large amounts of scarce school and district resources; money, time, the energy of teachers and administrators, without having "any discernible effect on what students actually learn in school" (Elmore, 1996, p. 35). To improve the quality of instruction with the intent of improving student outcomes,

educational reforms are often championed while vital school and district-wide conditions that may distract from or hinder the full implementation and sustainability of an initiative are ignored (Datnow, 2005; Elmore, 1996; Fixsen, Blase, Metz, & Van Dyke, 2013; McLaughlin & Mitra, 2001). The outcome may be a lack of coherence as districts seek to juggle competing priorities while implementing multiple initiatives; or the abandonment of a reform initiative before allowing any one reform to become fully embedded into practice. As Fullan (2005) contended, education does not suffer from lack of innovations, but rather "suffers from too many ad hoc, unconnected, superficial innovations" (p. 21).

Statement of the Problem

While effective instructional practices increase student achievement, "most educational reforms never reach, much less influence, long-standing patterns of teaching practices, and are therefore largely pointless if their intention is to improve student learning" (Elmore, 1996, p. 6). In the age of accountability and the external pressure to leave no child behind, districts may rush to adopt one or more reform initiatives without considering the impact on organizational components and may not consider the long-term responsibilities that may be required to implement and sustain a reform. This may result in a district "implementing" reform after reform without any long-lasting effect on a teachers' actual classroom practice and therefore, may have minimal, if any, discernable effect on student achievement. Fixsen et al. (2013) developed a formula which, when adapted for reforms, aptly depicts the importance of districts attending to the components impacting implementation:

"Effective [*reforms*] x effective implementation = improved outcomes"

As Fixsen et al. (2013) contended, "if [*reforms*] are not effective ([*reforms*] = zero) then the intended outcomes will not be achieved. If implementation supports are not effective (implementation = zero), then the intended outcomes will not be achieved" [*italics added*] (p. 214). Regardless of the effectiveness of the reform, in the absence of organizational supports or essential organizational components, reforms may fail to become embedded into practice and may dissipate or disappear altogether due to the lack of system coherence (Anderson & Stiegelbauer, 1994; Bertram, Blasé, & Fixsen, 2014; Coburn, 2003; Datnow, 2005; Elmore, 1996; Fixsen et al., 2013; Fullan & Miles, 1992; Kantamara, Hallinger, & Jatiket, 2006; McLaughlin & Mitra, 2001; Oakes, 1989; Stringfield & Datnow, 1998). Therefore, districts that embark upon a new reform should attend to systematic components that may influence the implementation and intended outcomes of the initiative.

Purpose of the Study

With all the responsibilities and activities required of teachers and administrators on a daily basis, the process of addressing organizational components may not seem as urgent as other pressing tasks. Not attending to these systematic variables, however, would be short-sighted as critical organizational components enable schools and districts to more successfully implement reform initiatives that may influence teachers' instructional practice, and, thereby, increase the overall effectiveness of the organization long-term.

The purpose of this study, therefore, is to determine whether the components of effective organizations, namely schools and districts, as identified by Leithwood, Aitken and Jantzi (2006) based on Organizational Learning Theory (OLT) and foundational to

the Science, Technology and Mathematics (STEM) Career Awareness Program's Innovation Leaders Academy (ILA) Program Capacity Survey (PCS), are significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative. If it is determined that one or more organizational components are significantly related to a positive influence on teachers' instructional practice, then, this study will seek to determine which components have statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform implementation. In addition, this study also will utilized the PCS data to determine whether the level of teachers' involvement in the decision making process to adopt a new reform initiative significantly relates to the teachers' instructional practice as perceived by the teacher. By identifying the components that influence a teachers' instructional practice and those with statistically more influence, administrators, who are often pressed for time and resources, may be able to prioritize how they address any potential barriers identified through a systematic analysis of these components.

Theoretical Framework

As schools and districts are dynamic systems functioning within ever changing economic, political and social contexts and with increasing demands for student achievement for all, it is imperative that leaders within the organization develop and cultivate the components necessary to respond to the needs of students. This requires that schools are not just learning environments for students, but also are learning organizations in order to make the systemic changes necessary to respond to the needs of all constituents. Leithwood, Aiken and Jantzi (2001) identified organizational elements of effective schools and districts and created a monitoring system that may assist

organizations to systematically collect data on the components used to identify potential barriers to reform implementation. These organizational components are not discrete factors, but are interrelated parts of a whole system that interact and influence each other.

Leithwood et al. (2001) synthesized the theory and research on (a) learning organizations, focusing on "conditions within an organization that foster organizational learning" (p. 13); (b) effectiveness in regards to teaching and classroom, school and district; (c) restructuring educational and non-educational institutions; and (d) "broad social trends and how to respond to them organizationally" (p. 15) as a basis for the monitoring system. In addition, the researchers incorporated the work by Banner and Gagne (1995) to identify categories that grouped the components included in the monitoring tool. Banner and Gagne (1995) drew from an amalgamation of theories and focused on system structures and processes to create a framework to analyze an organization at the macro-level through a transformational perspective. Their meta-model highlights various organizational components, such as collective paradigms and organizational culture, which may influence organizational structures and processes that in turn, may impact an organization's ability to transform based upon organizational needs and external influences. Through their research, Leithwood et al. (2001) initially identified seven critical components of effective organizations that were later revised to eight components (Leithwood et al., 2006). These eight organizational components are: (a) leadership and management, (b) mission and goals, (c) culture and community, (d) planning and instructional services, (e) structure and organization, (f) data-driven decision making, (g) policies and procedures, and (h) community partnerships. Based upon information gathered regarding these components, schools or districts may choose

to develop an action plan to address potential barriers identified that may impact reform implementation.

Organizational learning theory. Foundational to the monitoring system created by Leithwood et al. (2001) and to the PCS upon which this study is based, is the theory of organizational learning. Schön (1971) noted that society is in a continual process of transformation, and therefore,

> we must become able not only to transform our institutions, in response to changing situations and requirements; we must invent and develop institutions which are 'learning systems', that is to say, systems capable of bringing about their own continuing transformation. (p. 30)

The theory was further developed by Argyris and Schön (1978) who articulated that learning involves the "detection and correction of error" (p. 2). Once an error has been identified, inquiry occurs. They described this inquiry process by which individuals within the organization, and thus, the organization itself, approach and address these errors as single-loop or double-loop learning. Depending upon the error detected, both have their place in organizational learning. As Argyris and Schön (1978) noted, high quality inquiry may result from both processes.

Argyris and Schön's work, both individually and collectively, was foundational to Senge's seminal work, *The Fifth Discipline* (1990). While Senge was instrumental in forwarding the theory of learning organizations, Leithwood et al. (2001) also viewed his work through the lens of how organizations respond to broad social trends. Senge (1990) theorized that if personal mastery, mental models, building shared vision, team learning and systems thinking are addressed the necessary conditions would be created to

transform a system into a learning organization. These disciplines are foundational to learning organizations and are threaded, in part or in whole, throughout research and are substantive to identifying conditions necessary to implement educational innovations (Alsbury, 2008b; Alsbury et al., 2012; Leithwood et al., 2001; Leithwood, Leonard, & Sharratt, 1998; McLaughlin & Mitra, 2001). The components identified as critical to effective organizations by Leithwood et al. (2006) are related to the key elements identified in OLT (Figure 1), as well as the research identified in the Literature Review of this paper.

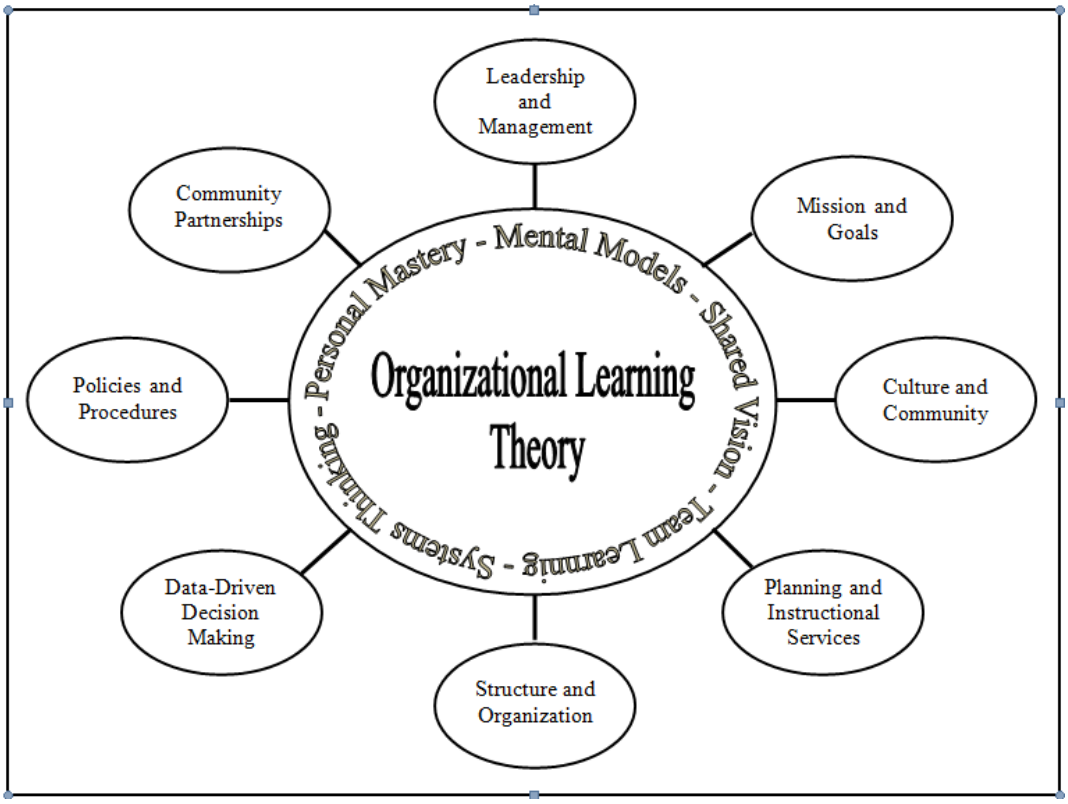


Figure 1. Organizational Learning and Components of Effective Organizations

Research Questions

In this era of accountability and increased pressure to ensure the learning of all students, organizations must be able to create conditions necessary to positively influence teachers' instructional practice. Research has shown that teachers directly impact student

achievement (Sanders & Horn, 1998; Wright, Horn, & Sanders, 1997) while school and district-wide conditions, such as leadership, indirectly effect student performance (Heck & Hallinger, 2010; Leithwood & Jantzi, 2006; Leithwood, Patten & Jantzi, 2010; Ross & Gray, 2006; Supovitz, Sirinides, & May, 2010; ten Bruggencate, Luyten, Scheerens, & Sleegers, 2012; Witziers, Bosker & Krüger, 2003). Therefore, it is imperative that an organization create conditions based upon OLT that enable teachers to focus on instructional strategies and classroom conditions that directly impact student achievement, and also remove barriers that distract from the needs of students and needlessly waste the limited time, energy, and attention of teachers and administrators.

The research questions posed in this study will be used to determine whether there is a relationship between components of effective organizations and teachers' instructional practice.

Question One – Are the components of effective organizations, based on Organizational Learning Theory, significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Two – Which component of effective organizations, based on Organizational Learning Theory, has statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Three – Is the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Null hypotheses.

Hypothesis One – The components of effective organizations, based on Organizational Learning Theory, are not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Hypothesis Two – None of the components of effective organizations, based on Organizational Learning Theory, has statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform initiative.

Hypothesis Three – The level of involvement in the decision making process to adopt a new reform initiative does not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Key term. Effective Organizations – This term specifically addresses elements or components of schools and districts "for which there is convincing evidence of 'value addedness' or impact on important outcomes" (Leithwood et al., 2006, p. 3). Grounded in Organizational Learning Theory, these components collectively enhance an organization's capacities to serve students.

Significance of the Study

The conclusions of this study are anticipated to be significant at the substantive and practical level. Substantively, this study seeks to statistically quantify the level of influence of components identified in effective organizations as identified by Leithwood et al. (2006). The study adds to the body of knowledge by determining the significance of organizational variables on teachers' instructional practice as perceived by the teacher during a reform initiative. The data collected during the implementation of the STEM Career Awareness Project utilizing the PCS, which is based upon the research conducted

by Leithwood et al. (2001) and Coburn (2003), will quantify the level of influence these components have on teachers' instructional practice as measured by teacher perception.

Regarding practical significance, administrators may use the results of this study to guide their prioritizing of how to address organizational components that may most influence how teachers' perceive their instructional practice during a reform initiative. By systematically identifying and addressing components within an organization that may hinder reform effectiveness and sustainability, administrators may be able to create contextually appropriate action plans that minimize barriers and better align organizational components, resulting in a more successful reform implementation.

Research Methods

This study will use a correlational research design using data from the STEM Career Awareness Project ILA PCS. All questions selected for inclusion in this study will be assigned to one of the eight components of effective organizations to determine whether the components are significantly related to and statistically have more influence on a teachers' instructional practice. The questions from the PCS selected to answer these research questions utilize a five-point Likert response format and will be considered categorical for this study. A factorial analysis will be used to determine the questions that load onto each of the components. The responses from the questions will be grouped together to create a composite score. Cronbach's alpha will be utilized to assess the internal consistency of each component. Frequency distributions will be used to assess the distribution of the PCS data regarding teachers' perception of their instructional practice. A multiple linear regression analysis then will be used to determine the

correlation identifying the degree to which the components of effective organizations and teachers' perception of their instructional practice during a reform initiative are related.

To determine whether the level of involvement in the decision making process to adopt a new reform initiative significantly relates to teachers' instructional practice as perceived by the teacher, frequency distributions will be used to assess the distribution of teachers' involvement in the decision making process to adopt the STEM Career Awareness Program. Pearson's Chi Square will be used to determine the relationship between the level of involvement in the decision making process and teachers' perception of their instructional practice. Cramer's V will be used to measure the strength of association between these two categorical variables (Field, 2009).

Limitations of the Study

This study utilizes self-reporting data to measure positive influence on instructional practice. This is a limitation as individuals' view of their own instructional practice is subjective based upon their own interpretation of their own actions which may differ from that of an observer (Cohen, 1990). While teachers may report a positive change in their instructional practice, this may not necessarily equate to more effective instructional practices. Another limitation is that organizational learning theorists have identified important components that influence behavior that may be difficult to measure, such as Argyris and Schön's (1978) espoused theory and theories-in-use, as well as Senge's (1990) mental models. While these theoretical elements are influential in guiding individual and organizational actions, they are not directly measured in this study. Nevertheless, the conceptions of mental models, espoused theory and theories-in-use may help explain and frame difficulties encountered during reform implementation and may

assist administrators in determining a course of action in addressing these barriers. Other limitations to this study will be addressed in Chapter Five.

Structure of the Dissertation

The framework of this dissertation is organized into four subsequent chapters, titled Literature Review, Research Methodology, Results and Discussion of the Results.

Chapter Two includes a review of literature regarding Organizational Learning Theory, Leithwood et al.'s (2001, 2006) monitoring system, as well as the work by Coburn (2003) regarding sustainability and scaling up of reform initiatives. These are all foundational to the PCS, the data upon which this study is based. The literature review includes research on effective teaching and classroom practices, effective schools and districts; most specifically focusing on the eight components of effective organizations.

Chapter Three includes an overview of Leithwood et al.'s (2001, 2006) survey foundational to the PCS, exploration of the PCS and validity of this survey, an explanation of the process for survey question categorization based components of effective organizations (Leithwood et al., 2006) and the research methodology and statistical methods utilized in this study.

Chapter Four includes the results of the statistical analysis and Chapter Five concludes with a discussion of the results, limitations of this study and suggestions for further study.

Chapter Two

Literature Review

As schools and districts face the need to transform based upon external demands and internal needs, the stress within organizations increases. While some tension is required for organizational learning to occur, a balance between stability and change is also necessary as too much tension or change "make[s] it difficult for learners to map their environment" (Fiol & Lyles, 1985, p. 805). Conversely, too much stability reduces the incentive to change as current behaviors are adequate for the situation. Therefore, it is critical for leaders to manage the amount of tension within an organization to identify the "sweet spot" between too much and too little. This is easier said than done considering the many and varied factors that may lead to tension within an educational setting: external accountability requirements, parent and community demands, staff turnover and burnout, multiple and possibly conflicting reform initiatives, etc. By engaging in systematic analysis of organizational components, leaders may be able to identify potential barriers and develop a prioritized plan of action to address those components that may be challenges to full and sustained reform implementation. Organizational Learning Theory is foundational to both the identification of components of effective organizations (Leithwood et al., 2001, 2006) and the conditions necessary for reform sustainability (Coburn, 2003); both of which create the underpinning of the PCS data used in this study.

Organizational Learning

To increase an organization's capacity to implement new initiatives, individuals within the organization must learn. While individual learning does not guarantee

organizational learning, the second cannot occur without the first (Argyris & Schön, 1978; Fiol & Lyles, 1985). Building upon earlier theoretical work, Fiol and Lyles (1985) included the need for both cognitive and behavioral change in their definition of organizational learning. They contended that although slight behavioral changes may occur, this does not necessarily mean that cognition changes occurred (Fiol & Lyles, 1985). Likewise, newly acquired knowledge does not necessarily equate to changes in behavior. Therefore, for organizational learning to occur, individual learning that requires both cognitive and behavioral changes is imperative.

Elmore (1996) and McLaughlin and Mitra (2001) contended that for reform efforts to continue beyond the initial implementation phase, theoretical constructs underlying initiatives must be addressed to shape teachers' pedagogical beliefs. This supports Senge's (1990) discipline of mental models as these paradigms shape how people perceive the world and are powerfully influential in determining how individuals act; even though they exist below the surface and may often go unexamined. Ensuring deep understanding of the reform initiative may necessitate a change in teachers' mental models and is essential in sustaining and scaling up a reform initiative (Coburn, 2003). Schein (1993) contended that having shared mental models that intersect the subsystems of an organization is required for organizational learning to occur.

Creating the conditions necessary for both individual and organizational learning appears to be critical for successful reform implementation and sustainability. Each of the following constructs: single- and double-loop learning, espoused theory and theories-in-use, organizational memory; as well as shared vision, team learning and systems thinking, are foundational to OLT and to the development of characteristics identified in

effective schools and districts. While these constructs are not measured directly in the PCS, they are key elements in OLT upon which this survey is based.

Single- and double-loop learning. A clear and simple explanation of *single-loop learning* is that of a thermostat that turns the heat on and off based upon whether the temperature in the area being monitored is too hot or too cold. The corrective action of the thermostat (turning on or off) is single-loop learning. Depending upon the error detected, this type of learning may be an efficient and an appropriate response as it assists an organization in remaining stable in the midst of a changing context. During single-loop learning, underlying norms and beliefs remain unchanged. Within education, single-loop learning is used when an issue is identified and addressed efficiently within the present structure. For example, a district might determine the need for an updated student data management system as the present system is too cumbersome for teachers to use efficiently. Once a new data management program is purchased and implemented, teachers are trained on how to use the new system. In this instance of single-loop learning, the district detected the error, conducted an inquiry process to select a new data management system, and trained the teachers on how to use the new program. Underlying beliefs and norms remained unchanged during this process; however, the process may have been efficiently conducted and appropriate, and may have included high quality inquiry to determine the most appropriate and effective data management system to be implemented.

Double-loop learning is when an error is identified and "corrected in ways that involve the modification of an organization's underlying norms, policies, and objectives" (Argyris & Schön, 1978, p. 3). Expanding upon the previous example, if during the

process of identifying a new student data management system, the district undertakes an inquiry process to discuss the purpose of specific assessments, determine which continue to meet the needs of all constituents and identify those assessments that should remain and those that should be replaced or discontinued, it is possible that double-loop learning may occur during this process. Depending upon the authenticity of the process, it is possible that tacit beliefs, norms and assumptions regarding the purpose and use of assessments are uncovered.

While this study does not measure single- or double-loop learning, understanding that the decision making process influences organizational conditions is critical (Bertram et al., 2014). School and district leaders need to be cognizant that decisions may tacitly express the organizational norms and beliefs that are acceptable. Single-loop learning may provide the stability necessary to an organization facing multiple conflicting demands, whereas, double-loop learning may signal that change may be necessary. Leaders should thoughtfully plan whether single- or double-loop learning is appropriate in a specific situation.

Espoused theory and theories-in-use. In addressing underlying assumptions fundamental to double-loop learning, Argyris and Schön (1974) referred to their earlier work regarding theories of action that inform professional practice and expanded the idea of *espoused theory* and *theories-in-use* from individual actions to organizational behavior (Argyris & Schön, 1978). An espoused theory is what is communicated to others; theories-in-use is what actually governs behavior. While an espoused theory and the theory-in-use may be one-and-the-same, there also may be differences between the two that may result in dissidence between what is communicated and observed behavior.

Underlying assumptions, beliefs and norms may be inferred from observing individual and organizational behavior. Theories-in-use results in maps that guide both individual and collective inquiry within the organization. While there may be a variety of reasons for the unspoken nature of the theories-in-use; they are powerful as they operate outside of awareness and account for continuity of both individual and organizational behavior (Argyris & Schön, 1978; Schein, 1992). Through the process of collective inquiry, double-loop learning may require resolving conflicting norms exposed between the espoused theory and theories-in-use. Extending the previous example, during the double-loop inquiry cycle of the student data management system, while the espoused theory may be that "all students learn," the data may uncover that some students are not learning. During the inquiry process, a teacher's theory-in-use may be uncovered regarding his or her belief regarding learning for all students. This may influence his or her decision whether to make an instructional adjustment ensuring all students truly learn versus continuing the same strategy even though it has not shown to be effective for some students.

While this study does not measure either espoused-theory or theory-in-use, these conceptions are critically important in framing both individual and organizational learning and behavior. The understanding of these theoretical constructs might assist leaders in developing effective action plans that address potential barriers to reform implementation, effectiveness and sustainability.

Organizational memory. *Organizational memory* (OM) is what maintains an organization's stability and may employ unspoken theories-in-use. It transcends individuals and exists as personnel transition in and out of the organization; powerfully

influencing the system. Public representations of an organization's memory may be evident in organizational charts, policies, procedures, etc. OM guides inquiry and "reveal[s] patterns of communication and control" (Argyris & Schön, 1978, p. 17) that governs current organizational activities and guides future action. OM may unintentionally perpetuate tacit theories-in-use that hinder transformative behavior impacting the organization's ability to learn. Fiol and Lyles (1985) contended that it may be necessary to uncover tacit beliefs and assumptions requiring a change in both thinking and behavior, if organizational learning is to occur. Organizational memory may influence components within an organization, such as policies and procedures and structure and organization, which, if left unaddressed, may hinder reform implementation and sustainability.

Shared vision. Changing theories-in-use underlying pedagogy is both difficult and individualized. Creating a *shared vision* fosters camaraderie throughout an organization and provides coherence to diverse activities which may be difficult for individuals to implement. This common sense of purpose and shared meaning is essential to growing both individuals and the organization as it provides focus, clarity and energy for learning. A shared vision "reaches into the hearts of people and engages them to act on behalf of something beyond their own immediate self interest" (Hallinger & Heck, 1999, p. 180). Senge (1990) argued that a learning organization is not possible without a shared vision; and, this leadership discipline is cited in research as a critical condition for an organization to implement change (Hallinger & Heck, 1999; Ross & Gray, 2006). This study will seek to determine whether shared vision as part of the Mission and Goals component influences teachers' instructional practice.

Team learning. Developing a culture of team learning, which includes the concepts of collaboration and capacity building, has been cited as a critical element to implementing educational reforms (Barth, 1986; Fullan, 2005; Hallinger & Heck, 1999; Leithwood et al., 1998). Senge (1990) contended that "team learning is vital because teams, not individuals, are the fundamental learning unit in modern organizations … unless teams can learn, the organization cannot learn" (p. 10). Within organizations, teams can accomplish more collectively than any one person can accomplish individually. In addition, when teams truly learn, individuals grow more rapidly than could have occurred individually (Senge, 1990). Team learning is imperative as teams function as a microcosm of the larger organization, and provides a structure for developing professional learning communities. Both Fullan (2005) and Leithwood et al. (2006) argued that professional learning communities are essential to developing and increasing an individual's professional repertoire and influence the culture and community of an organization. This study will seek to determine whether Culture and Community statistically influences teachers' perceptions of their instructional practice.

Systems thinking. The interrelated structures between the important components of a system influence behavior over time. *Systems thinking* emphasizes seeing the interrelationships between components and focuses on seeing patterns more clearly; enabling organizations to identify and attend to causes that may limit growth (Senge, 1990; Shaked & Schechter, 2013). Being able to identify those factors that create barriers is essential as it enables

organizations to identify where well-focused actions may lead to significant, enduring improvements (Senge, 1990). Therefore, in order to enact educational reforms that impact student achievement, an organization should use systems thinking to attend to the factors that influence both the individual's and organization's beliefs, attitudes and values that may limit growth. Thornton and Perreault (2008) supported this assertion that systems thinking is crucial as they contend that if "the process of systems change cannot be understood and applied at all levels within a school district, then school improvements are doomed to fail from the beginning" (p. 40).

Theory of Sustainability

Building upon OLT and incorporated into the PCS, Coburn (2003) identified the conditions necessary to scale-up and sustain reform efforts. Sustainability of a reform initiative is incredibly difficult in the "face of competing priorities, changing demands and teacher and administrator turnover" (Coburn, 2003, p. 6). By planning for this inevitable instability within the system, schools experienced more successful reform implementation and sustainability (McLaughlin & Mitra, 2001). In addition, for educational innovations to alter instruction, the reform should address the essential elements of educational practice (Coburn, 2003; Elmore, 1996). Coburn (2003) contended that attention must be paid to the "nature of change in classroom instruction; issues of sustainability; spread of norms, principles, and beliefs; and a shift in ownership such that a reform can become self-generative" (p. 3).

Coburn (2003) identified *depth*, *spread* and *shift* as necessary components to sustaining and scaling up educational reforms. Depth addresses profound and meaningful

change in teacher practices and pedagogical beliefs. It encompasses more than having classroom teachers implement a specific teaching strategy; it is ensuring an understanding of the theory behind why the strategy is effective. Coburn (2003) argued that reforms aimed at changing classroom practices can be implemented at "varying degrees of depth" (p. 5); therefore, for innovations to become deeply embedded into instructional practice and effectively scaled up, leaders must address teachers' core pedagogical beliefs and "underlying assumptions about how students learn, the nature of subject matter, expectations for students, or what constitutes effective instruction" (p. 4). As with OLT, addressing the underlying beliefs held by participants within an organization is essential to changing behavior and is foundational to reform implementation.

Spread disseminates the reform, as well as the values and beliefs underlying the change in classroom instruction, throughout the school and district. Exporting the beliefs and values beyond the classroom is important as it provides foundational knowledge to give the reform sustainability and influences the organizational culture. Shaping the culture by increasing and strengthening the capacity throughout the system enables district leadership to prioritize the use of resources to sustain the reform effort in the midst of competing demands.

Shift is described as the "moment a reform effort is internalized and continued by actions of the district" (Alsbury, 2008b, p. 180); ownership moves the reform beyond the initial implementers and into the organizational structures. Alsbury (2008b) identified some shift activities as: ensuring that leaders at all levels of the organization, as well as teachers, understand the pedagogy and nature of the reform; creating a method for on-

going professional learning; holding the district formally responsible for the continued spread of the reform through continued funding and by weaving the beliefs and values throughout policy, hiring practices, budgeting, scheduling of time, and procedures within buildings. Lack of shift in ownership may hinder an innovation from becoming internalized into the culture of an organization and may limit the depth of implementation and its sustainability (Coburn, 2003, McLaughlin & Mitra, 2001).

Sustainability theory identifies the organizational characteristics necessary for the effective scaling up of initiatives. As each organization is influenced by unique situational realities, the use of an instrument to measure these variables, such as the PCS, enables the district to make decisions based upon teachers, administrators and other stakeholders' feedback. Potential barriers may be avoided or minimized based upon the contextualized information gathered from the survey increasing the possibility of successfully implementing and sustaining the reform.

Review of Research

The research on effective teaching and classrooms, effective schools and effective districts is foundational to Leithwood et al.'s (2001, 2006) monitoring system as well as to the STEM Career Awareness Program Capacity Survey. The research and conceptions explained below may guide administrators' behavior in identifying barriers to reforms or in creating the conditions necessary for successful implementation and sustainability. In addition, they are foundational to the eight components of effective organizations used in this study.

Research on effective teaching and classrooms. Effective teaching and classroom practices are foundational to effective educational organizations

(Levine & Lezotte, 1990). Fundamentally, effective teachers have subject matter and pedagogical content expertise, as well as understand the pedagogy of teaching (Shulman, 1986). They actively teach and instruct students how to have an active role in their own learning to create a classroom environment where all students have the opportunity to learn (Brophy & Good, 1986; Wang & Palinscar, 1989). More effective teachers have a well-planned and organized classroom with established expectations, routines and rules (Evertson, 1989; Evertson, Anderson, Anderson, & Brophy, 1980; Virgilio, Teddlie, & Oescher, 1991). Students spend more time-on-task than students in less effective classrooms; instructional time is maximized as time spent on non-instructional activities and transitions are minimized (Brophy, 1986; Evertson et al., 1980; Levine & Lezotte, 1990; Stringfield & Herman, 1996; Virgilio et al., 1991). While classroom management is not an end unto itself, it provides a framework in which a teacher can create an effective classroom for all students and is "among the most powerful correlates of student achievement" (Brophy, 1986).

Effective teachers carefully plan, deliver and provide effective instructional activities with clear instructional objectives (Brophy, 1986; Levine & Lezotte, 1990; Shulman, 1986) to assist students in developing a clear understanding of the purpose of instruction. They deliver well-structured, well-sequenced presentations (Brophy, 1986), and are skilled at using a variety of instructional strategies to match the needs of students, such as effective questioning strategies, small group instruction, and differentiated assignments, amongst others (Brophy, 1986; Crone & Teddlie, 1995; Levine & Lezotte, 1990; Shulman, 1986; Virgilio et al., 1991). More effective teachers monitor students'

progress (Fuchs & Fuchs, n.d.; Levine & Lezotte, 1990) to determine if the instructional strategy is effective. If it is determined through progress monitoring that students are not showing the growth expected or necessary to master the content, effective teachers adjust their instructional practices to match the needs of the student (Levine & Lezotte, 1990; Stringfield & Herman, 1996). In order to appropriately adjust their instructional methods, teachers need to have a comprehensive repertoire of strategies, or if they are lacking effective instructional approaches, seek out new strategies (Stringfield & Herman, 1996). Effective teachers demonstrate the ability to monitor and adjust their instructional strategies based upon the needs of their students (Brophy & Good, 1986).

As every teacher and classroom is part of a larger organization, effective teachers demonstrate skills that expand beyond their own classroom setting. For example, more effective teachers collaborate with their colleagues to ensure vertical and horizontal alignment of curriculum to address potential redundancy and to ensure the proper scope and sequence is occurring within their classroom (Conoley, 1989; Levine & Lezotte, 1990). Leithwood et al. (2001, 2006) specifically address collaboration, deprivatized practice, and collective focus on student learning under the component of Culture and Community as effective teachers demonstrate these behaviors in the broader school community. As Crone and Teddlie (1995) noted, in more effective schools, teachers received information and informal help from colleagues which contributed to the overall result of "higher means and smaller variances of teacher behavior in effective schools" (p. 1); in other words, there were less ineffective teacher behaviors evident in effective schools.

R**esearch on effective schools.** The interconnectedness of effective teaching and classrooms in relation to effective schools cannot be overemphasized as school effectiveness is "clearly dependent upon effective classroom teaching" (Good & Brophy, 1986, p. 581). Just as teachers need to be able to identify the strengths and weakness of their students in order to provide effective instruction, school leaders must be able to do likewise for their teachers in order to provide the appropriate level of support (Virgilio et al., 1991). Knowing the areas of expertise and areas of growth of staff members enable principals to develop well-focused action plans to address barriers to effective reform implementation.

Effective school research covers a broad spectrum of interrelated components each containing interconnected elements that Leithwood et al. (2001, 2006) attempted to organize in a manageable structure. Some components may seem more obvious as essential to effective schools, such as School Leadership and Management, Mission and Goals, or Culture and Community. The authors, however, also highlighted those less visible and often overlooked elements of Structure and Organization and Policies and Procedures that may hinder a school or district's ability to implement a reform initiative. As Senge (1990) stated, "structures of which we are unaware hold us prisoner" (p. 95). The research for each of these interrelated components is addressed later in this chapter.

Research on effective districts. As classrooms are nested within schools, and schools nested within districts, district-level conditions influence reform implementation and sustainability (Coburn, 2003; Datnow, 2005; Leithwood et al., 1998). Anderson and Togneri (2005) contended that "district-level decisions and actions can, in fact, make a difference in the quality of teacher and student performance and in the implementation of

change at the school level" (p. 176). Research has shown that schools implementing reform initiatives without district-level support led to the deterioration of the reform effort at the school level (Datnow, 2005; Firestone, 2009; McLaughlin & Mitra, 2001). Spillane and Thompson (1997) fittingly captured the complex and interrelated nature of the components influencing the implementation and sustainability of reform initiatives:

> The factors that make up a district's capacity to support ambitious instructional reform are highly intertwined. Growth in one component depends crucially on, and frequently contributes to, growth in the others; capacity to support instruction is best understood as a complex, interactive configuration. (p. 188)

Coherent organizational structures are critical to district reform implementation, effectiveness and sustainability (Anderson & Togneri, 2005). District leaders need to be able to identify whether there are fractionalized processes, conflicting policies and practices and misaligned priorities which may result in lack of coherence and hinder reform implementation (Hightower, 2002; Johnson & Chrispeels, 2010). Organizational dissidence can impact resource allocation and leadership support for initiatives which may result in the demise of reforms and the return to the status quo. Hightower (2002) contended that "in most districts, the status quo has evolved into little more than an accumulation of programs and funding sources, leaving fragmented, unfocused district systems" (p. 8) making reform implementation and sustainability difficult.

With intensifying accountability demands, district leaders play an increasingly crucial role in creating the conditions necessary to move schools and districts forward in effectiveness and strengthening teaching and learning districtwide for all students (Honig, 2008). Districts also are critical in mitigating the tension between state and federal

mandates and local priorities. To moderate this tension, proactive districts engage in a process of "strategic interaction" (Anderson & Togneri, 2005, p. 177) where external demands are interpreted and used as opportunities to further district priorities in regards to change and improvement.

Many of the same conditions required for successful reform implementation at the school-level were identified as important factors at the district level: strong instructional leadership, system-wide focus on achievement, improvement and consistency of instruction, coherent professional development, district-guided curriculum and aligned assessments, frequent monitoring and use of data for decision making, alignment of resources with improvement goals, and a shared vision (Anderson & Togneri, 2005; Johnson & Chrispeels, 2010). As such, the components identified by Leithwood et al. (2006) as critical to ensuring a successful reform implementation at the district-level are similar to those at the school-level, with only minor differences in the wording of questions or of the elements identified within a component. By systemically attending to critical organizational conditions, districts can identify potential barriers and develop a contextually appropriate action plan to address potential challenges that may influence the implementation, effectiveness and sustainability of reforms.

Organizational Components

Based upon research and organizational learning theory, Leithwood et al. (2006) identified the following eight organizational components which are foundational to the STEM Career Awareness Program PCS and are used to determine whether there is a relationship between the components of effective organizations and teachers' perception

of their instructional practice. The Literature Review highlights features of each of the eight categories measured in this study.

Leadership and management. Effective leaders at both the district and school-level are integral to effective organizations. Levine and Lezotte (1990) cited "the building principal as the most critical leadership determinant of effectiveness" (p. 16). Research has since created a compelling case regarding this critical component, as Louis, Leithwood, Wahlstrom and Anderson (2010) claimed to "have not found a single case of a school improving its student achievement record in the absence of talented leadership" (p. 9). These researchers further stated that "leadership is second only to classroom instruction as an influence on student learning" (Louis et al., 2010, p. 9).

Leaders at all levels have a wide-ranging impact on organizational conditions by providing direction and exercising influence (Louis et al., 2010). Therefore, a thorough understanding of the interrelationship between the various components and thoughtful managing of these elements within a system is important as a leader's decisions have a ripple effect throughout the organization. These decisions, over time, shape the culture within an organization whether that is at the school or district level. District leaders shape key instructional components, such as staff development, curriculum alignment, curricular materials and student assessment, that impact teaching and learning throughout the entire educational system (Johnson & Chrispeels, 2010; Spillane, 1996, Spillane & Thompson, 1997). In addition, district administrators manage crucial organizational elements that may indirectly facilitate or hinder learning opportunities within the classroom; resource allocation, transportation coordination, facility adequacy, policy and

procedure implementation, to name a few (Horng & Loeb, 2010; Johnson & Chrispeels, 2010; Louis et al., 2010).

Through the process of hiring, supporting teachers' growth and removing ineffective staff, leaders have the "greatest impact" (Virgilio et al., 1991, p. 163); which results in better student outcomes (Horng & Loeb, 2010). Effective principals recognize that more effective teachers differ from less effective teachers in regards to the "expectations and achievement objectives that they hold for themselves, their classes, and individual students" (Brophy & Good, 1986, p. 370) and establish a clear process for socializing new teacher into the school to help transmit those expectations to new staff. This process helps establish and support a collaborative culture with common beliefs, norms and high expectations that are critical to effective organizations. This transformational approach to leadership is interwoven into Leithwood et al.'s (2006) monitoring system and thus integrated into the PCS, by examining how leaders within a school or district set direction, develop people and redesign the organization (Leithwood & Jantzi, 2006; Louis et al., 2010).

Mission and goals. Setting direction through a clear, compelling *mission* engages staff to commit to something larger than themselves; and, may harness their collective energy toward the accomplishment of clear student learning *goals*. The energy, focus and clarity created around a shared sense of purpose is essential to organizational learning, and a crucial component when implementing a new reform effort or moving toward an increase in school or district effectiveness (Leithwood et al., 1998; Levine & Lezotte, 1990). Shared school goals focused on student learning provide a clear target which may guide teachers' decisions and actions in a profession that is primarily practiced behind

closed doors (Leithwood et al., 1998). Engaging staff in developing meaningful, shared goals is critical as it creates buy-in which may harness the energy of staff to embrace a new reform initiative designed to meet a school or district's mission and goals.

In addition, mission and goals may serve as a filter by which an organization can interpret environmental demands and may be used to frame new futures (Leithwood et al., 1998). They provide the organization criteria by which to measure potentially conflicting mandates and may help in determining an appropriate response to these requirements. Leaders in less effective schools frequently blamed outside forces for many of the problems encountered (Levine & Lezotte, 1990), rather than use these external pressures as opportunities to move forward with change already identified as necessary through an internal process.

For this component to serve as a criteria for decision making, the mission and goals must be meaningful and well-understood, as well as "expressions of fundamental values held by organizational members" (Leithwood et al., 2006, p. 68). Therefore, the process by which they are created, as well as the end product, is critical to engendering staff engagement and commitment. Effective leadership creates the structure and process which give staff the opportunity to participate in the development of this critical component and fosters the acceptance of group goals (Crone & Teddlie, 1995; Leithwood et al., 1998; Levine & Lezotte, 1990). A clear mission and shared goals is often cited in research as a key factor in organizational effectiveness (Crone & Teddlie, 1995; Hallinger & Heck, 2002; Leithwood, et al., 1998; Levine & Lezotte, 1990).

Culture and community. Building a collaborative *culture* and *community* within the organization is a critical component to effective reform implementation. Little (1982)

contended that the failure of many reform efforts may be due to "the absence of attention to social organizational features and contexts in which changes were attempted" (p. 326). As such, school and district leaders would be well advised to attend to an organization's culture and community attributes prior to embarking upon a reform initiative. A culture of collaboration in which shared norms, beliefs and values in relation to student achievement, teacher growth and staff practice are characteristics of higher-performing, more effective schools (Levine & Lezotte, 1990; Little, 1982; Louis et al., 2010). In addition, a culture where there is a willingness to take risk and an "openness to change" (Leithwood et al., 2006, p. 72) influences the success of reform implementation.

Research has shown that increasing system coherence can be accomplished by utilizing a collaborative process while attending to the "cultural aspects of organizations" (Murphy & Hallinger, 1986, p. 230). As such, effective leaders institute structures to purposely develop a cohesive and collaborative culture which is evident in more effective than in less effective schools (Crone & Teddlie, 1995). Leithwood et al. (2006) incorporated questions into their monitoring system based upon four critical practices: (a) teachers engaged in frequent, continuous, and increasingly concrete and precise talk about instructional practice; (b) teachers are observed frequently and provided useful critiques of their practice; (c) teachers planned, designed, researched, evaluated, and prepared teaching materials collectively; and, (d) teachers coached each other in the practice of teaching (Little, 1982). Schools in which teachers participated in these practices "appeared to place a higher value on interdependent (rather than independent) work, to entertain and experiment with new practices, and to take others' interests and obligations in account" (Little, 1982, p. 336).

A supportive culture and collaborative community provides teachers with the horizontal supports necessary to sustain change. Horizontal supports include intentional opportunities to learn within a professional community (Coburn, 2003; Fullan, 2005; Leithwood, 2007; Leithwood et al., 2006). Fullan (2005) noted that "people learn best from peers (fellow travelers who are further down the road) if there is sufficient opportunity for ongoing, purposeful exchange" (p. 18), and identifies lateral capacity building as an incredibly powerful learning strategy. Meaningful supports, which include knowledgeable and supportive school and district leadership (Alsbury, 2008a; Coburn, 2003; Fullan, 2005; McLaughlin & Mitra, 2001; Ross & Gray, 2006), develop and sustain a culture of learning, both individually and within the educational community, that is essential to both sustainability and organizational learning (Barth, 1986; Coburn, 2003; Hallinger & Heck, 1999; Senge, Kleiner, Roberts, Ross & Smith, 1994).

Culture may be difficult to detect as it is often "just how we do things." It may appear as normal operating procedures which may have been developed from tacit theories-in-use without intentional planning or thought. These often unspoken assumptions and beliefs are extremely powerful in guiding behavior. Leithwood et al. (2006) referred to this component as "more tentative than such information about many other aspects of the monitoring system" (p. 70), as it is difficult to measure. Leaders, however, must be acutely aware of the organizational culture as it is critically influential and may be a barrier to reform implementation. Schein (1992) aptly captured both the importance and the interconnectedness of leadership and culture:

> Culture and leadership are two sides of the same coin in that leaders first create cultures when they create groups and organizations. Once cultures exist, they

> determine the criteria for leadership and thus determine who will or will not be a leader. But if cultures become dysfunctional, it is the unique function of leadership to perceive the functional and dysfunctional elements of the existing culture and to manage cultural evolution and change in such a way that the group can survive in a changing environment.
>
> The bottom line for leaders is that if they do not become conscious of the cultures in which they are embedded, those cultures will manage them. Cultural understanding is desirable for all of us, but it is essential to leaders if they are to lead. (p. 15)

Planning and instructional services. The component of *Planning* and *Instructional Services* is closely related and integral to other components of effective organizations. Through careful and deliberate planning, leaders may communicate a conscious process of change, and may use this potentially transformative process to "reshape existing frames of reference or establish new ones" (Inbar, 1993, p. 170). Inbar (1993) contended that "as a future-oriented process, planning has to articulate future events and introduce symbols and meanings in such a way that the participants' involvement and motivation will increase" (p. 175). Therefore, the elements of planning may be thoughtfully used to support reform efforts, signal a change of organizational priorities or, if overlooked, may unintentionally hinder reform implementation.

Even the most thorough plans, however, do not guarantee successful implementation as other components, such as culture and community, may possibly interfere with the planned actions. With the inability to control all aspects of a reform implementation, the process of planning based upon collective vision and values may

empower individuals resulting in "energy toward social change" (Inbar, 1993, p. 178). Leaders that understand the importance and potential benefits of the planning process should encourage broad participation in this process to increase awareness and support for any reform effort.

Instructional services are at the heart of the educational organization. While services are provided directly to students at the school level; district-wide conditions enable school staff to perform this most critical work well. This component is developed based upon the research of effective teaching and classrooms and effective districts. In regards to district conditions, Leithwood et al. (2006) have identified six critical areas upon which districts should focus their attention which enhance "schools' capacities for delivering powerful forms of instruction" (p. 81). These include: (a) organizational coherence resulting in an alignment and coordination of activities to support student learning goals; (b) local curriculum development providing clearer guidance to teachers than state standards; (c) instructional leadership development fostering increased or specialized capabilities among administrators and teachers leading instructional improvement efforts; (d) instructional expertise development focusing on research-based strategies that are more likely to be effective with students; (e) district accountability systems extending beyond state requirements to meet the needs of the district; and (f) interventions targeting underperforming schools to build capacity (Leithwood et al., 2006).

Structure and organization. The interrelated structures between the important components of a system influence behavior over time. Therefore, in order to successfully implement a reform, an organization should attend to those structural and organizational

components that have the potential to hinder implementation and sustainability. For this component, Leithwood et al. (2006) concentrated on decentralization to support the work required to meet the mission and goals, facilitate the daily work of teachers, and empower staff in problem solving by enabling greater participation in decision making. As greater participation in decision-making is a "characteristic of higher-producing schools" (Hallinger & Heck, 1999, p. 181), attending to the organization and structure of a school or district can assist in achieving greater coherence and collaboration which are fundamental to improvement (Anderson & Togneri, 2005; Louis, Marks & Kruse, 1996). As Louis et al. (1996) contended, "changing school structures can enhance professional community" (p. 785) by removing often overlooked systemic barriers that might hinder organizational learning or reform implementation. For example, by attending to this component, leaders can create the structures and organization necessary for staff to have regularly scheduled collaborative time which may influence other critical conditions necessary for effective organizations and successful reform implementation and sustainability.

Data-driven decision making. Leithwood et al. (2006) employed this component within the monitoring system to focus on utilizing relevant, current data to inform organizational learning through the process of decision making. While the process of ensuring the timely collection of useful information from a variety of stakeholders may seem subordinate to the actual decision making process, flawed decisions may be made without accurate and relevant information from the appropriate constituents and without effective methods for processing the information. Schools and districts should ensure that

they utilize a process that collects valid, accurate and meaningful feedback from constituents on a regular basis upon which contextualized action plans can be developed.

In addition, encouraging a broad participation in the decision making process may increase awareness and support for the decision, empowering teachers to take ownership of and make a shared commitment to the outcome (Leithwood et al., 1998; Ross, Hogaboam-Gray, & Gray, 2004). This interconnected component is critical as a more centralized decision-making structure may reinforce past behaviors or act as a standardizing factor; whereas, decentralized decision-making structures allow for more responsiveness to contextual influences. Depending upon the context of the organization and the factors influencing the stability of the system, either process may be appropriate depending upon the situation. As this appears in research as an important component, related to mission and goals and culture and community, this study seeks to determine whether the level of participation in decision making influences teachers' instructional practice as perceived by the teacher during a reform initiative.

Policies and procedures. *Policies* and *Procedures* is a crucial component as it communicates to staff "indirectly and symbolically, as well as directly, what learning is of more worth to the district" (Leithwood et al., 2006, p. 95). Policies and procedures are broad in scope as they are not limited to a particular innovation, but apply across multiple initiatives (Anderson & Togneri, 2005); however, assuring that policies and procedures do not create barriers for a particular reform effort is critical for successful implementation. As Coburn (2003) noted, "teachers and schools are more likely to be able to sustain and deepen reform over time when school and district policy and priorities are compatible or aligned with the reform" (p. 7).

In addition, this component is influential to shaping organizational memory through both informal and formal means. Formal policies promote the espoused theory of schools and districts through their explicit, published statements and communicate officially sanctioned behavior of leadership (Anderson & Togneri, 2005). Informal policies may draw from tacit theories-in-use and can be powerful in shaping the culture within an organization. Therefore leadership should attend to the policies and procedures to ensure there is an alignment and coherence with the systems' mission and goals.

Community partnership. Engaging the community, including family and businesses, is also an important component for effective organizations. Louis et al. (2010) contended that "student achievement is higher in schools where teachers … perceive greater involvement by parents" (p. 107). Therefore, schools and districts have an obligation to actively work to engage families in order to better meet the needs of their students. This may include learning how to communicate with families that have varying levels of involvement; from those that are highly-involved to those that may be marginalized (Sanders & Epstein, 1998).

Schools and districts also must remain acutely aware of the values held as important by the community in which it is nested. Garnering and maintaining local support for programs and initiatives is critical as the community may help mediate other external demands placed upon the educational organization in this era of accountability. Creating strong family and community partnerships, benefits all those within the educational system; students, families, teachers and administrators.

Chapter Three

Methodology

By engaging in systematic analysis of organizational components and developing contextually appropriate action plans, districts can identify potential barriers to full and sustained reform implementation. School administrators that identified and addressed organizational and leadership barriers, as well as developed contextually appropriate action plans to address these obstacles, noted a more successful implementation and scaling up of the reform (Kantamara et al., 2006; McLaughlin & Mitra, 2001). Without identifying and attending to critical organizational conditions, leaders may fail to align initiatives or recognize inconsistencies resulting in organizations moving too quickly from one reform effort to the next before completely embedding current initiatives into practice.

Therefore, the eight components of effective organizations (Leithwood et al., 2006), are utilized as the factors for this study to determine whether these components are significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative. Data will be utilized from the ILA PCS collected during the implementation of the STEM Career Awareness Program. As such, a thorough process was conducted to ensure a comprehensive understanding of the theory and research supporting all eight components to inform the categorization of the PCS questions within each component.

Surveys

Structure of the monitoring system. Within their monitoring system, Leithwood et al. (2001) drew from OLT and research to craft the questions included in the

monitoring tool as a basis to gauge a school and district's effectiveness. Leithwood et al. (2006) identified 35 variables of a school and district distributed across five areas that measure schools in organizational learning dimensions including (a) inputs, (b) district characteristics, conditions, and processes, (c) school characteristics, conditions, and processes, (d) immediate outcomes, and (e) long-term outcomes. Through their research, components were identified that influence the effectiveness of district and school processes. In conjunction with the strategic direction of the school or district, Leithwood et al. (2006) asserted that this framework may provide a system "that regularly collected information be translated into courses of action" (p. 6). This comprehensive system provides a systematic format for regularly collecting data from a variety of constituents that may be used to inform decisions throughout the organization.

To gather useful data specific enough from which a school or district might be able to develop an action plan to address potential barriers that can impact reform implementation, the questions on the monitoring tool appear as distinct elements; however, the elements are interrelated that together create a more effective learning environment for students. For example, while a teacher's subject matter content knowledge is central to his or her ability to teach and create an effective classroom (Grossman, Wilson, & Shulman, 1989; McDiarmid, Ball, & Anderson, 1989; Shulman, 1986), subject matter content knowledge or expertise is specifically addressed under School Leadership and Management, rather than under the School Instructional Services component (Leithwood et al., 2006). While it is ultimately the teacher's responsibility to ensure that he or she has the depth of subject matter content knowledge or expertise to effectively instruct students, organizationally, it would become the principal's

responsibility to hire, support through professional development or remove a teacher based upon their level of expertise.

Innovation Leaders Academy Organizational Capacity Survey. The ILA is part of a larger STEM Career Awareness Program funded by the National Science Foundation (NSF) (Alsbury et al., 2012). The Organizational Capacity Survey (OCS), administered at the onset of the Career Awareness Program, was designed to measure an organization's ability to implement educational innovations and identify inconsistencies and misalignments within the system that endangers the implementation, scaling-up and sustainability of a program (Alsbury, 2008b). This tool "integrates proven organizational variables from pre-existing, validated assessment instruments that build upon the work of organizational, leadership, and reform theorists, for more successful implementation and sustainability of innovative reform in districts" (Alsbury et al., 2012, p. 13). As the OCS measures contextualized variables, it provides districts with individualized data enabling leadership to respond to potentially disruptive organizational conditions.

***OCS validity*.** Extensive efforts were made to ensure the validity of the OCS; therefore, the researcher derived the questions from research validated sources. With permission, questions for the OCS were derived from *Making Schools Smarter: Leading with Evidence* (Leithwood et al., 2001) which has numerous studies validating the monitoring tool surveys (see Leithwood et al., 2001, 2006). Survey questions not directly derived from Leithwood et al., (2001) were based upon variables grounded in Coburn's (2003) principles regarding sustainable organizational change. The OCS also incorporated content criteria regarding district vision and organizational leadership from

the Educational Leadership Constituents Council (ELCC) standards, which have been validated by multiple empirical sources (Alsbury et al., 2012).

The OCS was first used in a NSF four-year longitudinal study implementing the Science Writing Heuristic (SWH) initiative in a middle-class, blue-collar, Midwestern district with a student enrollment of 2,300 (Alsbury, 2008b). As the study was already established, the use of this instrument was as an add-on to measure the organizational system components. Data was collected using interviews, observations and document collections each fall and spring from 2002 through 2006. Based upon the data, the outcomes of this study included "(a) the validation of the OCS, (b) an increase in organizational capacity to implement and sustain innovation, (c) improvement of student achievement, and (d) findings confirming the need to couple organizational systems support to any innovative program implementation" (Alsbury et al., 2012, p. 4-5).

For the STEM Career Awareness Program, the OCS was reviewed and revised by 15 secondary school administrators enrolled in the educational administration doctoral program at a State University. In addition, 45 teams from six districts which included the superintendent, district and school administrators and directors and teachers, participated in an OCS review. Revisions were made for clarity. The final review was conducted by soliciting feedback from nearly 900 faculty and staff who took the pilot OCS (Alsbury et al., 2012). In addition, through an exploratory factor analysis with maximum likelihood extraction and varimax rotation, the OCS was determined to have "strong internal validity" (Alsbury et al., 2012, p. 16), with the reliability for the identified subsections as follows: Vision and Planning, $r = .77$; Effective Leadership, alpha of .84; Accountability,

alpha of .91; Using Data for Continuous Improvement, *r* = .86, Systems Thinking, *r* =.72; and, Innovation and Creativity, alpha = .93 (Alsbury et al., 2012, p. 16-17).

***Organizational and Program Capacity Surveys*.** The OCS was administrated during the first year of the STEM Career Awareness Program (Spring 2011). In order to collect more meaningful feedback upon which a contextualized action plan could be developed, the OCS was modified to include targeted program-related questions resulting in the Program Capacity Survey (PCS). The name change assisted the researchers in identifying the different surveys and in tracking the data collected over the three-year reform implementation period. While several of the questions on the PCS were new, many remained completely identical (i.e., demographic questions) or essentially identical to the validated OCS tool. Any differences in the questions were minimal, with just added specificity in relation to the STEM Career Awareness Program. For example, Question #9 on the OCS was "Overall, how supportive are the school staff and faculty of new programs introduced in the school?" Whereas, Question #40 on the PCS was "Overall, how supportive are the school staff and faculty of the new STEM Career Awareness Program?" Table 1 identifies the similar questions on the OCS and the PCS.

Table 1

Similar questions on both the OCS and PCS

Organizational Capacity Survey (OCS)	Program Capacity Survey (PCS)
1	1
2	2
3	3
4	4
5	5
6	6
8	7

Organizational Capacity Survey (OCS)	Program Capacity Survey (PCS)
9	40
10	41
11	42
20	43
21	45
22	46
23	47
24(b)	49
24(c)	50
25(a)	51
25(d)	52
25(f)	54
26(b)	56
26(e)	57
26(f)	58
27(a)	61
27(b)	62
30(a)	63
30(b)	64
30(c)	65
31(b)	66
31(f)	67
32(a)	68
32(b)	69
32(c)	70
32(d)	71
32(e)	72

The PCS was administered four times, twice during both Year Two and Year Three of the STEM Career Awareness Program: Year Two - Fall 2011 (December) /

Spring 2012 (May); and Year Three - Fall 2012 (December) / Spring 2013 (May). This study utilizes data from districts during Year Two and Year Three of the ILA study.

Analysis of PCS questions. All of the 72 PCS questions were analyzed to determine which questions would be included in this study. The survey contained one "identifier" question (the last five digits of a phone or cell number) enabling researchers to track an individual's responses throughout the course of the study (Q #1). Even though each respondent may have taken the survey up to five times during the initial three-year implementation period (provided they continued to be district-employees working within the project scope) individuals could not be identified through the identifier question ensuring the anonymity of each respondent. While the full-survey may be viewed in Appendix A, the general breakdown of the survey is as follows: Six questions gathered demographic information (Q #2-7); two questions (Q #8-9) identified the respondents' familiarity and support for the program each utilized a five-point rating scales; each scale used different descriptors (i.e., Q #8: 1- Involved directly; 2 – Involved indirectly; 3 – Learned about; 4 – Heard about; 5 – Not aware. Q #9: 1 – Highly supportive; 2 – Supportive; 3 – Somewhat supportive; 4 – Not supportive; 5 – Unknown)

Twenty-eight questions also used a five-point rating scale, with the following labels: 5 – Strongly agree; 4 – Agree; 3 – Disagree; 2 – Strongly disagree; 1 – Unknown. These questions enabled respondents to express their level of concern regarding the STEM Career Awareness Program's impact (Q #10-23 and #26-39). This included, but was not limited to, the program's impact on teacher workload and working conditions, staffing, budget, faculty relationships, professional development, curriculum, instruction, discipline, students, families and community. In addition, respondents could express their

level of concern regarding premature implementation, level of support and administrative involvement. Soliciting feedback in an open-ended format, one question allowed the respondent to articulate their perception of the purpose of the program (Q #24). Using a multiple choice format, one question inquired about each individual's level of involvement in adopting the program (Q #25). Both questions #40 and #46 asked respondents to rate others' support and receptiveness of the program using the following five-point scale: 1- Highly supportive; 2 – Supportive; 3 – Neural; 4 – Not supportive; 5 – Highly not supportive. Question #41(a-c) required respondents to select the type of change in themselves, their teaching and their students' learning as a result of the STEM Career Awareness Program using a three-point scale (positive, negative, no significant change). Question #42(a-f) used a seven-point scale to rate respondents level of satisfaction with their administration, district, school, assignment, resources provided and parental support. The effectiveness of staff development and the need for more follow-up training was addressed in Questions #43-44 using a four-point rating scale and a force choice format, respectively. A multiple choice format was used to gather data about the number of new initiatives in the school (Q #45) and another question used a four-point scale to inquire about the frequency staff assessed the strength and weakness of the STEM Career Awareness Program (Q #47). The final 25 questions of the PCS survey (Q #48-72) used the same five-point Likert response format as used in questions #10-23 and #26-39 to specifically gather data about individual's perceptions of school and district processes. Table 2 identifies the question(s) and corresponding description for all 72 questions on the PCS.

Table 2

PCS Descriptors

Question(s)	Description
1	Identifier
2 -7	Demographics
10-23, 26-39	Program Impacts (positive or negative)
8, 9, 24-25, 40, 41a-c, 42a-f	Program Awareness and Support
43-44	Staff Development
45-47	Acceptance of Change
48	Parental Involvement
49-50	Vision and Planning
51-54	Effective Leadership
55-60	Accountability
61-62	Using Data for Continuous Improvement
63-65	Learning Organizations
66-67	Systems Thinking
68-72	Acceptance of Innovation and Creativity

ILA organizational and program capacity data. The OCS and the resulting PCS were developed to provide data to each district's ILA Leadership Team throughout the initial three-year reform initiative. The data from the more targeted PCS enabled the ILA team to respond to current, relevant data from individuals regarding the implementation of the STEM Career Awareness Program; assisting each district to address concerns and issues in their effort to enact "sustainable innovation focused on improving program qualify and subsequent student success" (Alsbury et al., 2012).

Data from both the STEM Career Awareness Project OCS and PCS were collected in five schools that participated in the STEM Career Awareness Project. Each of the five schools resided within a different district. Four of the five schools involved in

the reform initiative, utilized the Strategic Teaming Model (STM). The STM consisted of a Teacher Team, Leadership Team and Student Team that worked collaboratively with the STEM Project Team regarding project implementation. The Strategic Teams monitored and addressed components identified by Leithwood et al. (2001) as necessary for effective organizations. The Comparison District participated in the project, but did not have a Strategic Team leading, guiding or monitoring the reform implementation.

STEM Career Awareness Program participants. The STEM Career Awareness Program study was conducted in northeastern part of a Southeastern State with agriculture as its primary industry and double-digit unemployment in the region; although, just two hours away, a hub for high technology industries exists (Alsbury et al., 2012). While experienced teachers staff approximately 80% of classrooms, the remaining are staffed through alternative means (emergency credentialed, etc.). All schools are identified as high poverty with minorities making up approximately 90% of those families designated as low income. The school district information in Table 3 describes the participating districts:

Table 3

School District Data for 2008 - 2009

School District	Student Body Size (Average)	Percent Free and Reduced Lunch	AYP* Targets Met / Total	High School Graduation Rates	MS Teachers leaving the district 3/2008 to 3/2009	Lateral Entry, Alternative Emergency Teachers
B District	710	78%	27/34	68%	13%	11%
N District	274	86%	28/34	75%	22%	17%
W District	596	75%	36/44	68%	13%	27%
We District	213	77%	27/30	76%	45%	33%

School District	Student Body Size (Average)	Percent Free and Reduced Lunch	AYP* Targets Met / Total	High School Graduation Rates	MS Teachers leaving the district 3/2008 to 3/2009	Lateral Entry, Alternative Emergency Teachers
H District#	489	96%	29/36	61%	13%	19%

*AYP = Annual Yearly Progress; # = Comparison District (Alsbury et al., 2012, p. 18)

From 2010 - 2013, the STEM Career Awareness Program served 45 STEM teachers, 32 leadership personnel and 60 students in four middle schools in the four districts participating in the Strategic Teaming Model (Alsbury et al., 2012). The ILA team members who participated in the survey included the superintendent or assistant superintendent/curriculum director, middle school principals and teachers leaders, as well as middle school assistant principals, all teachers involved in the delivery of the STEM Career Awareness Program and all relevant support staff (i.e., technology support personnel) (Alsbury et al., 2012). While the teachers and students in the comparison middle school in H District participated in the STEM Career Awareness Program and took both the OCS and PCS, they did not have Leadership Teams directing the reform implementation.

***Return rate of the OCS and PCS*.** Survey data was collect five times throughout the initial three-year program implementation. Tables 4, 5 and 6 identify the return rate of the OCS and PCS for each district.

Table 4

ILA OCS Returns, Year One

School District	Spring 2011		
	N =	Returns	% Return
B District	55	48	87.3%
N District	49	26	53.1%
W District	40	32	80.0%

School District	Spring 2011		
	N =	Returns	% Return
We District	35	27	77.1%
H District#	56	23	41.1%

= Comparison District

Table 5

ILA PCS Returns, Year Two

School District	Fall 2011			Spring 2012		
	N =	Returns	% Return	*N* =	Returns	% Returns
B District	55	22	40.0%	55	32	58.2%
N District	49	20	40.8%	49	18	36.7%
W District	40	30	75.0%	40	30	75.0%
We District	35	5	14.3%	35	28	80.0%
H District#	56	54	96.4%	56	52	92.9%

= Comparison District

Table 6

ILA PCS Returns, Year Three

School District	Fall 2012			Spring 2013		
	N =	Returns	% Return	*N* =	Returns	% Returns
B District	55	36	65.5%	55	34	61.8%
N District	49	19	38.8%	49	16	32.7%
W District	40	30	75.0%	40	25	62.5%
We District	35	21	60.0%	35	12	34.3%
H District#	56	20	35.7%	56	32	57.1%

= Comparison District

Research Methods

This study will use a correlational research design using data from the STEM Career Awareness Program, Program Capacity Survey. The questions from the PCS selected for this study utilize the same five-point Likert response format (5 – Strongly agree; 4 – Agree; 3 – Disagree; 2 – Strongly disagree; 1 – Unknown). The data will be considered categorical for this study as no inferences can be made that the distances

between the different response categories are equal for each respondent (Fowler, 2009; Kahler, Rogausch, Brunner, & Himmel, 2008; Martilla & Carvey, 1975). In addition, based upon the theoretical framework of this study and as human behavior is "rarely partitioned into neatly packaged units that function independently of one another" (Costello & Osborne, 2005, p. 3), the components identified in effective organizations are not considered independent, but will be considered correlated to some extent (Costello & Osborn, 2005; Pett, Lackey, & Sullivan, 2003).

Research analysis for research questions one and two.

Question One – Are the components of effective organizations, based on Organizational Learning Theory, significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Two – Which component of effective organizations, based on Organizational Learning Theory, has statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform initiative?

To answer the research questions posed in this study, questions selected from the PCS for inclusion into this study will be assigned to one of the eight components of effective organizations as identified by Leithwood et al. (2006): (a) leadership and management, (b) mission and goals, (c) culture and community, (d) planning and instructional services, (e) structure and organization, (f) data-driven decision making, (g) policies and procedures, and (h) community partnerships. Frequency distributions will be used to assess the distribution of the PCS data regarding teachers' perception of their instructional practice. An exploratory factor analysis with principal axis factoring and a direct oblimin rotation will be used to determine the questions that correlate and will be

grouped together to create a composite score for each component (Field, 2009; Pett et al., 2003). Should the oblique rotation demonstrate a negligible correlation between extracted factors, then a varimax rotation will be used (Field, 2009). Eigenvalues, including scree tests, will be analyzed to determine relative importance of each factor (Costello & Osborne, 2005; Field, 2009). Cronbach's Alpha will be utilized to assess the internal consistency of each component. In addition, as the reliability of factor analysis is dependent on sample size (Field, 2009), the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy will be used to identify the reliability of the research design for Questions One and Two. A multiple linear regression analysis then will be used to determine the correlation identifying the degree to which the components of effective organizations and teachers' perception of their instructional practice during a reform initiative are related.

Research analysis for research question three. For Research Question Three, "Is the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative," a frequency distribution will be used to determine the distribution of teachers' involvement in the decision making process to adopt the STEM Career Awareness Program, as well as for teachers' perception of their instructional practice. Pearson's Chi Square will be used to determine the relationship between the level of involvement in the decision making process and teachers' perception of their instructional practice. Cramer's V will be used to measure the strength of association between these two categorical variables (Field, 2009).

Categorization of Program Capacity Survey Questions

Each survey question on the PCS was examined for inclusion in this study (see Appendix A for PCS). While all of the survey questions would provide each school and district with useful data during the implementation of the STEM Career Awareness Program, only those questions that would provide useful data to answer the identified research questions were considered for this study. Of those questions that were considered for this research, only those questions that utilized the same rating scale were considered for assignment to one of the eight components of effective organizations as identified by Leithwood et al. (2006) as the positions and labels used in rating scales influence how participants respond to questions (Fowler, 2009; Klockars & Yamagishi, 1988; Wilson, Altman, Whitaker, & Callegaro, 2004).

After analyzing each survey question on the PCS, it was determined that Program Capacity Survey questions (#41b and #48-72) would be utilized to investigate Research Questions One and Two posed in this dissertation. Question 41(b) asked respondents to identify the type of change the new STEM Career Awareness Program has or likely will cause in their teaching (positive, negative or no significant change). Questions #48 – 72 sought data regarding organizational factors that may influence the implementation of the STEM Career Awareness Program and were derived from the survey questions in Leithwood et al. (2001). Therefore, Questions #41(b) as well as #48-72 were used to determine if there is a significant relationship between components of effective organizations as identified by Leithwood et al. (2006) and a positive change in teachers' instructional practice as perceived by the teacher during a reform initiative. In addition, these questions were used to determine which component had statistically greater odds of

influencing a teachers' instructional practice as perceived by the teacher during a reform initiative.

Of the 25 questions selected from the PCS for categorization into the components of effective organizations, 20 were similar to questions on the OCS; the validity of which was addressed earlier in this chapter. Five questions (#48, 53, 55, 59 and 60) were not on the original OCS. These questions, however, were developed specifically for use on the PCS and were supported by questions identified on the research-validated monitoring tool created by Leithwood et al. (2001, 2006).

Questions #10-23 and #26-39 were considered for inclusion in this study as they used the same five-point Likert response format as the questions selected for this research. Each of these questions allowed participants to express their concern regarding different aspects of the STEM Career Awareness Project. Some of these questions aligned to a component of effective organizations as identified by Leithwood et al. (2006); such as question #37, "I am concerned that parents will not understand this new STEM Career Awareness Program" which may relate to the Community Partnership component. Respondents, however, may have been influenced by the wording of these questions ("I am concerned about …") which is dissimilar from questions #48-72 which were selected for this research. Small changes in wording may make a difference in how people answer survey questions (Fowler, 2009, Roszkowski & Soven, 2010). In addition, many of these questions did not as closely align to the questions in Leithwood et al. (2001) which were used as the basis for both the OCS and PCS. For example, "I am concerned that the school may have to cut other programs that my students or I value due to this new STEM Career Awareness Program." While the information derived from

questions not selected for inclusion in this study may be useful to a school or district in the midst of a reform implementation, it would be difficult in the context of this research to determine which organizational component identified in Leithwood et al. (2006) influenced the participant's concern. Therefore, questions #10-23 and #26-39 were omitted from this research.

Once a determination was made regarding the questions that would be used to answer the three research questions posed in this dissertation, questions #48-72 were further scrutinized to assign each question to one of eight components of effective organizations as identified by Leithwood et al. (2006) by first identifying the essential element of each question. Once identified, this salient element was further scrutinized in relation to the theoretical construct supporting each of the eight components. Leithwood et al.'s (2006) monitoring tool was then examined in that particular category to determine if there were any similar questions that aligned with the PCS question. The question was tentatively placed in a category. After placement, the subheading for that question was identified on the PCS to determine if this provided further evidence of the tentative categorization. The essential element for each question was reexamined in relation to the theoretical construct for each category and corresponding questions were identified on the monitoring tool. The data was triangulated to determine if there was sufficient evidence to support the placement of the question in a particular category. Once the decision was finalized, the rationale and corresponding questions on the monitoring tool were provided for each survey question to substantiate the assignment of the question to a particular category. See Appendix B for categorization, rationale for placement and corresponding questions identified from the monitoring tool.

In examining individual questions, there were several questions that could have potentially been placed in multiple categories. This would be expected as the components of effective schools and districts are not isolated elements, but rather interrelated factors within an organization. Therefore, questions were examined on multiple occasions to ascertain whether there was sufficient evidence for the selected category. This often required reexamining the theory behind each component and confirming that there were similar questions on Leithwood et al.'s (2006) monitoring tool.

There were similar questions under the same subheading on the PCS that were categorized under different organizational components. For example, Questions #58 and #59, under the subheading of Accountability, both addressed evaluations. After identifying the essential element of each question, however, the researcher determined that one question focused specifically on the actions of the principal (Q #58) while the other question focused more on the overall policy and procedures within the system (Q #59). This resulted in the different categorization of two similar questions.

Results of categorization. Once categorization was finalized, six of the eight components had questions assigned to the category, as shown in Table 7.

Table 7

Categorization of PCS Questions

Components of Effective Organizations	PCS Questions
Community Partnership	48
Data-Driven Decision Making	60, 61, 62
Leadership and Management	51, 52, 53, 54, 58, 63, 65, 70
Planning and Instructional Services	49, 50, 56, 57, 69
Policy and Procedures	55, 59
Structure and Organization	64, 66, 67, 68, 71, 72

From the initial 25 questions categorized, none were assigned to the Mission and Goals and Culture and Community categories. While there were questions within the PCS survey that measured a respondent's perception of factors that may influence the culture and community of an organization, such as question #16 ("I am concerned over the impact on collegiality or faculty relationships that may be influenced by the STEM Career Awareness Program") none of the questions that were selected for inclusion in this study addressed the component directly. In addition, as stated earlier, culture and community, while important to effective schools and districts, is difficult to measure, and is therefore, more tentative than other components in the monitoring system.

Theory and research have shown that mission and goals are critical components of effective organizations (Hallinger & Heck, 1999, 2002; Leithwood et al., 1998). The essential elements within the two questions that initially appeared to address this category, which were under the section of Vision and Planning in the PCS, were more aligned theoretically with the component of Planning and Instructional Services for the purpose of this study. When discussing the categorization results with the OCS and PCS creator, the researcher learned that during the development phase of the PCS it was determined that respondents' awareness and support for the STEM Career Awareness Program would be used to measure Mission and Goals (Alsbury, personal communication, February 18, 2015). This rationale is in alignment with the theoretical framework and research upon which both the OCS and PCS were developed regarding a clear shared purpose and goals.

In reviewing the PCS, there were five questions that could be used to determine the respondents' awareness and support for the reform initiative. Three questions directly

asked the respondents to either rate their or others' familiarity or support of the STEM Career Awareness Program (Q #8, 9 and 40), a fourth question requested participants comment directly on the purpose of the initiative (Q #24), and a fifth question that could be used to infer awareness based upon involvement in decision-making (Q #25). Three of the questions (Q #8, 9 and 40) utilized different rating scales to measure familiarity and support than the scale of the questions selected for inclusion into this study. As noted earlier, the position and descriptor of categories influence how survey participants respond (Fowler, 2009; Klockars & Yamagishi, 1988; Wilson et al., 2004); therefore, these questions were not included in this study. Question #24 allowed respondents an opportunity to utilize a comment format to articulate their perception of the purpose of the STEM Career Awareness Program. While this information would be helpful to a school or leadership team to determine awareness of the goals of the program, the researcher omitted this question as the response format was different than the rating scale used for the other questions selected for this study.

Question #25 on the PCS allowed respondents to identify their involvement in the process to adopt the new STEM Career Awareness Program. There were three choices available: "I was/am part of the decision-making team," "I was given an opportunity to offer input," and "I was not given an opportunity to offer input." This question could be used to infer program awareness and support which may be used to measure the component of Mission and Goals. It could also align with the theoretical construct and organizational component of Data-Driven Decision Making as the response selected directly measures participation in the decision-making process. As the rating scale was significantly different than the questions already categorized for this study, however, it

was not assigned to either organizational component. It was utilized in this study to answer Research Question Three, "Is the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?"

Therefore, after a thorough review of all the PCS questions which were not originally selected for inclusion into this study, the determination was made that none of those questions would be added to this research based upon the rationale provided above. PCS questions (#41b and #48-72) would be utilized to investigate Research Questions One and Two posed in this dissertation; whereas, PCS question #25 would be used, along with #41b, to investigate Research Question Three.

Question One – Are the components of effective organizations, based on Organizational Learning Theory, significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Two – Which component of effective organizations, based on Organizational Learning Theory, has statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Three – Is the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Chapter Four

Results

Proposed Research Methodology for Research Questions One and Two

To answer the research questions posed in this dissertation, questions selected from the Program Capacity Survey (PCS) for inclusion into this study were assigned to one of the eight components of effective organizations as identified by Leithwood et al. (2006): (a) leadership and management, (b) mission and goals, (c) culture and community, (d) planning and instructional services, (e) structure and organization, (f) data-driven decision making, (g) policies and procedures, and (h) community partnerships (see Table 7 for categorization results).

Question One – Are the components of effective organizations, based on Organizational Learning Theory, significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative?

Question Two – Which component of effective organizations, based on Organizational Learning Theory, has statistically more influence on a teachers' instructional practice as perceived by the teacher during a reform initiative?

Frequency distributions were used to assess the distribution of the PCS data regarding teachers' perception of their instructional practice. An exploratory factor analysis with principal axis factoring and a direct oblimin rotation were used to determine the questions that correlate and will be grouped together to create a composite score for each component (Field, 2009, Pett et al., 2003). Should the oblique rotation demonstrate a negligible correlation between extracted factors, then a varimax rotation was used (Field, 2009). Eigenvalues, including scree tests, were analyzed to determine relative importance

of each factor (Costello & Osborne, 2005; Field, 2009). Cronbach's alpha was utilized to assess the internal consistency of each component. In addition, as the reliability of factor analysis is dependent on sample size (Field, 2009), the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were used to identify the reliability of the research design for Research Questions One and Two. A multiple linear regression analysis then was used to determine the correlation identifying the degree to which the components of effective organizations and teachers perception of their instructional practice during a reform initiative are related.

Program Capacity Survey Data

The PCS data was reviewed for each of the four data collection periods of the STEM Career Awareness Program; Fall 2011, Spring 2012 (Year Two), and Fall 2012, Spring 2013 (Year Three). Only surveys where the respondent answered all the survey questions selected for inclusion in the study were included in the analysis. The sample size for each collection period is shown in Table 8 after cases without responses were removed.

Table 8

Number of Fully Completed Program Capacity Surveys

Year Two		Year Three	
Fall 2011	Spring 2012	Fall 2012	Spring 2013
93	116	104	94

Program Capacity Survey Scale Considerations

The Likert Scale utilized by the PCS is as reported in the left column of Table 9. The researcher ran statistical analysis to determine if altering the Likert scale with the neutral choice ("Unknown") moved to the center might ease interpretation.

Table 9

Scale used in Program Capacity Survey

Original Likert Scale	Change in Likert Scale Considered
5 = Strongly Agree	5 = Strongly Agree
4 = Agree	4 = Agree
3 = Disagree	3 = Unknown
2 = Strongly Disagree	2 = Disagree
1 = Unknown	1 = Strongly Disagree

Altering the scale eased interpretation during the visual review of the histograms as Likert scales often have the neutral response at mid-point. The one noted difference between maintaining the original scale and transforming the scale was that the transformation changed the factorial analysis slightly; with two factors identified before the inflection point based upon visual inspection of the scree plot (Cattell, 1966) and Kaiser's Criterion of 1 (Kaiser, 1960) for the Leadership and Management component in Year Three (both, Fall 2012 and Spring 2013 collection periods). The data for the two factors is provided in Table 10.

Table 10

Leadership and Management Factor Analysis with Transformed Likert Scale

	Eigenvalue		
Data	Factor	Factor Total	Variance Explained
Fall 2012	1	3.792	54.17%
	2	1.000	14.29%
Spring 2013	1	4.062	50.77%
	2	1.077	13.47%

As the questions on the PCS survey selected for inclusion in this study were categorized according to the theoretical construct underlying each organizational component, it would be expected that one factor would be identified during the factor analysis. By maintaining the original scale, one factor was clearly identified as reported

in Table 11, based upon visual inspection of the scree plot (Cattell, 1966) and Kaiser's Criterion of 1 (Kaiser, 1960).

Table 11

Leadership and Management Factor Analysis with Original Likert Scale

	Eigenvalue		
Data	Factor	Factor Total	Variance Explained
Fall 2012	1	4.617	57.71%
Spring 2013	1	4.729	59.11%

In addition to considering transforming the Likert Scale, the researcher considered collapsing the Likert scale from five categories to three (1 = Strongly Disagree/Disagree, 2 = Unknown, 3 = Agree/Strongly Disagree). By collapsing the categories, the data would have a more concise scale; however, changes in the outputs were negligible and there were no substantial changes to the cell frequencies; making the loss of variability less desirable. Therefore, it was determined that the original scale would be maintained for this study.

As there was a five-point Likert Scale used in the Program Capacity Survey, each question selected for inclusion in this study was considered categorical with an ordinal scale. While the researcher had initially attempted to maintain the categorical nature of each component, in order to determine the relationship between components of effective organizations and teachers' instructional practice, a composite score for each organizational component had to be created for each participant. Creating one composite score per component for each participant allows for analysis of the data by component rather than by individual question and allows for comparison between components to determine the odds ratio each organizational component might influence teachers' instructional practice. Agresti (1984) noted that "strict adherence to operations that utilize

only the ordering in ordinal scales limits too severely the scope of useful methodology" (p. 2). Therefore, a composite score was created for each participant for each organizational component.

To identify one composite score per participant for each organizational component, a total score was created by adding each response score for each individual question assigned to a particular component. As each question had a 1 – 5 scale, the number of questions selected determined the total scale for each component. For example, as the Leadership and Management Component had eight questions assigned to that component, the scores ranged from 8 – 40. A participant who may have selected "unknown" for each question would have a total score of 8. A respondent who selected "strongly disagree" for each question would have a total score of 16. A total score of 24 would indicate a participant selected "disagree" for each question. A participant who agreed with each question would have a total score of 32. A total score of 40 would indicate that a respondent selected "strongly agree" for each question. Scores could vary within the scale depending upon how the participants answered individual questions. A score closer to 32, but within the range of 24 – 32 or within the range of 32 – 40 would indicate that the participant agreed with more of the questions than disagreed or than strongly agreed, respectively.

As there is differing opinions regarding whether a five-point Likert item can be treated as interval data, for comparison purposes, the researcher identified a mean total score for each component rather than a summed total score. Having a mean total score made the analysis for how a participant responded to the cluster of component questions easier to interpret then a summed score as the mean score ranged from 1 – 5. The

researcher then conducted a comparison of the logistic regression using the mean score for each component rather than the summed total score. Using the mean total score rather than the summed total score did not change the statistical significance of the regression results, except for one notable statistically significant difference in the Leadership and Management outcome for the Fall 2011 data. This difference is discussed in the Limitations Section in Chapter Five. After careful consideration, the researcher decided to use the summed composite score rather than the mean score which was more in alignment with the ordinal nature of the data.

Statistical Analysis Considerations

Utilizing a multiple linear regression also was initially considered for the statistical analysis as the dependent variable had three distinct categories, (1) Positive Change, (2) Negative Change, and (3) No Significant Change, based upon participants' response to the question, "Note what type of change the new STEM Career Awareness Program has or likely will cause in your teaching." Upon further review of the data, however, "Negative Change" did not have a significant number of participants selecting that category making the results less reliable. For two of the three collection periods, only 2 – 3 people selected this category (ranging from 2.2 – 3.2% of the respondents). For one collection period, no participant that had fully completed the survey selected "Negative Change" (Table 12). Therefore, the researcher determined that a binomial rather than a multinomial, ordinal logistic regression was a more appropriate statistical analysis to use for this study; with the question identifying the change in the teachers' instructional practice as the criterion variable and the components of effective organizations as the predictor variables.

Table 12

Frequency Data for Change in Teachers' Instructional Practice

Category	Frequency	Percent
Fall 2011		
Positive Change	63	67.7
Negative Change	2	2.2
No Significant Change	28	30.1
Fall 2011 Total	93	100.0
Positive Change	67	57.8
Negative Change	3	2.6
No Significant Change	46	39.7
Spring 2012 Total	116	100.0
Fall 2012		
Positive Change	73	70.2
Negative Change	0	0.0
No Significant Change	31	29.8
Fall 2012 Total	104	100.0
Spring 2013		
Positive Change	63	67
Negative Change	3	3.2
No Significant Change	28	29.8
Spring 2013 Total	94	100.0

Prior to running the logistic regression, multicollinearity was examined and addressed for each component which influenced the number of questions per component. To address the multicollinearity issues, questions were eliminated based upon both theoretical considerations and statistical output. When the number of questions for a component was reduced, this is reported in the respective section; however, when initially running the factor analysis, the number of questions per component was the same across the data collection periods as reported in Table 13.

Table 13

Number of PCS Questions by Component

Components of Effective Organizations	Number of PCS Questions
Community Partnership	1
Data-Driven Decision Making	3

Components of Effective Organizations	Number of PCS Questions
Leadership and Management	8
Planning and Instructional Services	5
Policies and Procedures	2
Structure and Organization	6

As there was only one question assigned to the Community Partnership component, the decision was made not to compare the Community Partnership question with the other components when running the logistical regression. As the other components had a summed composite score representing each component comprised of multiple questions, changing the one Community Partnership question to a total composite score would not align with the ordinal nature of the data. It was determined to review the relative strength of association using Cramer's V between the one question identified for Community Partnerships and teachers' instructional practice.

Research Methods

As the same statistical process was utilized for the STEM Career Awareness Program data used for this study, a description of the process is identified in this section, with the results of the data group by collection period; Fall 2011, Spring 2012 (Year Two), and Fall 2012 and Spring 2013 (Year Three).

Frequency distributions. The frequency distributions were analyzed for the components of effective organizations as identified by Leithwood, et al. (2006). As the data was considered ordinal, this was completed by analyzing the crosstabs results, as well as the chi-square and Cramer's V to determine the relationship between the components of effective organizations and the change in teachers' instructional practice. While not the original intent of this study, the chi-square and Cramer's V also were analyzed to determine the relationship between individual questions comprising the

components of effective organizations and the change in teachers' instructional practice in order to gain greater insight into the organizational components.

Factor analysis. A Principal Axis Factor (PAF) analysis with a direct oblimin rotation was used to validate the categorization of individual survey questions to each organizational component. As the questions were assigned according to the theoretical construct for each organizational component, the questions correlated making an oblique rotation appropriate. The Kaiser-Meyer-Olkin (KMO) measure was used to verify the sampling adequacy for the analysis, and the base KMO value for individual items in a particular component was reported. Bartlett's test of sphericity was used to ensure that the correlations between items were sufficient for a PAF. In addition, eigenvalues were obtained for each factor in the component and a visual inspection of the scree plot was used to confirm the number of factors identified before the inflection point in the graph (Cattell, 1966). As questions were categorized based upon theoretical construct and only one factor was extracted for each of the organizational components, the factor was not rotated; therefore, the unrotated factor loadings are reported for the identified factor. Cronbach's α was used to determine the level of internal consistency for all the questions assigned to the organizational components. The factor analysis results for each organizational component are reported under the "Factor Analysis" section for each collection period.

Program Capacity Survey Data – Fall 2011

Frequency distributions. The frequency distributions were analyzed for the PCS – Fall 2011 data. Crosstabs, chi-square and Cramer's V were analyzed for each organizational component to determine whether any of the components had a statistically

significant relationship with teachers' instructional practice. The frequencies for composite scores for the questions comprising each organizational component are reported in Appendix C. Even though the Community Partnership component has one question, it is reported along with the other components. The results for chi-square and Cramer's V, including cell frequencies, are provided in Table 14. While the cell frequencies are sparse, there was one component, Structure and Organization, that had a strong association with teachers' instructional practice at $p = .001$ (Rea & Parker, 2014).

Table 14

Frequency Data by Organization Component – Fall 2011

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Community Partnerships	$x^2(8) = 9.971$, $p = .267$	9 (60.0%)	$\varphi = 0.232$, $p = .267$
Data-Driven Decision Making	$x^2(22) = 20.069$, $p = .579$	31 (86.1%)	$\varphi = 0.328$, $p = .579$
Leadership and Management	$x^2(52) = 66.131$, $p = .090$	78 (96.3%)	$\varphi = 0.596$, $p = .090$
Planning and Instructional Services	$x^2(38) = 45.320$, $p = .193$	57 (95%)	$\varphi = 0.494$, $p = .193$
Policies and Procedures	$x^2(16) = 25.373$, $p = .064$	22 (81.5%)	$\varphi = .369$, $p = .064$
Structure and Organization	$x^2(40) = 71.966$, $p = .001$	59 (93.7%)	$\varphi = .622$, $p = .001$

The frequency distributions also were analyzed and reported for individual questions comprising the organizational components. Individual questions that comprised the Data-Driven Decision Making component did not have a statistically significant relationship as identified during the chi-square and Cramer's V analysis. A summary of the individual questions that comprised the components of effective organizations as identified by Leithwood et al. (2006) and have a statistically significant relationship with

teachers' instructional practice are listed in Table 15. All statistically significant individual questions for Fall 2011 data, including cell frequencies, are listed in Appendix D. All eleven statistically significant questions had a moderate to relatively strong association ranging from .310 - .445 (Rea & Parker, 2014).

Table 15

Statistically Significant Questions by Component – Fall 2011

Number of Questions	Number of Statistically Significant Questions	Statistical Significance	Strength of Association (Range)
Leadership and Management			
8	4	$p \leq .001$	.375 - .437
	1	$p \leq .05$	.310
Planning and Instructional Services			
5	3	$p \leq .001$	.370 - .445
Policies and Procedures			
2	1	$p \leq .001$	.440
Structure and Organization			
6	1	$p \leq .001$	.382
	1	$p \leq .005$	.358

Factor analysis results. The results Principal Axis Factoring with a direct oblimin rotation for the Fall 2011 data is reported in Table 16 to verify the categorization of individual survey questions to components of effective organization as identified by Leithwood et al. (2006). The results indicate a high level of internal consistency for the categorization of questions based upon theoretical construct for four of the five organizational components with a range of correlation coefficients of .879 - .918. The Policies and Procedures component, with only two assigned questions, was the weakest at .592.

Table 16

Factor Analysis Results for Organizational Components – Fall 2011

Number of Questions	KMO	Bartlett's Test of Sphericity	Eigenvalue		Cronbach's α
			Factor Total	Variance Explained	
Data-Driven Decision Making					
3	.747	x^2 (3) = 159.739*	2.472	82.38%	.893
Leadership and Management					
8	.892	x^2 (28) = 443.782*	5.008	62.57%	.914
Planning and Instructional Services					
5	.827	x^2 (10) = 235.854*	3.375	67.49%	.879
Policies and Procedures					
2	.500	x^2 (1) = 17.788*	1.422	71.12%	.592
Structure and Organization					
6	.844	x^2 (15) = 401.528*	4.269	71.15%	.918

*p = < .001

***Data-driven decision making factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "middling" (Kaiser, 1974), and all KMO values for individual items were > .726. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 17 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the three questions based upon the theoretical construct of Data-Driven Decision Making.

Table 17

Unrotated Factor Loading for Data-Driven Decision Making – Fall 2011

Item	Factor Loading
Question 60 - Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program	.823

Item	Factor Loading
Question 61 - The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	.871
Question 62 - The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	.880

***Leadership and management factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis was "meritorious" (Kaiser, 1974), and all KMO values for individual items were > .864. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. An initial analysis was run to obtain eigenvalues for each factor in the component. As only one factor was extracted, the factor was not rotated; therefore, Table 18 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the eight questions based upon the theoretical construct of Leadership and Management.

Table 18

Unrotated Factor Loading for Leadership and Management – Fall 2011

Item	Factor Loading
Question 70 - Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	.835
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	.793
Question 54 - School leaders are knowledgeable about the new STEM Career Awareness Program.	.792
Questions 53 - School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	.774

Item	Factor Loading
Question 51 - The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	.737
Question 58 - The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	.735
Question 65 - The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	.730
Question 63 - The school nurtures technology leadership capabilities across the organization.	.650

Planning and instructional services factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974), and all KMO values for individual items were > .798. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 19 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the five questions based upon the theoretical construct of Planning and Instructional Services.

Table 19

Unrotated Factor Loading for Planning and Instructional Services – Fall 2011

Item	Factor Loading
Question 50 - The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	.813
Question 49 - The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	.804
Question 57 - The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	.794

Item	Factor Loading
Question 56 - Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	.791
Question 69 - The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	.647

***Policies and procedures factor analysis interpretation*.** Of all the organizational components, Policies and Procedures, with only two assigned questions, was the weakest in terms of internal consistency based upon Cronbach's α at .592. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "miserable" (Kaiser, 1974), and all KMO values for individual items were = .500. Bartlett's test of sphericity was marginal for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 20 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the adequate level of internal consistency based upon Cronbach's α support the categorization of the two questions based upon the theoretical construct of Policies and Procedures.

Table 20

Unrotated Factor Loading for Policies and Procedures – Fall 2011

Item	Factor Loading
Question 55 - Adequate funds are allocated to support the new STEM Career Awareness Program.	.649
Question 59 - Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	.649

***Structure and organization factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974), and all KMO values for individual items were > .795. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 21 shows the unrotated

factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the six questions based upon the theoretical construct of Structure and Organization.

Table 21

Unrotated Factor Loading for Structure and Organization – Fall 2011

Item	Factor Loading
Question 72 - School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	.840
Question 66 - The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	.839
Question 68 - The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	.836
Question 71 - School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	.828
Question 67 - The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.	.776
Question 64 - The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	.731

Multicollinearity. Tests were run to determine if multicollinearity was an issue for any of the components for the Fall 2011 data prior to running the logistical regression. Collinearity was not present for Data-Driven Decision Making, Planning and Instructional Services or Policies and Procedures for the Fall 2011 data based upon the results of the "Tolerance" and VIF. Multicollinearity, however, was identified as an issue for the questions for the components of Leadership and Management, and Structure and

Organization for the Fall 2011 data. Only the results of the "Tolerance" below .1 and the VIF above 10 are reported in Table 22.

Table 22

Multicollinearity Results for Leadership and Management – Fall 2011

Question	Collinearity Statistics	
	Tolerance	VIF
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program	.097	10.280
Question 63 - The school nurtures technology leadership capabilities across the organization.	.077	13.050
Question 65 - The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	.050	20.019

Based upon the results in Table 22, Question 65 was removed from the Leadership and Management Component. This decision was made as Question 65 had the highest VIF, and Question 70 also addressed "Creating Collaborative Cultures" (Appendix B). After Question 65 was removed, the statistical analysis was rerun including all the remaining questions and the "Tolerance" was above 0.1 and the VIF values were less than 10 (range 1.810 – 5.568) for all remaining questions; removing the issue of collinearity leaving seven questions to comprise the Leadership and Management Component.

Table 23

Multicollinearity Results for Structure and Organization – Fall 2011

Question	Collinearity Statistics	
	Tolerance	VIF
Question 68 "The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness	.075	13.338

Question	Collinearity Statistics	
	Tolerance	VIF
Program."		
Question 71 "School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program."	.078	12.757

Based upon the results reported in Table 23, Question 68 was removed from the Structure and Organization Component. This decision was made as Question 68 had the highest VIF, and Questions 64 and 66 both address "Facilitating Professional Growth" and "Facilitation of Alternative Practices" similar to Question 68 (Appendix B). In addition, Question 67 also addressed "Facilitating Professional Growth." After Question 68 was removed, the statistical analysis was rerun including all the remaining variables and the "Tolerance" was above 0.1 and the VIF values were less than 10 (range 1.726 – 6.204); removing the issue of collinearity for this component leaving five questions to comprise the Structure and Organization Component. After removing questions to address the issues of multicollinearity, the PCS questions comprising the components of effective organizations for the Fall 2011 data is reported in Table 24.

Table 24

Questions Comprising Organizational Components – Fall 2011

Components of Effective Organizations	PCS Questions
Community Partnership	48
Data-Driven Decision Making	60, 61, 62
Leadership and Management	51, 52, 53, 54, 58, 63, 70
Planning and Instructional Services	49, 50, 56, 57, 69
Policies and Procedures	55, 59
Structure and Organization	64, 66, 67, 71, 72

Ordinal logistic regression. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of organizational components on teachers' instructional practice as reported by the teacher during a reform initiative using data collected during Fall 2011. The assumption of proportional odds was met, as assessed by a full likelihood ratio test comparing the residual of the fitted location model to a model with varying location parameters, χ^2 (5) = .882, p = .972. The Pearson goodness-of-fit test indicated that the model was a good fit to the observed data, x^2 (149) = 152.574, p = .404; most cells, however, were sparse with 65.4% of cells with zero frequencies. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, x^2 (5) = 21.782, p = .001. As reported in Table 25, the odds of Data-Driven Decision Making, Leadership and Management, Planning and Instructional Services, Policies and Procedures and Structure and Organization, were all statistically non-significant. This supports the null hypothesis for Fall 2011; the components of effective organizations are not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Table 25

Logistic Regression Results - Fall 2011

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Data-Driven Decision Making			
.596	.821	1.130	χ^2 (1) = 1.466, p = .226
Leadership and Management			
.982	1.151	1.349	χ^2 (1) = 3.008, p = .083
Planning and Instructional Services			
.841	1.026	1.252	χ^2 (1) = .065, p = .798
Policies and Procedures			
.937	1.395	2.077	χ^2 (1) = 2.688, p = .101

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Structure and Organization			
.812	.977	1.176	χ^2 (1) = .060, *p* = .806

Program Capacity Survey Data - Spring 2012

Frequency distributions. Frequency distributions were analyzed for the Spring 2012 PCS data. Crosstabs, chi-square and Cramer's V were analyzed for each organizational component to determine whether any of the components have as a statistically significant relationship with teachers' instructional practice. Even though the Community Partnership component has one question, it is reported along with the other components. The frequencies of composite scores for the questions comprising each organizational component are reported in Appendix E. The results for chi-square and Cramer's V, including cell frequencies, are provided in Table 26. While the cell frequencies are sparse, there are four components that are statistically significant at various statistical levels; all with a relatively strong association ranging from .419 - .547 (Rea & Parker, 2014).

Table 26

Frequency Data by Organization Component – Spring 2012

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Community Partnerships	$x^2(8) = 9.725$, *p* = .285	7 (46.7%)	φ = 0.205, *p* = .285
Data- Driven Decision Making	$x^2(22) = 42.852$, *p* = .005	29 (80.6%)	φ =0.430, *p* = .005
Leadership and Management	$x^2(56) = 66.276$, *p* = .164	85 (97.7%)	φ = 0.534, *p* = .164
Planning and Instructional Services	$x^2(40) = 63.680$, *p* =.010	56 (88.9%)	φ = 0.524, *p* = .010

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Policies and Procedures	$x^2(16) = 40.801$, $p = .001$	19 (70.4%)	$\varphi = .419$, $p = .001$
Structure and Organization	$x^2(40) = 69.484$, $p = .003$	59 (93.7%)	$\varphi = .547$, $p = .003$

The frequency distributions also were analyzed for the individual questions comprising the organizational components for the PCS –Spring 2012 data. The individual questions identified in Appendix F were determined to have a statistically significant relationship with teachers' instructional practice. A summary of statistically significant individual questions comprising the component are listed in Table 27. All questions had a moderate association ranging from .288 and .394 (Rea & Parker, 2014).

Table 27

Statistically Significant Questions by Component – Spring 2012

Number of Questions	Number of Statistically Significant Questions	Statistical Significance	Strength of Association (Range)
Data-Driven Decision Making			
3	2	$p < .001$	.356 & .358
	1	$p \leq .05$	.295
Leadership and Management			
8	6	$p \leq .001$	.331 - .392
	2	$p \leq .05$	.288 & .303
Planning and Instructional Services			
5	3	$p \leq .001$	.345 - .367
	2	$p \leq .005$	.315 & .318
Policies and Procedures			
2	2	$p < .001$	.355 & .373
Structure and Organization			
6	6	$p \leq .001$	.340 - .394

Factor analysis results. Using the Spring 2012 data, the factor analysis results for the components of effective organizations as identified by Leithwood et al. (2006) is

reported in Table 28. All of the components, except for Data-Driven Decision Making, had a higher level of internal consistency for the Spring 2012 data than the Fall 2011. Data-Driven Decision Making, while .016 lower, still reported a high level of internal consistency.

Table 28

Factor Analysis Results for Organizational Components – Spring 2012

Number of Questions	KMO	Bartlett's Test of Sphericity	Eigenvalue		Cronbach's α
			Factor Total	Variance Explained	
Data-Driven Decision Making					
3	.704	x^2 (3) = 194.935*	2.411	80.36%	.877
Leadership and Management					
8	.916	x^2 (28) = 667.156*	5.463	68.28%	.932
Planning and Instructional Services					
5	.847	x^2 (10) = 331.470*	3.500	70.00%	.892
Policies and Procedures					
2	.500	x^2 (1) = 39.858*	1.544	77.21%	.703
Structure and Organization					
6	.904	x^2 (15) = 574.035*	4.601	76.68%	.938

*p = < .001

***Data-driven decision making factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "middling" (Kaiser, 1974), and all KMO values for individual items were > .649. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 29 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the three questions based upon the theoretical construct of Data-Driven Decision Making.

Table 29

Unrotated Factor Loading for Data-Driven Decision Making – Spring 2012

Item	Factor Loading
Question 62 - The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	.940
Question 61 - The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program.	.865
Question 60 - Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program.	.719

***Leadership and management factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy as "marvelous" (Kaiser, 1974), and all KMO values for individual items were > .902. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. An initial analysis was run to obtain eigenvalues for each factor in the component. Table 30 shows the unrotated factor loadings for the one identified factor. The interpretation of the data was consistent with the identification of one organizational component; Leadership. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the eight questions based upon the theoretical construct of Leadership and Management.

Table 30

Unrotated Factor Loading for Leadership and Management – Spring 2012

Item	Factor Loading
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	.896
Question 70 - Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	.850

Item	Factor Loading
Question 65 - The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	.841
Question 51 - The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	.809
Question 54 - School leaders are knowledgeable about the new STEM Career Awareness Program.	.780
Questions 53 -School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	.744
Question 58 - The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	.739
Question 63 - The school nurtures technology leadership capabilities across the organization.	.720

***Planning and instructional services factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy as "meritorious" (Kaiser, 1974) for the five questions assigned to the Planning and Instructional Services component. All KMO values for individual items were > .834. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 31 shows the unrotated factor loadings for the one identified factor. The interpretation of the data and the high level of internal consistency as determined by Cronbach's α support the identification of one organizational component; Planning and Instructional Services.

Table 31

Unrotated Factor Loading for Planning and Instructional Services – Spring 2012

Item	Factor Loading
Question 69 - The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	.857

Item	Factor Loading
Question 50 - The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	.823
Question 49 - The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	.800
Question 56 - Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	.744
Question 57 - The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	.727

***Policies and procedures factor analysis interpretation*.** As with the Fall 2011 data, the internal consistency of the Spring 2012 data for Policies and Procedures was the weakest of all the components. The internal consistency of .703, however, was stronger in this data than in the first collection of PCS data. The Kaiser-Meyer-Olkin measure identified the sampling adequacy as "miserable" (Kaiser, 1974), and all KMO values for individual items were = .500. Bartlett's test of sphericity indicates that correlations between items were adequate for PAF. Table 32 shows the unrotated factor loadings for the one identified factor. The interpretation of the data was consistent with the identification of one organizational component, Policies and Procedures, with an adequate level of internal consistency based upon Cronbach's α.

Table 32

Unrotated Factor Loading for Policies and Procedures – Spring 2012

Item	Factor Loading
Question 55 - Adequate funds are allocated to support the new STEM Career Awareness Program.	.737
Question 59 - Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	.737

***Structure and organization factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy as "marvelous" (Kaiser, 1974), and all KMO values for individual items were > .878. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. Table 33 shows the unrotated factor loadings for the one identified factor. The interpretation of the data and high internal consistency as determined by Cronbach's α support the identification of one organizational component; Structure and Organization.

Table 33

Unrotated Factor Loading Structure and Organization – Spring 2012

Item	Factor Loading
Question 66 - The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	.869
Question 64 - The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	.863
Question 71 - School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	.859
Question 72 - School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	.853
Question 68 - The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	.836
Question 67 - The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.	.811

Multicollinearity. Statistical tests were run to determine if multicollinearity was an issue prior to running the logistic regression for the organizational components utilizing the Spring 2012 data. Collinearity was not present for any of the components;

Data-Driven Decision Making, Leadership and Management, Planning and Instructional Services, Policies and Procedures, or Structure and Organization for the Spring 2012 data based upon the results of the "Tolerance" and VIF.

Ordinal logistic regression. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of organizational components on teachers' instructional practice as reported by the teacher during a reform initiative using data collected Spring 2012. The assumption of proportional odds was met, as assessed by a full likelihood ratio test comparing the residual of the fitted location model to a model with varying location parameters, χ^2 (5) = 1.144, p = .950. As the chi-square statistic was computed based upon the log-likelihood value of the last iteration of the general model and validity of the test is uncertain, further analysis of the proportional odds was conducted. The estimated parameters were examined to determine if the odds ratios were similar for each parameter in the equation. As the odds ratio was similar (Table 34), the assumption of proportional odds appears tenable.

Table 34

Odds Ratio for the Component Totals – Spring 2012

Component Total	Parameter Estimates [(B)]		Odds Ratio [Exp (B)]	
	Cat 1	Cat 2	Cat 1	Cat 2
Data-Driven Decision Making	.015	-.029	1.015	.972
Leadership and Management	-.001	.011	.999	1.011
Planning and Instructional Services	-.018	-.004	.982	.996
Policies and Procedures	-.154	-.240	.857	.786
Structure and Organization	-.144	-.122	.866	.885

The Pearson goodness-of-fit test indicated that the model was a good fit to the observed data, x^2 (187) = 184.824, p = .531; most cells, however, were sparse with 65.6%

of cells with zero frequencies. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, x^2 (5) = 45.044, $p < .001$. Based upon the results of the logistic regression, the odds of all the organizational components were statistically non-significant as shown in Table 35 which supports the null hypothesis that the components of effective organizations are not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative based upon the results obtained by utilizing the STEM Career Awareness Program Spring 2012 data.

Table 35

Logistic Regression Results - Spring 2012

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Data-Driven Decision Making			
.829	1.003	1.214	χ^2 (1) = .001, p = .975
Leadership and Management			
.866	.992	1.136	χ^2 (1) = .013, p = .908
Planning and Instructional Services			
.860	1.014	1.196	χ^2 (1) = .027, p = .869
Policies and Procedures			
.917	1.214	1.607	χ^2 (1) = 1.842, p = .175
Structure and Organization			
.996	1.145	1.316	χ^2 (1) = 3.626, p = .057

Program Capacity Survey Data - Fall 2012

Frequency distributions. The frequency distributions were analyzed for the Fall 2012 PCS data. Crosstabs, chi-square and Cramer's V were analyzed for each organizational component to determine whether any of the organizational components have a statistically significant relationship with teachers' instructional practice. The results for chi-square and Cramer's V, including cell frequencies, are provided in Table

36 with the frequencies of composite scores reported in Appendix G. While the cell frequencies are sparse, there are three components, Leadership and Management, Planning and Instructional Services, and Structure and Organization, that had a strong association of .736, .666, and .713, respectively, at $p < .001$ (Rea & Parker, 2014).

Table 36

Frequency Data by Organization Component – Fall 2012

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Community Partnerships	$x^2(4) = 9.437$, $p = .051$	2 (20.0%)	$\varphi = 0.301$, $p = .051$
Data- Driven Decision Making	$x^2(11) = 15.913$, $p = .144$	18 (75.0%)	$\varphi = 0.391$, $p = .144$
Leadership and Management	$x^2(24) = 56.342$, $p < .001$	46 (92.0%)	$\varphi = 0.736$, $p < .001$
Planning and Instructional Services	$x^2(18) = 46.108$, $p < .001$	32 (84.2%)	$\varphi = 0.666$, $p < .001$
Policies and Procedures	$x^2(8) = 14.257$ $p = .075$	10 (55.6%)	$\varphi = 0.370$, $p = .075$
Structure and Organization	$x^2(22) = 52.828$, $p < .001$	42 (91.3%)	$\varphi = .713$, $p < .001$

The frequency distributions also were analyzed for individual questions comprising the components of effective organizations as identified by Leithwood et al. (2006). A summary of those questions that have a statistically significant relationship with teachers' instructional practice is provided in Table 37. All statistically significant individual questions for Fall 2012, including cell frequencies, are listed in Appendix H. Nineteen of the statistically significant questions had a moderate association, ranging from .319 - .495 (Rea & Parker, 2014). Two questions had a relatively strong association of .512 and .576 at $p \leq .001$ (Rea & Parker, 2014).

Table 37

Statistically Significant Questions by Component – Fall 2012

Number of Questions	Number of Statistically Significant Questions	Statistical Significance	Strength of Association (Range)
Data-Driven Decision Making			
3	1	$p \leq .05$	.363
Leadership and Management			
8	6	$p < .001$	.444 - .512
	1	$p \leq .005$	.385
Planning and Instructional Services			
5	3	$p \leq .001$	.418 - .469
	2	$p \leq .005$	.383 & .410
Policies and Procedures			
2	2	$p < .05$	.319 & .321
Structure and Organization			
6	6	$p < .001$	.430 - .576

Factor analysis results. The factor analysis results for the Fall 2012 PCS data, including the KMO, Bartlett's Test of Sphericity, factor values and Cronbach's α, is reported in Table 38 for the components of effective organizations as identified by Leithwood et al. (2006), all supporting the categorization of the questions to their respective organizational component.

Table 38

Factor Analysis Results for Organizational Components – Fall 2012

Number of Questions	KMO	Bartlett's Test of Sphericity	Eigenvalue		Cronbach's α
			Factor Total	Variance Explained	
Data-Driven Decision Making					
3	.658	x^2 (3) = 118.143*	2.180	72.68%	.811
Leadership and Management					
8	.817	x^2 (28) = 484.239*	4.617	57.71%	.891
Planning and Instructional Services					
5	.801	x^2 (10) = 209.538*	3.088	61.77%	.844

Number of Questions	KMO	Bartlett's Test of Sphericity	Eigenvalue		Cronbach's α
			Factor Total	Variance Explained	
Policies and Procedures					
2	.500	x^2 (1) = 24.645*	1.464	73.22%	.631
Structure and Organization					
6	.886	x^2 (15) = 330.376*	3.930	65.49%	.889

*p = < .001

***Data-driven decision making factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "mediocre" (Kaiser, 1974). All KMO values for individual items were > .609. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 39 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the three questions based upon the theoretical construct of Data-Driven Decision Making.

Table 39

Unrotated Factor Loading for Data-Driven Decision Making – Fall 2012

Item	Factor Loading
Question 61 - The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	.929
Question 62 - The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	.797
Question 60 - Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program	.589

***Leadership and management factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974). All

KMO values for individual items were > .783. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 40 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the eight questions based upon the theoretical construct of Leadership and Management.

Table 40

Unrotated Factor Loading for Leadership and Management – Fall 2012

Item	Factor Loading
Question 51 - The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	.851
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	.822
Question 54 - School leaders are knowledgeable about the new STEM Career Awareness Program.	.807
Questions 53 - School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	.663
Question 63 - The school nurtures technology leadership capabilities across the organization.	.658
Question 65 - The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	.656
Question 70 - Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	.646
Question 58 - The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	.627

Planning and instructional services factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974). All KMO values for individual items were > .753. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 41 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the five questions based upon the theoretical construct of Planning and Instructional Services.

Table 41

Unrotated Factor Loading for Planning and Instructional Services – Fall 2012

Item	Factor Loading
Question 50 - The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	.807
Question 49 - The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	.778
Question 57 - The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	.692
Question 69 - The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	.667
Question 56 - Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	.667

Policies and procedures factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "miserable" (Kaiser, 1974) for the two questions assigned to the Policies and Procedures component as in the previous data

collected in Year Two of the STEM Career Awareness Program. All KMO values for individual items were > .500. Bartlett's test of sphericity indicated that correlations between items were adequate for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 42 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the adequate level of internal consistency based upon Cronbach's α support the categorization of the two questions based upon the theoretical construct of Policies and Procedures.

Table 42

Unrotated Factor Loading for Policies and Procedures – Fall 2012

Item	Factor Loading
Question 55 - Adequate funds are allocated to support the new STEM Career Awareness Program.	.681
Question 59 - Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	.681

***Structure and organization factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974). All KMO values for individual items were > .861. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 43 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the six questions based upon the theoretical construct of Structure and Organization.

Table 43

Unrotated Factor Loading for Structure and Organization – Fall 2012

Item	Factor Loading
Question 68 - The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	.859
Question 66 - The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	.830
Question 67 - The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.	.805
Question 72 - School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	.717
Question 64 - The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	.693
Question 71 - School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	.682

Multicollinearity. Statistical tests were run to determine if multicollinearity was an issue for any of the components using the Fall 2012 data. Collinearity was not present for Data-Driven Decision Making, Planning and Instructional Services, Policies and Procedures, or Structure and Organization for the Fall 2012 data based upon the results of the "Tolerance" and VIF. Multicollinearity, however, was identified as an issue for the questions categorized under the component of Leadership and Management for Fall 2012 data. The "Tolerance" below 0.1 and VIF above 10 are reported in Table 44 for the Leadership and Management Component.

Table 44

Multicollinearity Results for Leadership and Management – Fall 2012

Question	Collinearity Statistics	
	Tolerance	VIF
Question 51 - The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	.066	15.266
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program	.066	15.082

Based upon the results reported in Table 44, Question 51 was removed from the Leadership and Management Component. This decision was made as Question 51 had the highest VIF and Question 52 and also addressed "Restructuring to Foster Collaboration" (Appendix B). After Question 51 was removed, the statistical analysis was rerun including all the remaining variables and the "Tolerance" above 0.1 and the VIF values were less than 10 (range 1.572 – 4.092); removing the issue of collinearity for Fall 2012 and reducing the number of questions for the Leadership and Management Component to seven for the logistic regression.

Table 45

Questions Comprising Organizational Components – Fall 2012

Components of Effective Organizations	PCS Questions
Community Partnership	48
Data-Driven Decision Making	60, 61, 62
Leadership and Management	52, 53, 54, 58, 63, 65, 70
Planning and Instructional Services	49, 50, 56, 57, 69
Policies and Procedures	55, 59
Structure and Organization	64, 66, 67, 68, 71, 72

Ordinal logistic regression. The Test of Parallel Lines was not generated for this data as the null hypothesis indicated that the location parameters (slope coefficients) are the same across response categories. As such, a deeper investigation of the assumption of proportional odds was undertaken to determine if the estimated parameters are equal for each dichotomized cumulative category. The odds ratio was analyzed to determine if the proportional odds was tenable. As the odds ratio was identical for each dichotomized category as reported in Table 46, the proportional odds ratio was tenable.

Table 46

Odds Ratio for the Component Totals – Fall 2012

Component Total	Parameter Estimates [(B)]		Odds Ratio [Exp (B)]	
	Cat 1	Cat 2	Cat 1	Cat 2
Data-Driven Decision Making	.184	.184	1.202	1.202
Leadership and Management	-.185	-.185	.831	.831
Planning and Instructional Services	-.007	-.007	.993	.993
Policies and Procedures	.040	.040	1.041	1.041
Structure and Organization	-.119	-.119	.888	.888

The deviance goodness-of-fit test indicated that the model was a good fit to the observed data, x^2 (74) = 85.124, p = .177; however, most cells were sparse with 49.4% of the cells with zero frequencies. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, x^2 (5) = 35.566, p = .001. Based upon the results of the regression analysis as reported in Table 47, the odds of all the organizational components were statistically non-significant which supports the null hypothesis that the component of effective organizations are not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative based upon the results of the STEM Career Awareness Program Fall 2012 survey data.

Table 47

Logistic Regression Results - Fall 2012

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Data-Driven Decision Making			
.650	.832	1.065	χ^2 (1) = 2.130, p = .144
Leadership and Management			
.986	1.204	1.469	χ^2 (1) = 3.326, p = .068
Planning and Instructional Services			
.806	1.007	1.258	χ^2 (1) = .004, p = .952
Policies and Procedures			
.706	.961	1.307	χ^2 (1) = .065, p = .799
Structure and Organization			
.968	1.126	1.309	χ^2 (1) =2.365, p = .124

Program Capacity Survey Data - Spring 2013

Frequency distributions. Crosstabs, chi-square and Cramer's V were analyzed for Spring 2013 PCS data to determine whether any of the components of effective organizations as identified by Leithwood et al. (2006) have a statistically significant relationship with teachers' instructional practice. The results for chi-square and Cramer's V, including cell frequencies, are provided in Table 48 with the frequencies for composite scores for the questions comprising the organizational components reported in Appendix I. While the cell frequencies are sparse, all components, except Leadership and Management, are statistically significant at various statistical levels with a relatively strong association ranging from .414 - .592 (Rea & Parker, 2014).

Table 48

Frequency Data by Organization Component – Spring 2013

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Community Partnerships	$x^2(8) = 32.268$, $p < .001$	9 (60.0%)	$\varphi = 0.414$, $p < .001$

Components of Effective Organizations	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Data-Driven Decision Making	$x^2(22) = 49.063$, $p = .001$	31 (86.1%)	$\varphi = 0.511$, $p = .001$
Leadership and Management	$x^2(54) = 62.050$, $p = .211$	83 (98.8%)	$\varphi = 0.575$, $p = .211$
Planning and Instructional Services	$x^2(38) = 56.385$, $p < .028$	58 (96.7%)	$\varphi = 0.548$, $p < .028$
Policies and Procedures	$x^2(16) = 37.444$, $p = .002$	20 (74.1%)	$\varphi = 0.446$, $p = .002$
Structure and Organization	$x^2(42) = 65.803$, $p = .011$	63 (95.5%)	$\varphi = .592$, $p = .011$

Crosstabs, chi-square and Cramer's V also were analyzed for the Spring 2013 PCS data to determine the relationship between individual questions and the change in teachers' instructional practice. A summary of the individual questions that comprised the components of effective organizations as identified by Leithwood et al. (2006) and have a statistically significant relationship with teachers' instructional practice are listed in Table 49. All statistically significant individual questions for Spring 2013 data, including cell frequencies, are listed in Appendix J. All questions had a moderate association at various statistical significance levels within the range of .298 - .491 (Rea & Parker, 2014).

Table 49

Statistically Significant Questions by Component – Spring 2013

Number of Questions	Number of Statistically Significant Questions	Statistical Significance	Strength of Association (Range)
Data-Driven Decision Making			
3	1	$p < .005$	.317
	1	$p < .05$	.313
Leadership and Management			
8	2	$p < .001$	.392 & .414
	2	$p < .005$	.345 & .350
	4	$p \leq .05$	.305 - .319

Number of Questions	Number of Statistically Significant Questions	Statistical Significance	Strength of Association (Range)
Planning and Instructional Services			
5	3	$p \leq .001$	.372 - .481
	1	$p < .05$	.298
Policies and Procedures			
2	1	$p < .001$	.491
	1	$p < .05$	.334
Structure and Organization			
6	4	$p \leq .001$	.377 - .407
	2	$p < .05$	.290 & .293

Factor analysis results. As reported in Table 50 using the Spring 2013 PCS data, the factor analysis results for the components of effective organizations as identified by Leithwood et al. (2006), have a high internal consistency supporting the categorization of the questions by theoretical construct. The one exception was Policies and Procedures which had a weaker internal consistency of .689 based upon Cronbach's α.

Table 50

Factor Analysis Results for Organizational Components – Spring 2013

Number of Questions	KMO	Bartlett's Test of Sphericity	Eigenvalue		Cronbach's α
			Factor Total	Variance Explained	
Data-Driven Decision Making					
3	.670	x^2 (3) = 144.579*	2.321	77.35%	.853
Leadership and Management					
8	.876	x^2 (28) = 412.309*	4.729	59.11%	.898
Planning and Instructional Services					
5	.758	x^2 (10) = 186.275*	3.015	60.31%	.834
Policies and Procedures					
2	.500	x^2 (1) = 29.679*	1.526	76.32%	.689
Structure and Organization					
6	.862	x^2 (15) = 329.295*	4.040	67.34%	.903

*p = < .001

Data-driven decision making factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "mediocre" (Kaiser, 1974). All KMO values for individual items were > .617. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 51 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the three questions based upon the theoretical construct of Data-Driven Decision Making.

Table 51

Unrotated Factor Loading for Data-Driven Decision Making – Spring 2013

Item	Factor Loading
Question 61 - The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	.947
Question 62 - The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	.868
Question 60 - Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program	.632

Leadership and management factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974). All KMO values for individual items were > .823. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 52 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization

of the eight questions based upon the theoretical construct of Leadership and Management.

Table 52

Unrotated Factor Loading for Leadership and Management – Spring 2013

Item	Factor Loading
Question 65 - The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	.847
Question 51 - The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	.793
Question 52 - The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	.762
Question 54 - School leaders are knowledgeable about the new STEM Career Awareness Program.	.735
Question 70 - Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	.726
Question 58 - The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	.693
Question 63 - The school nurtures technology leadership capabilities across the organization.	.638
Questions 53 - School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	.631

Planning and instructional services factor analysis interpretation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy was “middling” (Kaiser, 1974). All KMO values for individual items were >.736. Bartlett’s test of sphericity indicated that correlations between items were sufficient for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 53 shows the unrotated factor loadings for the one

identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the five questions based upon the theoretical construct of Planning and Instructional Services.

Table 53

Unrotated Factor Loading for Planning and Instructional Services – Spring 2013

Item	Factor Loading
Question 57 - The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	.814
Question 50 - The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	.730
Question 49 - The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	.726
Question 69 - The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	.669
Question 56 - Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	.606

***Policies and procedures factor analysis interpretation*.** As with the data collected during Year Two and the beginning of Year Three of the STEM Career Awareness Program, the Kaiser-Meyer-Olkin measure verified the sampling adequacy was "miserable" (Kaiser, 1974) for Policies and Procedures. All KMO values for individual items were = .500. Bartlett's test of sphericity indicated that correlations between items were marginal for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 54 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the adequate of internal consistency based

upon Cronbach's α support the categorization of the two questions based upon the theoretical construct of Policies and Procedures.

Table 54

Unrotated Factor Loading for Policies and Procedures – Spring 2013

Item	Factor Loading
Question 59 - Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	.725
Question 55 - Adequate funds are allocated to support the new STEM Career Awareness Program.	.725

***Structure and organization factor analysis interpretation*.** The Kaiser-Meyer-Olkin measure verified the sampling adequacy was "meritorious" (Kaiser, 1974). All KMO values for individual items were > .814. Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF. As only one factor was extracted, the factor was not rotated; therefore, Table 55 shows the unrotated factor loadings for the one identified factor. The interpretation of the factor analysis results and the high level of internal consistency based upon Cronbach's α support the categorization of the six questions based upon the theoretical construct of Structure and Organization.

Table 55

Unrotated Factor Loading for Structure and Organization – Spring 2013

Item	Factor Loading
Question 72 - School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	.852
Question 71 - School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	.780
Question 67 - The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.	.778

Item	Factor Loading
Question 66 - The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	.772
Question 64 - The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	.764
Question 68 - The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	.732

Multicollinearity. Statistical tests were used to determine if multicollinearity was an issue with any of the organizational components prior to running the logistical regression with the Spring 2013 data. Collinearity was not present for any of the components; Data-Driven Decision Making, Leadership and Management, Planning and Instructional Services, Policies and Procedures, or Structure and Organization for the Spring 2013 data based upon the results of the "Tolerance" and VIF.

Ordinal logistic regression. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of organizational components on teachers' instructional practice as reported by the teacher during a reform initiative using data collected Spring 2013. The assumption of proportional odds was met, as assessed by a full likelihood ratio test comparing the residual of the fitted location model to a model with varying location parameters, χ^2 (5) = 1.848, p = .870. As the chi-square statistic was computed based upon the log-likelihood value of the last iteration of the general model and the validity of the test is uncertain, further analysis of the proportional odds was conducted. The estimated parameters were examined to determine if the odds ratios were similar for each parameter in the equation. As the odds ratio was similar (Table 56), the assumption of proportional odds appears tenable.

Table 56

Odds Ratio for the Component Totals – Spring 2013

Component Total	Parameter Estimates [(B)]		Odds Ratio [Exp (B)]	
	Cat 1	Cat 2	Cat 1	Cat 2
Data-Driven Decision Making	-.131	-.007	.877	.993
Leadership and Management	-.010	-.111	.990	.895
Planning and Instructional Services	-.040	.038	.961	1.039
Policies and Procedures	.028	-.058	1.029	.944
Structure and Organization	-.077	-.064	.926	.938

The deviance goodness-of-fit test indicated that the model was a good fit to the observed data, x^2 (155) = 106.075, p = .999. Most cells were sparse with 66.3% of cells with zero frequencies. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, x^2 (5) = 22.827, $p < .001$. The odds of the components of effective organizations as identified by Leithwood et al. (2006) all are statistically non-significant as reported in Table 57. This supports the null hypothesis that components of the effective organizations are not significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative using the Spring 2013 PCS data; in spite of the strength of relationship as identified by the chi-square and Cramer's V statistical tests.

Table 57

Logistic Regression Results – Spring 2013

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Data-Driven Decision Making			
.881	1.087	1.342	χ^2 (1) = .609, p = .435
Leadership and Management			
.892	1.044	1.220	χ^2 (1) = .285, p = .594
Planning and Instructional Services			
.840	1.015	1.225	χ^2 (1) = .024, p = .878

95% CI for Odds Ratio			
Lower	Odd Ratio	Upper	Wald
Policies and Procedures			
.749	1.011	1.366	χ^2 (1) = .006, p = .941
Structure and Organization			
.947	1.078	1.227	χ^2 (1) = 1.290, p = .256

Research Analysis for Research Question Three

For Research Question Three, "Is the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative," a frequency distribution was used to determine the distribution of teachers' involvement in the decision making process to adopt the STEM Career Awareness Program, as well as for teachers' perception of their instructional practice. Pearson's Chi Square was used to determine the relationship between the level of involvement in the decision making process and teachers' perception of their instructional practice. Cramer's V was used to measure the strength of association between these two categorical variables (Field, 2009). Participants selected one of three categories when describing their involvement in the decision making process: (1) Part of the Decision Making Team; (2) Given an opportunity for input; or (3) Not given an opportunity for input; and, the change in their instructional practice: (1) Positive Change, (2) Negative Change, or (3) No Significant Change.

Program Capacity Survey Data - Fall 2011. In the Fall 2011, 117 participants completed both questions on the STEM Career Awareness Program Capacity Survey were used to determine whether a participants involvement in the decision making process influenced their instructional practice as reported by the teacher during a reform initiative. Table 58 provides the frequency data for both questions.

Table 58

Frequency Data – Fall 2011

Category	Frequency	Percent
Involvement in the Decision Making Process		
Part of the Decision Making Team	12	10.3
Given an opportunity for input	22	18.8
Not given an opportunity for input	83	70.9
Total	117	100.0
Change in Teachers' Instructional Practice		
Positive Change	73	62.4
Negative Change	5	4.3
No Significant Change	39	33.3
Total	117	100.0

A chi-square test for association was conducted between a teacher's level of involvement in the decision-making process and teachers' instructional practice. Four cells (44.4%) have expected cell frequencies less than five. There was a statistically significant association at $p < .05$ between the level of involvement in the decision-making process and change in teachers' instructional practice, $x^2(4) = 11.478$, $p = .022$. There was a moderate association (Rea & Parker, 2014) between involvement in decision-making process and teachers' instructional practice, $\varphi = 0.221$, $p = .022$. This supports the hypothesis that the level of involvement in the decision making process to adopt a new reform initiative is significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Program Capacity Survey - Spring 2012. As reported in Table 59, 146 individuals participated in the STEM Career Awareness Program and completed both questions on the PCS survey were used to determine whether a participants involvement in the decision making process influenced their instructional practice as reported by the teacher during a reform initiative.

Table 59

Frequency Data – Spring 2012

Category	Frequency	Percent
Involvement in the Decision Making Process		
Part of the Decision Making Team	21	14.4
Given an opportunity for input	41	28.1
Not given an opportunity for input	84	57.5
Total	146	100.0
Change in Teachers' Instructional Practice		
Positive Change	84	57.5
Negative Change	4	2.7
No Significant Change	58	39.7
Total	146	100.0

A chi-square test for association was conducted between a teacher's level of involvement in the decision-making process and teachers' instructional practice. Three cells (33.3%) have expected cell frequencies less than five. There was a statistically significant association at $p < .001$ between the level of involvement in the decision-making process and change in teachers' instructional practice, $x^2(4) = 28.424$, $p < .001$. There was a moderate association (Rea & Parker, 2014) between involvement in decision-making process and teachers' instructional practice, $\varphi = 0.312$, $p < .001$. The hypothesis is again supported using the STEM Career Awareness Program Spring 2012 data; the level of involvement in the decision making process to adopt a new reform initiative is significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Program Capacity Survey Data - Fall 2012. In Fall 2012, 117 respondents participated in the STEM Career Awareness Program and completed both questions on the PCS survey (Table 60) were used to determine whether a participants involvement in

the decision making process influenced their instructional practice as reported by the teacher during a reform initiative.

Table 60

Frequency Data – Fall 2012

Category	Frequency	Percent
Involvement in the Decision Making Process		
Part of the Decision Making Team	14	12.0
Given an opportunity for input	46	39.3
Not given an opportunity for input	57	48.7
Total	117	100.0
Change in Teachers' Instructional Practice		
Positive Change	83	70.9
Negative Change	0	0.0
No Significant Change	34	29.1
Total	117	100.0

A chi-square test for association was conducted between a teacher's level of involvement in the decision-making process and teachers' instructional practice. One cell (16.7%) has an expected cell frequency less than five which met the minimum expected count. There was a statistically significant association at $p \leq .001$ between the level of involvement in the decision-making process and change in teachers' instructional practice, $x^2(2) = 13.803$, $p = .001$. There was a moderate association (Rea & Parker, 2014) between involvement in decision-making process and teachers' instructional practice, $\varphi = 0.343$, $p = .001$. As with the PCS data collected in Year Two of the STEM Career Awareness Program, the PCS data collected at the beginning of Year Three (Fall 2012), supports the hypothesis that the level of involvement in the decision making process to adopt a new reform initiative is significantly related to a teachers' instructional practice as perceived by the teacher during a reform initiative.

Program Capacity Survey Data - Spring 2013. In the Spring 2013, 110 participants completed both questions on the STEM Career Awareness PCS were used to determine whether a participants involvement in the decision making process influenced their instructional practice as reported by the teacher during a reform initiative. Table 61 provides the frequency data for both questions.

Table 61

Frequency Data – Spring 2013

Category	Frequency	Percent
Involvement in the Decision Making Process		
Part of the Decision Making Team	15	13.6
Given an opportunity for input	41	37.3
Not given an opportunity for input	54	49.1
Total	110	100.0
Change in Teachers' Instructional Practice		
Positive Change	74	67,3
Negative Change	3	2.7
No Significant Change	33	30.0
Total	110	100.0

A chi-square test for association was conducted between a teacher's level of involvement in the decision-making process and teachers' instructional practice. Four cells (44.4%) have expected cell frequencies less than five. There was a statistically significant association at $p < .005$ between the level of involvement in the decision-making process and change in teachers' instructional practice, $x^2(4) = 16.308$, $p = .003$. There was a moderate association (Rea & Parker, 2014) between involvement in decision-making process and teachers' instructional practice, $\varphi = 0.272$, $p = .003$. The PCS data collected at the end of Year Three of the STEM Career Awareness Program supports the hypothesis across all four collection periods; that the level of involvement in

the decision making process to adopt a reform initiative is significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

Chapter Five

Discussion

In this era of accountability and increased pressure to ensure the learning of all students, schools and districts must be able to create conditions necessary to positively influence teachers' instructional practice. As cited in the research identified in Chapter Two of this dissertation, teachers directly impact student achievement while school and district-wide conditions, such as leadership, indirectly effect student performance. While effective instructional practices increase student achievement, as Elmore (1996) noted, "most educational reforms never reach, much less influence, long-standing patterns of teaching practices …" (p. 6).

Either in response to external pressures or to internal identification of students' needs, districts and schools may rush to implement new initiatives without considering the long-term commitment that may be required to fully-implement and sustain a reform. This may result in a district "implementing" reform after reform without any long-lasting effect on a teachers' classroom practice. With all the responsibilities and activities required of school and district leaders on a daily basis, the importance of addressing organizational components may not seem as urgent as other pressing tasks. Not attending to these systematic variables, however, may hinder reform implementation and thereby, decrease the overall effectiveness of the organization long-term. Therefore, it is imperative that school and district leaders remove barriers that may waste the limited time, energy, and attention of teachers and administrators and create conditions that enable teachers to focus on instructional strategies and classroom conditions that directly impact student achievement.

Research Questions One and Two

This study focused on three research questions in the hopes of providing guidance to administrators who may use the results of this study to prioritize their limited resources to identify and address components within schools and districts that may hinder reform effectiveness and sustainability. In addition, this study sought to quantify the level of significance components of effective organizations have on teachers' instructional practice during a reform initiative.

This study used the eight components of effective organizations as identified by Leithwood et al. (2006) based on Organizational Learning Theory (OLT) and foundational to the Science, Technology and Mathematics (STEM) Career Awareness Program's Innovation Leaders Academy (ILA) Program Capacity Survey (PCS), as a framework to determine whether the components of effective organizations are significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative (Research Question One). The eight components as identified by Leithwood et al. (2006) are: (a) leadership and management, (b) mission and goals, (c) culture and community, (d) planning and instructional services, (e) structure and organization, (f) data-driven decision making, (g) policies and procedures, and (h) community partnerships. If it is determined that one or more organizational components are significantly related to teachers' instructional practice, then, this study also sought to determine which components have statistically more influence on teachers' instructional practice as perceived by the teacher during a reform initiative (Research Question Two).

The 25 questions selected for inclusion in this study from the PCS survey were first assigned to one of the eight components based upon the essential element of each

question. The theoretical construct was examined for each category and Leithwood et al.'s (2006) monitoring tool was examined to determine if there were similar questions that aligned with the survey question (Appendix B). A factor analysis was run to determine the internal consistency of the component using Cronbach's alpha. Based upon the results, as shown in Table 62, the internal consistency across all four collection periods was high for Data-Driven Decision Making, Leadership and Management, Planning and Instructional Services and Structure and Organization, validating the categorization of the questions into components. The Policies and Procedures component had the weakest internal consistency; although, with only two questions assigned to the component, still produced adequate consistency results.

Table 62

Internal Consistency of Organizational Components based upon Cronbach's α

Organizational Component	Year Two		Year Three	
	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Data-Driven Decision Making	.893	.877	.811	.853
Leadership and Management	.914	.932	.891	.898
Planning and Instructional Services	.879	.892	.844	.835
Policies and Procedures	.592	.703	.631	.689
Structure and Organization	.918	.938	.889	.903

After the factor analysis validated the organizational components, an ordinal logistic regression was run to determine the degree to which the components of effective organization and teachers' perception of their instructional practice correlate. Based upon the results of the regression utilizing the PCS data, none of the components of effective organization were statistically significant to teachers' instructional practice as perceived by the teacher during Year Two and Year Three of the STEM Career Awareness Program

(See Table 25 for Fall 2011 data, Table 35 for Spring 2012 data, Table 47 for Fall 2012 data and Table 57 for Spring 2013 data). Based upon the research reported in the literature review, this was unexpected. As the data used for this study was not specifically designed to measure the correlation between organizational components and teachers instructional practice, however, the results may be more reflective of using data for which it was not originally intended than an actual reflection of the factors influencing teachers' instructional practice.

In analyzing the frequency data of the components, all five components that had two or more questions assigned to the component, had a statistically significant strength of association based upon Cramer's V for at least one of the four collection periods of the PCS. The relationship between the Community Partnership component and teachers' instructional practice, with only one assigned question, had a relatively strong association at $p < .001$ (Rea & Parker, 2014) for one collection period (Spring 2013). Community support may be important in reform implementation and sustainability; however, as this study only had one assigned question to this component, this result should be taken with caution. In addition, it should be noted that the expected cell frequencies failed to meet the minimum count of five for every component measured and therefore, all results should be taken with caution.

The relationship between the Structure and Organization component and teachers' instructional practice was statistically significant for all four collection periods of the STEM Career Awareness Program. The Fall 2011 and Fall 2012 data was statistically significant at $p < .001$ with a strong association at .622 and .713 (Rea & Parker, 2014) between the Structure and Organization component and teachers' instructional practice as

perceived by the teacher during a reform initiative. For both Spring collection periods (2012 and 2013), there was a relatively strong association at .547 and .592 at $p < .005$ and $p < .05$, respectively (Rea & Parker, 2014).

These results support the importance of attending to the structures within an organization that have the potential to hinder the implementation and sustainability of a reform initiative. The questions that comprise this component address the structure that enables time and resources to support staff communication, collaboration, creative thinking and problem-solving. When school or district leadership structure time to support and encourage collaboration amongst staff members, greater coherence and collaboration may be achieved which are fundamental to improvement. As cited in Chapter Two, research has identified that in more effective schools, leaders attend to and institute structures to purposely develop a cohesive and collaborative culture. As Senge (1990) stated, "structures of which we are unaware hold us prisoner" (p. 95). These results indicate that throughout the period of reform implementation, leaders should attend to the structure within an organization as there is a strong association between teachers' instructional practice and the Structure and Organization component.

The relationship between the Planning and Instructional Services component and teachers' instructional practice was statistically significant three of the four collection periods, Fall 2012 at $p < .001$, and Spring 2012 and 2013 at $p < .05$. For Fall 2012, there was a strong association at .666 based upon Rea and Parker (2014); while, there was a relatively strong association at .524 and .548 (Rea & Parker, 2014) for Spring 2012 and 2013, respectively, between the component of Planning and Instructional Services and teachers' instructional practice as perceived by the teacher during a reform initiative. The

questions that comprise the Planning and Instructional Services component focus on creating a process which supports broad participation that encourages open discussion of problems and issues and encourages feedback from stakeholders. In addition, high expectations for staff and students, beyond test scores, are a focus of two of the five questions that comprise the Planning and Instructional Services component. Through deliberate planning, leaders may communicate a conscious process of change to staff members and may use this opportunity to establish new frames of reference. If the process of planning is based upon a collective vision and shared values, this may empower individuals to engage in activities that extend beyond their own self-interest; possibly increasing participants' involvement in and commitment toward successful reform implementation.

As shown in Table 63, the relationship between both the Data-Driven Decision Making and Policies and Procedures components and teachers' instructional practice were statistically significant for the Spring 2012 and Spring 2013 collection period with a relatively strong association at both $p \leq .001$ and $p \leq .005$ (Rea & Parker, 2014). Encouraging broad participation in Data-Driven Decision Making can increase awareness and support for the decision resulting in staff taking a greater ownership in the outcome. This also is supported by the statistical results for Research Question Three of this study.

Policies and Procedures that are compatible with the reform signals to staff members that the school or district is committed to the long-term success of the initiative by aligning resources to support both the initial and ongoing implementation; thus providing for a greater possibility of sustaining the reform. This shift of the reform initiative beyond the initial implementers occurs when the effort is "internalized and

continued by actions of the district" (Alsbury, 2008b, p. 180). These actions are specifically reflected in the policies and procedures of a school or district.

The relationship between the Leadership and Management component and teachers' instructional practice was statistically significant at $p < .001$ for the Fall 2012 data with the strongest association of all the components at .736. It was surprising to the researcher that the Leadership and Management component was statistically significant based upon Cramer's V for only one of the four collection periods as effective leadership is "second only to classroom instruction as an influence on student learning" (Louis, et al., 2010, p. 9). While the relationship between the Leadership and Management component and teachers' instructional practice was not statistically significant as reflected in the PCS data throughout the four collection periods of the STEM Career Awareness Program, effective leaders thoughtfully manage the different elements of the other components which may create, minimize or eliminate barriers that may influence the implementation and sustainability of a reform initiative. As Schein (1992) noted, it is the unique function of leadership to identify and address the functional and dysfunctional elements within an organization. Therefore, while the component itself did not yield a statistically significant association to teachers' instructional practice, it is only through effective leadership and management that the elements of the other components can be adequately addressed. Ensuring that leadership is able to employ systems thinking when implementing a new initiative is critical to ensuring that the appropriate conditions are in place to give the reform the best opportunity for success. As cited in Chapter Two, without the proper implementation supports, the intended outcomes of the reform may not be achieved.

The PCS results that yielded a statistically significant strength of association based upon Cramer's V indicate that the components of effective organizations as identified by Leithwood et al. (2006) continue to be meaningful elements to which school and district leaders should attend when implementing a new reform initiative. By addressing the eight components, leaders may be able to create the conditions necessary to successfully implement and sustain the reform over time.

Table 63

Frequency Data by Organization Component based upon Cramer's V

Organizational Component	Year Two		Year Three	
	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Community Partnership	φ = 0.232, *p* = .267	φ = 0.205, *p* = .285	φ = 0.301, *p* = .051	φ = 0.414, *p* < .001
Data-Driven Decision Making	φ =0.328, *p* = .579	φ =0.430, *p* = .005	φ =0.391, *p* = .144	φ =0.511, *p* = .001
Leadership and Management	φ = 0.596, *p* = .090	φ = 0.534, *p* = .164	φ = 0.736, *p* < .001	φ = 0.575, *p* = .211
Planning and Instructional Services	φ = 0.494, *p* = .193	φ = 0.524, *p* = .010	φ = 0.666, *p* < .001	φ = 0.548, *p* < .028
Policies and Procedures	φ = .369, *p* = .064	φ = .419, *p* = .001	φ = 0.370, *p* = .075	φ = 0.446, *p* = .002
Structure and Organization	φ = .622, *p* = .001	φ = .547, *p* = .003	φ = .713, *p* < .001	φ = .592, *p* = .011

Digging deeper into the components, some trends emerge in regards to the individual questions that comprised the components. While 25 questions were selected for inclusion into the study, 11 questions were statistically significant across all four collection periods (see Table K1 in Appendix K). All 11 questions had a moderate or relatively strong association (Rea & Parker, 2014) to teachers' instructional practice as

reported by the teacher during a reform initiative, ranging from .288 - .576 based upon Cramer's V. Forty-five percent (5 of 11) of the questions were assigned to the Leadership and Management component. Twenty-seven percent (3 of 11) of the questions were assigned to the Planning and Instructional Services component, while 18% (2) of the questions were from the Structure and Organization component. The final question was from the Policies and Procedures component. The essential element of each of the questions that were statistically significant across Years Two and Three of the STEM Career Awareness Program appeared to align under three broad themes: (a) staff collaboration, dialogue, involvement in decision making and planning; (b) high expectations in regards to the reform; and (c) district/school commitment to the reform effort.

Based upon the theoretical construct underlying the research cited in Chapter Two, these trends are not surprising. Developing a professional learning culture and community where staff members work together to achieve a common vision is supported by Organizational Learning Theory and by research of effective schools and districts. Having high expectations in regards to the reform means developing leadership capabilities specifically designed to support the initiative, as well as recognizing high levels of student and staff achievement in regards to the reform. This symbolically keeps the initiative at the forefront in a profession where there may be conflicting demands and shifting priorities. In addition, two questions addressed the district's commitment to the reform initiative. This includes hiring new staff members who would support the reform and allocating adequate funds to continue to support the initiative. Without an adequate funding source for ongoing professional learning, any new initiative will dissipate over

time as scarce resources are allocated toward other priorities. All 11 questions were statistically significant at the onset of Year Two (Fall 2011) and remained significant throughout the third year of the reform implementation, indicating that these are important elements that leadership should be taken into consideration if desiring a reform be sustained over time.

In addition, there were eight additional questions that became statistically significant in Spring 2012 and remained significant during the final year of the STEM Career Awareness Program; Fall 2012 and Spring 2013, as reported in Table K2 (Appendix K). All eight additional questions that were statistically significant, had a moderate association with a range of .290 – .449 (Rea & Parker, 2014). Of the eight questions that were statistically significant over the final three collection periods, two were from the Leadership and Management Component, one each from both Planning and Instructional Services and Policies and Procedures, and four questions were from the Structure and Organization Component. Therefore, seven of the eight (88%) questions that originally comprised the Leadership and Management Component were statistically significant with a moderate to relatively strong association based upon Cramer's V for three of the four collection periods. The eighth question that comprised the Leadership and Management Component that was statistically non-significant for the first three collection periods, was statistically significant at <.005 with a moderate associate of .345 (Rea & Parker, 2014) in Spring 2013. Therefore, all eight questions of the Leadership and Management component were individually statistically significant based upon Cramer's V by the end of the third year of the STEM Career Awareness Program even though the

Leadership and Management Component itself was only statistically significant for one collection period (Fall 2012).

Of the six questions originally assigned to the Structure and Organization component, all six questions (100%) were statistically significant with a moderate to relatively strong association over three of the four collection periods based upon Cramer's V. The relationship between the Structure and Organization component as a whole and teachers' instructional practice was statistically significant based upon Cramer's V for all four collection periods. These results, again, confirm the importance of attending to the structures and organization of a system to support a reform initiative. In the haste to address pressing issues, the structures within an organization may be overlooked, but this may be detrimental to the longevity of the initiative.

In addition, both questions assigned to the Policies and Procedures component were statistically significant with a moderate to relatively strong association to teachers' instructional practice over three of the four collection periods based upon Cramer's V. This component may easily be neglected as its impact may not be as obvious to leadership, however, these results highlight the need to attend to the Policies and Procedures of effective organizations as identified by Leithwood et al. (2006). The importance of these components based upon the strength of association should be taken with caution, however, as the cell frequencies were sparse exceeding the minimum cell frequency of five (See Appendix D, F, H, and J for frequency data).

To address the problem of excessive cell frequencies less than five, the researcher merged the categories as described in Chapter Four and as recommended by Rea and Parker (2014). Merging the categories of the organizational component from a five-point

to a three-point scale, however, did not address this issue as the frequency count of the merged categories still failed to meet the minimum expected count. In addition, to compare the output, the researcher collapsed the categories of the criterion variable from the three distinct categories of (1) Positive Change, (2) Negative Change, and (3) No Significant Change to two categories of (1) Positive Change, and (3) No Significant Change. The purpose of this transformation was to determine if this change would address the issue of excessive cell frequencies. This transformation was attempted with the Fall 2011 data for the organizational components with both the summed component scores and the mean total scores. During this collection period, only two participants had selected "(2) Negative Change" in response to the question regarding "the type of change the NEW STEM Career Awareness Program has or likely will cause in your teaching." In both outputs, the cell frequencies failed to meet the minimum expected count less than five for all components for both the summed component scores and the mean total scores. Even if the cell frequencies met the minimum expected count, however, the researcher would have serious reservations about eliminating this category just for the purpose of statistical analysis. During a reform initiative, participants should have the option of reporting whether he or she feels that the reform initiative has a negative effect on his/her instructional practice. Leadership also needs this information in order to know how participants perceive the initiative and determine if the information warrants being addressed.

Research Question Three

In addition, this study sought to determine whether a teachers' involvement in the decision making process to adopt a new reform is significantly related to teachers'

instructional practice as perceived by the teacher during a reform initiative (Research Question Three). On the PCS, there was one question that specifically addressed participants' level of involvement in the process to adopt the new STEM Career Awareness Program. The respondents were given three choices:

1. I was/am part of the decision-making team.
2. I was given an opportunity to offer input.
3. I was not given an opportunity to offer input.

Pearson's Chi Square was used to determine the relationship between the level of involvement in the decision making process and teachers' perception of their instructional practice. Cramer's V was used to measure the strength of association between these two categorical variables to determine whether the level of involvement in the decision making process to adopt a new reform initiative significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative. The results were all statistically significant as reported in Table 64 with a moderate association (Rea & Parker, 2014) ranging from .221 - .343 based upon Cramer's V. The results of the chi-square test need to be taken with caution as the frequency count failed to meet the minimum expected count for three of the four collection periods. For the Fall 2012 data, only one cell (16.7%) had an expected cell frequency less than five which met the minimum expected count of 4.07. As such, the results from this analysis can be taken without reservation; there is a moderate association that involvement in the decision making process is significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative.

This is important as it indicates that teachers' involvement should be sought when determining whether to implement a new reform initiative; as participants who are involved in the decision making process may have a greater ownership in the outcome. Some school and district leadership may be hesitant to involve staff members in the decision making process as they may be concerned that there will be resistance to change and that taking the time to gather input may slow down the implementation process. While this may be true, research has shown and this study has demonstrated that involving staff members in the decision making process, and creating the forum to obtain feedback and address concerns, as well as create the structure to enable staff to problem-solve, brainstorm ideas and collaborate has a relatively strong to strong association with teachers' instructional practice as reported by the teacher during a reform initiative. If the intent of the reform is to influence teachers' instructional practice, then, involving staff members in the decision making process should not be overlooked.

Table 64

Frequency Data by Collection Period

Collection Period	Frequency	Chi-Square	Cell Counts Less Than Five (Percentage)	Cramer's V
Fall 2011	117	$x^2(4) = 11.478$, $p = .022$	4 (44.4%)	$\varphi = 0.221$, $p < .001$
Spring 2012	146	$x^2(4) = 28.424$, $p < .001$	3 (33.3%)	$\varphi = 0.312$, $p < .001$
Fall 2012	117	$x^2(2) = 13.803$, $p = .001$	1 (16.7%)	$\varphi = 0.343$, $p = .001$
Spring 2012	110	$x^2(4) = 16.308$, $p = .003$	4 (44.4%)	$\varphi = 0.272$, $p = .003$

Limitations of the Study

This study originally sought to determine whether all eight of the components of effective organizations as identified by Leithwood et al. (2006) influences teachers'

instructional practice as perceived by the teacher. Mission and Goals and Culture and Community, both theoretically supported by Organizational Learning Theory and components of effective organizations as identified by Leithwood et al. (2006) did not have PCS questions selected for inclusion into this study. This decision was based upon the structure of the questions or based upon the difference in rating scale or response format. This inability to utilize PCS survey questions to determine whether Mission and Goals and Culture and Community are significantly related to teachers' instructional practice as perceived by the teacher during a reform initiative and whether either components has statistically more influence than other components is a limitation to this study, as it has been determined by research as cited in Chapter Two of this dissertation that both components are important elements in effective organizations.

Another limitation is that organizational learning theorists have identified important elements that influence behavior that may be difficult to measure, such as Argyris and Schön's (1978) espoused theory and theories-in-use, as well as Senge's (1990) mental models. While these theoretical constructs are influential in guiding individual and organizational actions, they are not directly measured in this study.

As the Program Capacity Survey data was not originally collected to determine whether organizational components influence teachers' instructional practice, this may be a limitation to the statistical results of this study. The determination was made that the design of the survey did not lend itself to use statistical analysis for interval data. As such, the researcher used a summed scale score to run the logistic regression rather than a mean score. As each component had a different number of questions assigned to the component, the range of the scores varied widely (Policies and Procedures; range 5 – 10;

Leadership and management, range 8 – 40). Ideally, the same number of questions would be selected for each component, however, as the researcher was utilizing data not originally created for this research question in this study, the number of questions varied by component. This may call into question the factor analysis results of the Policies and Procedures component, and may influence the outcome of the logistic regression.

As there is differing opinions regarding whether a five-point Likert item can be treated as interval data, for comparison purposes, the researcher ran an ordinal logistic regression using the mean totaled for Data-Based Decision Making, Leadership and Management, Planning and Instructional Services, Policies and Procedures, and Structure and Organization components rather than the summed total. There was only one statistically significant difference. All components, similar to the research cited in Chapter Four, were determined to support the null hypothesis, and were not statistically significant in regards to the organizational components influence on teachers' instructional practice. The Fall 2011 – Leadership and Management data, however, was statistically significant at $p \leq .05$ (.033) with an odds ratio of 3.114. According to this analysis, the component of Leadership and Management has three (3) times the odds of influencing a teachers' instructional practice at the onset of a reform initiative.

Running the data with the mean total rather than the summed total also allows for ease in interpretation. If an educational practitioner, who is often pressed for time, were to use survey data to determine a course of action, running the data as interval would provide a quick snapshot of staff member's feelings toward organizational components. In this researcher's opinion, it would not be necessary to run the data as ordinal, as running the data as interval would provide a close approximation of the data and would

provide guidance in developing a course of action to address possible barriers to reform implementation. As noted by Agresti (1984) "… for many ordinal categorical variables it is sensible to imagine the existence of an underlying continuous variable" (p. 2).

Finally, this study utilizes self-reporting data to measure positive influence on instructional practice. This is a limitation as noted in Chapter One as individuals' view of their own instructional practice is subjective based upon their own interpretation of their own actions which may differ from that of an observer (Cohen, 1990). While teachers may report a positive change in their instructional practice, this may not necessarily equate to more effective instructional practices.

Suggestions for Further Study

The data for this study was mined from the three-year STEM Career Awareness Program; although, this study only used data from Year Two and Year Three of the program. This program consisted of five middle schools, each located in a different district, in a southern U.S. state. Four of the five of the districts utilized the Strategic Teaming Model which included both district and building level leadership to guide the implementation of the STEM Career Awareness Program. The fifth district chose not to create and utilize a leadership team to guide the reform implementation in the middle school participating in the program.

Further study might be to disaggregate the data used in this study to examine whether there is a statistical difference in the district that did not have district support and guidance provided by a leadership team from those schools that had the support and guidance from district leadership under the Strategic Teaming Model. This would provide information whether teachers perceived a more positive change in their instructional

practice in those schools where leadership support was formalized in relation to those teachers who implemented a reform initiative without formalized leadership support. This may provide insight and quantitative data to administrators on whether it may be beneficial to create a formalized structure to lead, guide and support a new reform initiative during the implementation period.

As described in this chapter as a limitation to this study, the fact that Mission and Goals and Culture and Community, two components identified by research as important to effective organizations, was not measured translates into a suggestion for further study. One recommendation would be to develop a contextually based monitoring tool to measure all eight components of effective organizations as based upon Leithwood et al.'s research (2006) and utilize this tool throughout a reform implementation in order to measure each component's influence on a teachers' instructional practice as reported by the teacher during a reform initiative.

In addition, all components of effective organization as identified by Leithwood et al. (2006) require leadership to utilize systems thinking to effectively manage all aspects of reform implementation by ensuring alignment of structure, policies and practices. Further study should be conducted on how to best support and develop leaders to ensure they have the skills necessary to lead a reform implementation. Further study may provide additional guidance on how to best address administrators who do not currently utilize research-based practices in order to address potential barriers that may hinder reform implementation. It is only through effective leadership in conjunction with effective organizational components that successful reform implementation and sustainability is possible.

References

Agresti, A. (1984). *Analysis of ordinal categorical data*. New York, NY: John Wiley & Sons.

Alsbury, T. L. (2008a). The crucible of reform: The search for systemic leadership. In B. Després (Ed.), *Systems thinkers in action: A field guide for effective change leadership in education* (pp. 77-108). Lanham, MD: Rowman & Littlefield.

Alsbury, T. L. (2008b). Promoting sustainable leadership within the reform system. In B. M. Hand (Ed.), *Science inquiry, argument and language* (pp. 177-194). Rotterdam, Netherlands: Sense.

Alsbury, T. L., Overstreet, N. A., Blanchard, M. R., Osborne, J. W., Williams, B., Albert, J. L., Kier, M. W., & Reed, R. (2012, April). *Innovation Leaders Academy: Districtwide strategic teaming that improves the implementation and sustainability of innovative reform programs in high need districts*. Paper presented at the annual meeting of the American Educational Research Association, Vancouver, British Columbia, Canada.

Anderson, S. E., & Stiegelbauer, S. (1994). Institutionalization and renewal in a restructured secondary school. *School Organization, 14*(3), 279-293.

Anderson, S. E., & Togneri, W. (2005). School district-wide reform policies in education. In N. Bascia, A. Cumming, A. Datnow, K. Leithwood and D. Livingstone (Eds.) *International Handbook of Educational Policy*, (p. 173-194). Great Britain: Springer.

Argyris, C., & Schön, D. A. (1974). *Theory in Practice.* San Francisco, CA: Jossey-Bass.

Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective.* Reading, MA: Addition-Wesley Publishing Co.

Banner, D. K., & Gagne, T. E. (1995). *Designing effective organizations: Traditional & transformational views*. Thousand Oakes, CA: Sage.

Barth, R. S. (1986). On sheep and goats and school reform. *Phi Delta Kappan, 68*(4), 293-296.

Bertram, R. M., Blase, K. A., & Fixsen, D. L. (2014). Improving programs and outcomes: Implementation frameworks and organizational change. *Research on Social Work Practice, 25*(4), 477-487. http://dx.doi.org/10.1177/1049731514537687

Brophy, J. (1986). Teacher influences on student achievement. *American Psychologist, 41*(10), 1069-1077.

Brophy, J. & Good, T. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., p. 328-375). New York, NY: MacMillan Publishing Company.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research, 1*(2), 245-276. http://dx.doi.org/10.1207/s15327906mbr0102_10

Coburn, C. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational Researcher, 32*(6), 3-12. http://dx.doi.org/10.3102/0013189X032006003

Cohen, D. K. (1990). A revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis, 12*(3), 311-329.

Conoley, J. C. (1989). Professional communication and collaboration among educators. In M. C. Reynolds (Ed.), *Knowledge Base for the Beginning Teacher* (p. 245-254). Oxford, England: Pergamon Press.

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation, 10*(7). Retrieved from http://pareonline.net/getvn.asp?v=10&n=7

Crone, L. & Teddlie, C. (1995). Further examination of teacher behavior in differentially effective schools: Selection and socialization process. *Journal of Classroom Interaction, 30*(1), 1-9

Cuban, L. (1990). Reforming again, again, and again. *Educational Researcher, 19*(1), 3-13.

Cuban, L. (1992). What happens to reforms that last? The case of the Junior High School. *American Educational Research Journal*, *29*(2), 227-251.

Datnow, A. (2005). The sustainability of comprehensive school reform models in changing district and state contexts. *Educational Administration Quarterly*, *41*(1), 121-153. http://dx.doi.org/10.1177/001316104269578

Elmore, R. F. (1996). Getting to scale with good educational practice. *Harvard Educational Review, 66*(1), 1-26.

Evertson, C. M. (1989). Classroom organization and management. In M. C. Reynolds (Ed.), *Knowledge Base for the Beginning Teacher* (p. 59-70). Oxford, England: Pergamon Press.

Evertson, C. M., Anderson, C. W., Anderson, L. M., & Brophy, J. E. (1980). Relationships between classroom behaviors and student outcomes in junior high mathematics and English classes. *American Educational Research Journal, 17*(1), 43-60.

Field, A. (2009). *Discovering statistics using SPSS*. London, England: Sage.

Fiol, C. M., & Lyles, M. A. (1985). Organizational learning. *Academy of Management Review, 10*, 803-813.

Firestone, W. A. (2009). Accountability nudges districts into changes in culture. *Phi Delta Kappan, 90*(9), 670-676.

Fixsen, D. L, Blase, K. A, Metz, A., Van Dyke, M. (2013). Statewide implementation of evidence-based programs. *Council for Exceptional Children, 79*(2), 213-230.

Fowler, Jr., F. J. (2009). *Survey research methods*. Thousand Oakes, CA: Sage.

Fuchs, L. S., & Fuchs, D. (n.d.) *What is Scientifically-Based Research on Progress Monitoring? National Center on Student Progress Monitoring*. Retrieved from http://files.eric.ed.gov/fulltext/ED502460.pdf

Fullan, M. (2005). *Leadership & sustainability*. Thousand Oakes, CA: Corwin.

Fullan, M., & Miles, M. B. (1992). Getting reform right: What works and what doesn't. *Phi Delta Kappan, 73*(10), 744-752.

Good, T., & Brophy, J. (1986). School effects. In M. C. Wittrock (Ed.), *Handbook of Research on Teaching*, (3rd ed., p. 570-602). New York, NY: MacMillan.

Grossman, P. L., Wilson, S. M., & Shulman, L. S. (1989). Teachers of substance: Subject matter knowledge for teaching. In M. C. Reynolds (Ed.), *Knowledge Base for the Beginning Teacher* (p. 23-36). Oxford, England: Pergamon Press.

Hallinger, P., & Heck, R. H. (1999). Can leadership enhance school effectiveness? In T. Bush, L. Bell, R. Bolam, R. Glatter, & P. Ribbins (Eds.), *Educational Management: Redefining Theory, Policy and Practice.* London, England: Sage.

Hallinger, P., & Heck, R. H. (2002). What do you call people with vision? The role of vision, mission and goals in school leadership and improvement. In K. Leithwood, P. Hallinger (Eds.), *Second International Handbook of Educational Leadership and Administration*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Heck, R. H., & Hallinger, P. (2010). Collaborative leadership effects on school improvement: Integrating unidirectional and reciprocal-effects model. *The Elementary School Journal, 111*(2), 226-252.

Hightower, A. M. (2002, January). *San Diego's big boom: District bureaucracy supports culture of learning* (No. R-02-2). Seattle: Center for the Study of Teaching and Policy, University of Washington.

Honig, M. I. (2008). District central offices as learning organizations: How sociocultural and organizational learning theories elaborate district central office administrators' participation in teaching and learning improvement efforts. *American Journal of Education, 114*(4), 627-664.

Horng, E., & Loeb, S. (2010). New thinking about instructional leadership. *Phi Delta Kappan, 92*(3), 66-69.

Inbar, D. E. (1993). Educational planning; The transformation of symbols, frames of reference, and behavior. *Educational Policy, 7*(2), 166-183.

Johnson, P. E., & Chrispeels, J. H. (2010). Linking the central office and its schools for reform. *Educational Administration Quarterly*, *46*(5), 738-775. http://dx.doi.org/10.1177/0013161X10377346

Kahler, E., Rogausch, A., Brunner, E., & Himmel, W. (2008). A parametric analysis of ordinal quality-of-life data can lead to erroneous results. *Journal of Clinical Epidemiology, 61*(5), 475-480.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20,* 141-151.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 32-36.

Kantamara, P., Hallinger, P., & Jatiket, M. (2006). Scaling-up educational reform in Thailand: Context, collaboration, networks, and change. *Planning and Changing, 37*(1&2), 5-23.

Kirst, M. W., & Meister, G. R. (1985). Turbulence in American secondary schools: What reforms last? *Curriculum Inquiry*, *15*(2), 169-186.

Klockars, A. J., & Yamagishi, M. (1988, Summer). The influence of labels and positions in rating scales. *Journal of Educational Measurement, 25*(2), 85-96.

Leithwood, K. (2007). Organizational conditions that enhance teaching and learning. In W. D. Hawley with D. L. Rollie (Eds.), *The Keys to Effective Schools* (pp. 139-152). Thousand Oakes, CA: Corwin.

Leithwood, K., Aitken, R., & Jantzi, D. (2001). *Making schools smarter: A system for monitoring school and district progress* (2nd ed.). Thousand Oakes, CA: Corwin.

Leithwood, K., Aitken, R., & Jantzi, D. (2006). *Making schools smarter: Leading with evidence* (3rd ed.). Thousand Oakes, CA: Corwin.

Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform: Effects on students, teachers, and their classroom practices. *School Effectiveness and School Improvement, 17*(2), 201-277. http://dx.doi.org/10.1080/09243450600565829

Leithwood, K., Leonard, L., & Sharratt, L. (1998). Conditions fostering organizational learning in schools. *Educational Administration Quarterly, 34*(2), 243-276. http://dx.doi.org/10.1177/0013161X98034002005

Leithwood, K., Patten, S., & Jantzi, D. (2010). Testing a conception of how school leadership influences student learning. *Educational Administration, 46*, 671-706. http://dx.doi.org/10.1177/0013161X10377347

Levine, D. U., & Lezotte, L. W. (1990). *Unusually effective schools: A review and analysis of research and practice*. Madison, WI: National Center for Effective Schools Research and Development Digital Collections - Lake Forest College. Retrieved from http://collections.lakeforest.edu/items/show/4228

Little, J. W. (1982, Autumn). Norms of collegiality and experimentation: Workplace conditions of school success. *American Educational Research Journal, 19*(3), 325-340.

Louis, K. S., Leithwood, K., Wahlstrom, K.L., & Anderson, S. E. (2010). *Learning from leadership: Investigating the links to improved student learning.* (Final report of research to the Wallace Foundation). Retrieved from University of Minnesota, Center for Applied Research and Educational Improvement. Retrieved from http://conservancy.umn.edu/bitstream/handle/11299/140885/1/Learning-from-Leadership_Final-Research-Report_July-2010.pdf

Louis, K. S., Marks, H. M., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal, 33*(4), 757-798.

Martilla, J. A., & Carvey, D. W. (1975). Four subtle sins in marketing research. *The Journal of Marketing*, 8-15.

McDiarmid, G. W., Ball, D. L., & Anderson, C. W. (1989). Why staying one chapter ahead doesn't really work: Subject-specific pedagogy. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (p. 193-206). Oxford, England: Pergamon Press

McLaughlin, M., & Mitra, D. (2001). Theory-based change and change-based theory. *Journal of Educational Change, 2*, 301-323. http://dx.doi.org/10.1023/A:1014616908334

Murphy, J., & Hallinger, P. (1986). The superintendent as instructional leader: Findings from effective school districts. *Journal of Educational Administration, 24*(2), 213-236.

Oakes, J. (1989). What educational indicators? The case for assessing the school context. *Educational Evaluation and Policy Analysis*, *11*(2), 181-199.

Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). *Making sense of factor analysis*. Thousand Oakes, CA: Sage.

Rea, L. M., & Parker, R. A. (2014). *Designing and conducting survey research: A comprehensive guide*. San Francisco, CA: Jossey-Bass.

Ross, J. A., Hogaboam-Gray, A., & Gray, P. (2004). Prior student achievement, collaborative school processes, and collective teacher efficacy. *Leadership and Policy in Schools, 3*(3), 163-188.

Ross, J. A., & Gray, P. (2006). School leadership and student achievement: The mediating effects of teacher beliefs. *Canadian Journal of Education, 29*(3), 798-822.

Roszkowski, M. J. & Soven, M. (2010, January). Shifting gears: Consequences of including two negatively worded items in the middle of a positively worded questionnaire. *Assessment & Evaluation in Higher Education, 35*(1), 117-134.

Sanders, M. G., & Epstein, J. L. (1998). School-Family-Community Partnerships and Educational Change: International Perspectives. In Hargreaves, A., Lieberman, A., Fullan, M., & Hopkins, D. (Eds.), *International Handbook of Educational Change* (p. 482-502). The Netherlands: Kluwer Academic Publishers.

Sanders, W. L., & Horn, S. P. (1998). Research findings from the Tennessee Value-Added Assessment System (TVAAS) database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education, 12*(3), 247-256.

Schein, E. H. (1992). *Organizational culture and leadership.* San Francisco, CA: Jossey-Bass, Inc.

Schein, E. H. (1993). On dialogue, culture, and organizational learning. *Organization Dynamics, 22*(2), 40-51. http://dx.doi.org/10.1016/0090-2616(93)90052-3

Schön, D. A. (1971). *Beyond the stable state.* New York, NY: W. W. Norton.

Senge, P. M. (1990). *The fifth discipline*. New York, NY: Doubleday.

Senge, P. M., Kleiner, A., Roberts, C., Ross, R. B., & Smith, B. J. (1994). *The fifth discipline fieldbook: Strategies and tools for building a learning organization*. New York, NY: Doubleday.

Shaked, H., & Schechter, C. (2013). Seeing wholes: The concept of systems thinking and its implementation in school leadership. *International Review of Education, 59*(6), 771-791. http://dx.doi.org/10.1007/s11159-013-9387-8

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *American Educational Research Association, 15*(2), 4-14.

Spillane, J. P. (1996). School districts matter: Local educational authorities and state instructional policy. *Educational Policy, 10*(1), 63-87.

Spillane, J. P., & Thompson, C. L. (1997). Reconstructing conceptions of local capacity: The local education agency's capacity for ambitious instructional reform. *Educational Evaluation and Policy Analysis, 19*(2), 185-203.

Stringfield, S., & Datnow, A. (1998). Introduction: Scaling up school restructuring designs in urban schools. *Education and Urban Society, 30,* 269-276. http://dx.doi.org/10.1177/0013124598030003001

Stringfield, S., & Herman, R. (1996). Assessment of the state of school effectiveness research in the United States of America. *School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice, 7*(2), 159-180.

Supovitz, J., Sirinides, P., & May, H. (2010). How principals and peers influence teaching and learning. *Educational Administration Quarterly, 46(*1), 31-56. http://dx.doi.org/10.1177/1094670509353043

ten Bruggencate, G., Luyten, H., Scheerens, J., & Sleegers, P. (2012). Modeling the influence of school leaders on student achievement: How can school leaders make

a difference? *Educational Administration Quarterly*, *48*(4), 699-732. http://dx.doi.org/10.1177/001316X11436272

Thornton, B., & Perreault, G. (2008). Using systems thinking to improve twenty-first century schools. In B. Després (Ed.), *Systems thinkers in action: A field guide for effective change leadership in education* (pp. 39-54). Lanham, MD: Rowman & Littlefield.

Tyack, D. & Tobin, W. (1994). The "grammar" of schooling: Why has it been so hard to change? *American Educational Research Journal*, *31*(3), 453-479.

Virgilio, I., Teddlie, C., & Oescher, J. (1991). Variance and context differences in teaching at differentially effective schools. *School Effectiveness and School Improvement, 2*(2), 152-168.

Wang, M. C., & Palincsar, A. S. (1989). Teaching students to assume an active role in their learning. In M. C. Reynolds (Ed.), *Knowledge Base for the Beginning Teacher* (p. 71-84). Oxford, England: Pergamon Press.

Wilson, B. F., Altman, B. M., Whitaker, K., & Callegaro, M. (2004). How good is good? Comparing numerical ratings of response options for two versions of the self-assessed health status question. *Journal of Official Statistics, 20*(2), 379-391.

Witziers, B., Bosker, R., & Krüger, M. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly, 34*(3), 398-425. http://dx.doi.org/10.1177/0013161X03253411

Wright, S. P., Horn, S. P., & Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11*, 57-67.

Appendix A
Program Capacity Survey

Number	Question
1	Because we will be administering the survey each year, we need to track your responses with a personal ID number. We are asking you to enter the LAST 5 DIGITS OF YOUR HOME OR CELL NUMBER. Your responses will remain anonymous. We cannot link you to this number. Example [5-4321] _____
Background Questions	
2	What is the name of your school? _____
3	Your current position in the district? [ ] Classroom teacher [ ] District-level administrator [ ] School-level administrator [ ] support staff (counselor, librarian, instructional aide, instructional technology aide, etc...) [ ] organizational support staff (custodian, secretary, food service, transportation, etc...) [ ] Other _____
4	What grade level do you work in primarily? [ ] High School [ ] Middle School [ ] Elementary School [ ] Combination of grades
5	How many years have you worked in this district as a staff or faculty member? [ ] 0-2 years [ ] 3-5 years [ ] 6-10 years [ ] 10-20 years [ ] 20 or more years

Number	Question
6	How many years have you worked in any district as a staff or faculty member? [ ] 0-2 years [ ] 3-5 years [ ] 6-10 years [ ] 10-20 years [ ] 20 or more years
7	What is your gender? [ ] Male [ ] Female
8	Please note your level of familiarity with the STEM Career Awareness Program? [ ] I am involved in the project directly [ ] I am involved in the project indirectly [ ] I have learned about the project [ ] I have heard about the project [ ] I am not aware of the project
9	How would you describe your current level of support for the STEM Career Awareness Program? [ ] Highly Supportive [ ] Supportive [ ] Somewhat Supportive [ ] Not Supportive [ ] Unknown

Questions 10 – 23

Please respond to the following questions regarding your agreement or disagreement with the following potential concerns over the implementation of the STEM Career Awareness program.

[ ] Strongly Agree
[ ] Agree
[ ] Disagree
[ ] Strongly Disagree
[ ] Unknown

Number	Question
10	I am concerned about instructional and pedagogical issues that may be caused by the STEM Career Awareness Program.
11	I am concerned over curricular or content issues that may be caused by the STEM Career Awareness Program.
12	I am concerned over the impact on teacher workload that may be caused by the STEM Career Awareness Program.
13	I am concerned about the impact on teacher working conditions that may be caused by the STEM Career Awareness Program.
14	I am concerned over the impact on staff time management that may be caused by the STEM Career Awareness Program.
15	I am concerned over the impact on staffing (transitions, transfers, or staff turnover) that may be caused by the STEM Career Awareness Program.
16	I am concerned over the impact on collegiality or faculty relationships that may be influenced by the STEM Career Awareness Program.
17	I am concerned professional development or staff training issues that may be caused by the STEM Career Awareness Program.
18	I am concerned over the effectiveness of communications in the adoption and implementation of the STEM Career Awareness Program.
19	I am concerned over the lack curriculum or program cohesiveness and increased program fragmentation that may be caused by the STEM Career Awareness Program.
20	I am concerned over the impact on classroom management, discipline, or safety that may be caused by the STEM Career Awareness Program.
21	I am concerned over the fiscal/budgetary impact or a change in resource allocation that may be caused by the STEM Career Awareness Program.

Number	Question
22	I am concerned over negative impacts on student welfare or family issues that may be caused by the STEM Career Awareness Program.
23	I am concerned over the impact on the community that may be caused by the STEM Career Awareness Program.
24	What do you believe is the actual purpose of the STEM Career Awareness Program._____
25	How were you involved in the process to adopt the new STEM Career Awareness Program? [ ] I was/am part of the decision-making team [ ] I was given an opportunity to offer input [ ] I was not given an opportunity to offer input

Questions 26 – 39 (Instructional Impact of the STEM Career Awareness Program)

Please respond to the following questions regarding your agreement or disagreement with the following potential concerns over how the new STEM Career Awareness Program may impact your work:

[ ] Strongly Agree
[ ] Agree
[ ] Disagree
[ ] Strongly Disagree
[ ] Unknown

26	Faculty assignments or roles at my school might change.
27	I might not have a voice in changes that affect my work.
28	I am concerned that I might end up with more work.
29	I am concerned that the new STEM Career Awareness Program will bring new teaching methods or instructional changes I don't understand or do not agree with.
30	I am concerned that we are implementing something prematurely, before the staff really understand what it is or why we need it.

Number	Question
31	I am concerned that this STEM Career Awareness Program will put new demands on my time.
32	I am concerned that this new STEM Career Awareness Program may have a negative impact on my students.
33	I am concerned that the teachers will not have adequate support for the changes they are expected to make to accommodate this new STEM Career Awareness Program.
34	I am expect [sic] that the STEM Career Awareness Program may disappear in a year or two.
35	I am concerned that administrators will not be trained along with the teachers in the new STEM Career Awareness Program.
36	I am concerned that this new STEM Career Awareness Program will impact my teaching evaluations.
37	I am concerned that parents will not understand this new STEM Career Awareness Program.
38	I anticipate significant changes to my instructional approaches as a result of this new STEM Career Awareness Program.
39	I am concerned that the school may have to cut other programs that my students or I value due to this new STEM Career Awareness Program.
40	Overall, how supportive are the school staff and faculty of the new STEM Career Awareness Program? [ ] Highly supportive [ ] Supportive [ ] Neutral [ ] Not supportive [ ] Highly non-supportive

Number	Question
41	Note below what type of change the new STEM Career Awareness Program has or likely will cause in you, your teaching, or your students' learning. [ ] Positive change [ ] Negative change [ ] No significant change (a) You (b) Your teaching (c) Your students' learning
42	Describe your general level of satisfaction with the following: [ ] Highly satisfied [ ] Satisfied [ ] Somewhat satisfied [ ] Somewhat dissatisfied [ ] Dissatisfied [ ] Highly dissatisfied [ ] Neutral (a) your administration (b) your district (c) your school (d) your current grade/subject assignment (e) resources provided (f) support from parents
Staff Development	
43	How effective is the staff development program in supporting the new STEM Career Awareness Program? [ ] Highly effective [ ] Effective [ ] Somewhat effective [ ] Not effective
44	In your opinion is more follow-up training needed for this new STEM Career Awareness Program? [ ] Yes [ ] No

Number	Question
Innovation and Change	
45	Concerning new initiatives introduced in your school, there are.... [ ] too many new initiatives introduced [ ] about the correct number of new initiatives introduced [ ] too few new initiatives introduced
46	In general, how receptive/supportive are the faculty to the new STEM Career Awareness Program? [ ] Highly supportive [ ] Supportive [ ] Neutral [ ] Not supportive [ ] Highly non-supportive
47	How often do staff to assess strengths and weaknesses in the STEM Career Awareness Program that lead to necessary changes? [ ] Usually [ ] Sometimes [ ] Rarely [ ] Never

The following questions ask about how various parts of the district organization influence your effectiveness as a faculty or staff member in implementing and sustaining the STEM Career Awareness Program.

For each of the following statements indicate your level of agreement (Strongly Agree, Agree, Disagree, or Strongly Disagree or Unknown).

[ ] Strongly Agree
[ ] Agree
[ ] Disagree
[ ] Strongly Disagree
[ ] Unknown

Number	Question
Parental Involvement	
48	Parents were significantly involved in the development of the new STEM Career Awareness Program?
Vision and Planning	
49	The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.
50	The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.
Effective Leadership	
51	The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.
52	The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.
53	School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.
54	School leaders are knowledgeable about the new STEM Career Awareness Program.
Accountability	
55	Adequate funds are allocated to support the new STEM Career Awareness Program.
56	Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.
57	The school supports reward, consequence, and recognition systems to encourage high levels of staff and student achievement in the new STEM Career Awareness Program.
58	The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.

Number	Question
59	Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.
60	Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program.
Using Data for Continuous Improvement	
61	The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program.
62	The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.
Learning Organizations	
63	The school nurtures technology leadership capabilities across the organization.
64	The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.
65	The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.
Systems Thinking	
66	The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.
67	The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.
Innovation and Creativity	
68	The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.

Number	Question
69	The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.
70	Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.
71	School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.
72	School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program.

Appendix B
Categorization of Program Capacity Survey Questions

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
Community Partnerships	Question 48 Parents were significantly involved in the development of the new STEM Career Awareness Program? Survey Heading – Parent Involvement	Question 48 Extends the STEM Career awareness program into the family	Question 48 *School 9.3 - Parent/Guardian Participation* • 9.3.17 – "Parents/guardians are involved as influential decision makers in our school."
Data-Driven Decision Making	Question 60 Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program Survey Heading – Accountability	Question 60 All categories of personnel know those requirements of their roles … Staff routinely monitor knowledge and compliance of those they supervise with role and responsibilities as specified …	Question 60 *School 7.1 - Systematic Collection* • 7.1.2 – "In our school, teacher performance is monitored through regular reviews …" • 7.1.4 – "In our school, teacher performance is regularly monitored through such means as …"
Data-Driven Decision Making	Question 61 The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	Question 61 Evidence of systematic monitoring of progress is evident.	Question 61 *District 7.1 – Information Sources* • 7.1.2 – "Our district systematically monitors the progress of …"

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
	Survey Heading – Using Data for Continuous Improvement		*District 7.2 – Use of Information* • 7.2.10 – "Our staff use … information to help formulate decisions for our school."
Data-Driven Decision Making	Question 62 The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources. Survey Heading – Using Data for Continuous Improvement	Question 62 Evidence of systematic monitoring of progress is evident. Collects optimal amounts and types of information.	Question 62 *District 7.1 – Information sources* • 7.1.2 – "Our district systematically monitors the progress of …" *District 7.2 – Use of Information* • 7.2.10 – "Our staff use … information to help formulate decisions for our school."
Leadership and Management	Question 51 The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program. Survey Heading – Effective Leadership	Questions 51 Establishes working conditions that facilitate staff collaboration for planning and professional growth	Question 51 *School 1.3.2 – Restructuring to Foster Collaboration* • 1.3.2.41 – "Establishes working conditions that foster staff collaboration."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
Leadership and Management	Question 52 The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program. Survey Heading – Effective Leadership	Question 52 Ensures that staff have adequate involvement in decisions about programs and instruction	Question 52 *School 1.3.2 – Restructuring to Foster Collaboration* • 1.3.2.39 – "Ensures that we have adequate involvement in decision making."
Leadership and Management	Questions 53 School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program. Survey Heading – Effective Leadership	Question 53 Staffing is an important management function; leadership is most frequently exercised *through* the performance of managerial activities. At the school level, staffing is reflected specifically in an emphasis on instructional management Considers teacher expertise when hiring (not only content expertise, but other areas of competence / expertise – teaming,	Question 53 *School 1.4.1 – Planning and Supervising Instruction* • 1.4.1.48 – "Ensures that teacher's expertise is of paramount importance in staffing." • 1.4.1.49 – "Places staff in areas of competence and expertise." *District 1.4.3 – Staffing* • 1.4.3.53 – "District hiring criteria encourage commitment to district mission and goals."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
		collaboration, shared values, beliefs and attitudes that indicate support for reform initiative which touches on creating collaborative cultures (1.3.1. and leadership)	
Leadership and Management	Question 54 School leaders are knowledgeable about the new STEM Career Awareness Program. Survey Heading – Effective Leadership	Question 54 Coordinates instructional program; participates in discussions of instructional issues	Question 54 *School 1.4.2 – Providing Instructional Support* • 1.4.2.54 – "Frequently participates in discussions of educational issues." • 1.4.2.55 – "Helps clarify the instructional implications of the school's vision and goals."
Leadership and Management	Question 58 The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program. Survey Heading - Accountability	Question 58 Regularly visits classrooms to observe teaching and learning; encourages staff to evaluate progress toward achieving school goals; regularly monitors school [student] progress - (pg. 64-65).	Question 58 *School 1.4.1 – Planning and Supervising Instruction* • 1.4.1.50 – "Regularly observes classroom activities." *School 1.1.2 – Fostering the Acceptance of Group Goals* • 1.1.2.5 – "Regularly encourages us to evaluate our progress

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
		(Assumption that STEM Program goals specifically address student progress)	toward achieving school [Program] goals." *School 1.4.3 – Monitoring the Student's Progress* • 1.4.3.59 – "Frequently reviews student progress."
Leadership and Management	Question 63 The school nurtures technology leadership capabilities across the organization. Survey Heading – Learning Organizations	Question 63 Leadership capabilities are nurtured throughout the system Developing people is one of the core elements of "Leadership and Management" Fullan discusses developing leadership capacity at many levels throughout the system when leaders lead through the change process (Ed Ldrshp, 2002, p. 20) (National Staff Development Council, 2005, p. 55)	Question 63 *School 1.1.3 – High Performance Expectations* • 1.1.3.12 – "Expects staff to engage in ongoing professional growth."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
Leadership and Management	Question 65 The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program. Survey Heading – Learning Organizations	Question 65 Successful leadership practices are built upon a collaborative culture, where stakeholders have a voice and input into goals, new programs	Question 65 *1.3.1 - Creating Collaborative Cultures* • 1.3.1.34 – "Encourages ongoing teacher collaboration for implementing new programs and practices."
Leadership and Management	Question 70 Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program. Survey Heading – Innovation and Creativity	Question 70 Leaders create opportunities for meaningful discussion; collaboration amongst staff	Question 70 *1.3.1 - Creating Collaborative Cultures* • 1.3.1.34 – "Encourages ongoing teacher collaboration for implementing new programs and practices." • 1.3.1.35 – "Facilitates effective communication among staff."
Planning and Instructional Services	Question 49 The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program. Survey Heading – Vision and Planning	Question 49 Productive planning process includes those who are touched by the plan (broad participation); captures relevant information possessed by all appropriate stakeholders	Question 49 *School 4.1 – Captures Relevant Information* • 4.1.1 – "I have opportunities to provide input into …" • 4.1.2 – "Parent/community members are involved in developing …"

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
			District 4.1 – Influences on Plan • 4.1.3 – "All stakeholder groups … have an opportunity to influence …"
Planning and Instructional Services	Question 50 The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program. Survey Heading – Vision and Planning	Question 50 Productive planning process includes those who are touched by the plan (broad participation); captures relevant information possessed by all appropriate stakeholders; identifies areas in which district is or is not meeting current needs of stakeholders	Question 50 *School 4.1 – Captures Relevant Information* • 4.1.1 – "I have opportunities to provide input into …" *School 4.3 - Systematic Review of Current Plan* • 4.2.7 – "Review of … is facilitated by the systematic collection of data on … strengths and areas requiring improvement." *School 4.4 - Encourages Support and Understanding* • 4.4.16 – "I am encouraged to collaborate …" *District 4.1 – Influences on Plan* • 4.1.3 – "All stakeholder groups … have an opportunity to influence …"

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
			District 4.2 – Review of Current Status • 4.2.5 – "Changes are made … when data indicate stakeholder needs are not being met."
Planning and Instructional Services	Question 56 Student success, not just test scores, is the top priority in the new STEM Career Awareness Program. Survey Heading - Accountability	Question 56 Instructional Services are "at the heart of a school's and district's reason for being" (p. 80) Instructional Services address aspects of the instructional program that is critical to student learning/ success beyond performance on tests (i.e., instruction is carefully planned; instructional goals are appropriate and clear; content is challenging; instructional strategies are suited to instructional objectives and students' needs; instructional strategies reflect defensible principles	Question 56 *School 5.1 – Planning* • 5.1.1 – "My instruction is carefully planned to provide diverse activities and experiences for my students." • 5.1.5 – "Our programs help students understand how a particular topic relates to their relevant prior knowledge." • 5.1.6 – "I always establish a clear framework for instructional themes or activities in my classroom." *School 5.3 - Content* • 5.3.13 – "Our school's curriculum challenges our students to exert their best effort." *School 5.4 – Strategy Appropriateness*

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
		of learning; instruction time is used effectively). Research on instructional services is based upon "a constructivist view of the learning process and its implications for instruction" (p. 84)	• 5.4.15 – "Teachers in our school are becoming skills in the use of a large repertoire of instructional strategies." • 5.4.16 – "Students are given opportunity to determine their learning activities." • 5.4.17 – "My instructional strategies enable students to construct their own knowledge." • 5.4.18 – "I take students' interests, needs, and experiences into account when planning learning opportunities." • 5.4.19 – "My classroom is a comfortable learning environment with minimal distraction from instructional purposes." *School 5.5 – Strategy Use* • 5.5.20 – "My curriculum makes meaningful linkages between learning opportunities and our students' lives and experiences." • 5.1.21 – "My curriculum stresses learning skills and applications that connect with the world beyond the school."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
Planning and Instructional Services	Question 57 The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program. Survey Heading – Accountability	Question 57 District Accountability Systems - "High-performing systems are not content to live with state-imposed accountability systems if those systems do not seem likely to accomplish something useful locally. These districts often introduce practices and technical support coherent with state efforts by extending their own accountability demands and tools significantly beyond what states propose." (p. 82)	Question 57 *District 5.5 – Create District Accountability Systems* • 5.5.28 – "School accountability systems are closely linked to district goals and strategic improvement plans."
Planning and Instructional Services	Question 69 The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program. Survey Heading – Innovation and Creativity	Question 69 Productive planning process includes those who are touched by the plan (broad participation); captures relevant information possessed by all appropriate stakeholders	Question 69 *School 4.1 – Captures Relevant Information* • 4.1.1 – "I have opportunities to provide input into …" • 4.1.2 – "Parent/community members are involved in developing …" *District 4.1 – Influences on Plan* • 4.1.3 – "All stakeholder groups

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
			… have an opportunity to influence …"
Policies and Procedures	Question 55 Adequate funds are allocated to support the new STEM Career Awareness Program. Survey Heading - Accountability	Question 55 Policy and procedures are aligned with school goals	Question 55 *School 8.1 - Coherence* • 8.1.7 – "Our school's budget allocation reflects our school's goals." *School 8.8 - Resource Allocation* • 8.1.47 – "Allocation of resources within our school supports our school goals."
Policies and Procedures	Question 59 Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program. Survey Heading – Accountability	Question 59 Teacher evaluation are tied to district and school (program) goals	Question 59 *School 8.6 – Professional Focus* • 8.6.31 – "Our teacher evaluation/supervision practices reflect our school … goals and priorities."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
Structure and Organization	Question 64 The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program. Survey Heading – Learning Organization	Question 64 Problem-solving involving risk-taking is encouraged; alternate solutions are encouraged – not the status quo; creative thinking involves risk-taking	Question 64 *School 6.3 - Facilitating Professional Growth* • 6.3.12 – "School provides opportunity for …" • 6.3.15 – "Our school makes time for us to … that assist in making new ideas meaningful." *District 6.4 - Facilitation of Alternative Practices* • 6.4.22 – "I am encouraged to consider using a wide range of practices in my work."
Structure and Organization	Question 66 The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program. Survey Heading – Systems Thinking	Question 66 Staff perceive that school structures support teacher collaboration, initiative, and leadership for the purpose of maximizing student learning opportunities	Question 66 *School 6.3 - Facilitating Professional Growth* • 6.3.11 – "Collaboration among staff is encouraged by our school's organizational structure." *School 6.4 Maximizing Student Learning* • 6.4.17 – "The structures of our school support teacher collaboration to maximize

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
			student learning opportunities." *District 6.4 - Facilitation of Alternative Practices* • 6.4.22 – "I am encouraged to consider using a wide range of practices in my work." • 6.4.25 – "I am encouraged to consider to ideas from within my school setting."
Structure and Organization	Question 67 The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program Survey Heading – Systems Thinking	Question 67 Organizational structures facilitate organizational learning and long-term problem-solving capacity.	Question 67 *School 6.3 - Facilitating Professional Growth* • 6.3.12 – "Our school provides opportunities for collaboration with colleagues outside the school." • 6.3.13 – "Our school has effective procedures for making new ideas from external sources easily accessible for staff."
Structure and Organization	Question 68 The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	Question 68 Organizational structure of school allows for / facilitates the time and the opportunity for creative	Question 68 *School 6.3 - Facilitating Professional Growth* • 6.3.12 – "School provides opportunity for …"

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
	Survey Heading – Innovation and Creativity	thinking	• 6.3.15 – "Our school makes time for us to …. that assist in making new ideas meaningful." *District 6.4 - Facilitation of Alternative Practices* • 6.4.22 – "I am encouraged to consider using a wide range of practices in my work."
Structure and Organization	Question 71 School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program. Survey Heading – Innovation and Creativity	Question 71 Based upon feedback or data collected during the implementation process, school leaders are provided flexibility to respond to unexpected events Decentralized control over decision making which allows for flexibility in response to unforeseen and unexpected events Organizational structures facilitate organizational learning and long-term problem-solving capacity; school/district organization	Question 71 *District 6.5 - Provision of School Autonomy* • 6.5.28 – "My school makes significant decisions regarding the generation of its goals." • 6.5.29 – "My school makes significant decisions regarding the implementation of its goals." • 6.5.31 – "My school's goals reflect the needs of its student community." • 6.5.33 – "District support to my school reflects the school's unique needs."

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Rationale	Corresponding Questions on Monitoring Tool (Leithwood et al., 2006)
		and decision-making structures have a substantial influence on teachers/building leaders flexibility	
Structure and Organization	Question 72 School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program Survey Heading – Innovation and Creativity	Question 72 Organizational structures facilitate organizational learning and long-term problem-solving capacity.	Question 72 *District 6.3 – Collaboration and Communication* • 6.3.21 – "I can easily obtain information that I might need from within the organization." *District 6.4 – Facilitation of Alternative Practices* • 6.4.23 – "Our … establishes informal teacher groups to consider alternative educational practices." • 6.4.24 – "Our … involves staff members on formal committees that consider alternative approaches …"

Appendix C
Component Frequencies - Fall 2011

Figure C1. Community Partnership Response Frequency

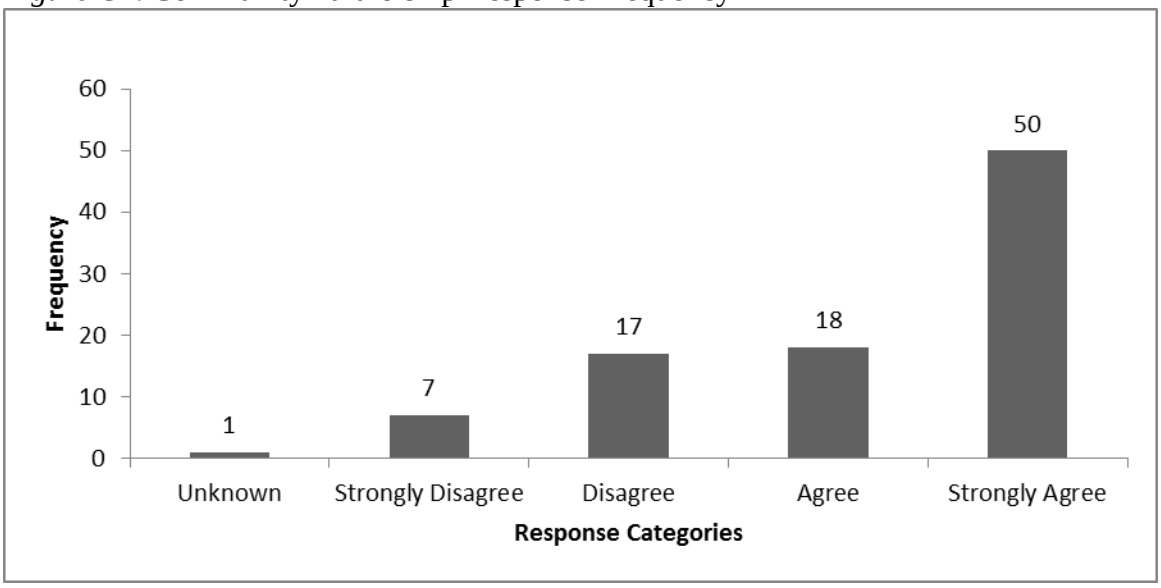
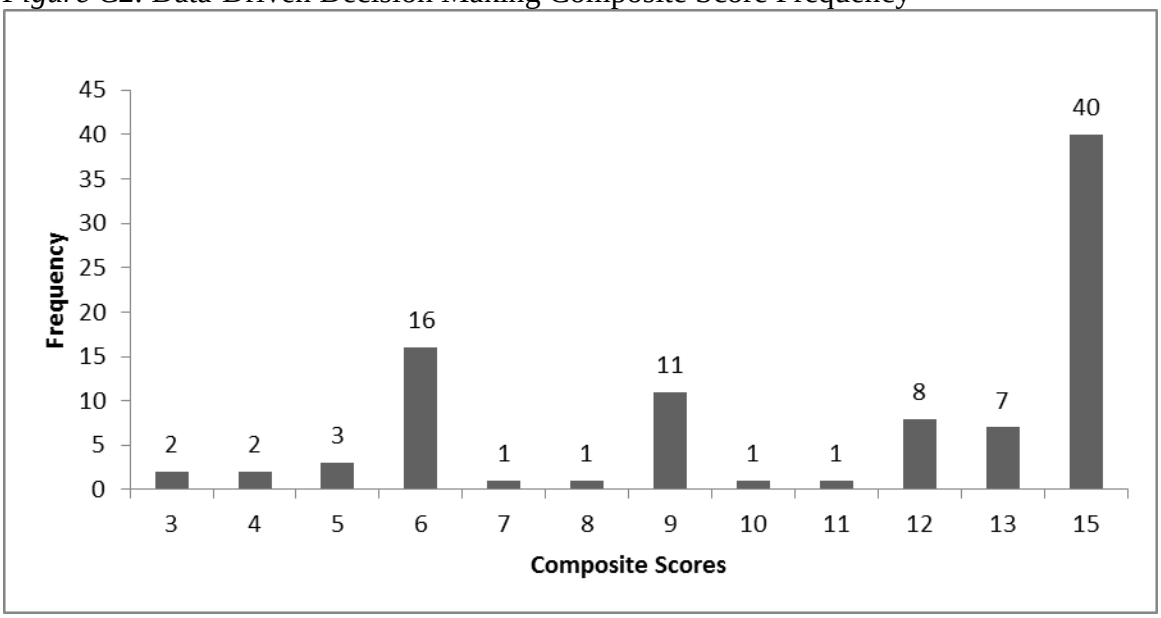
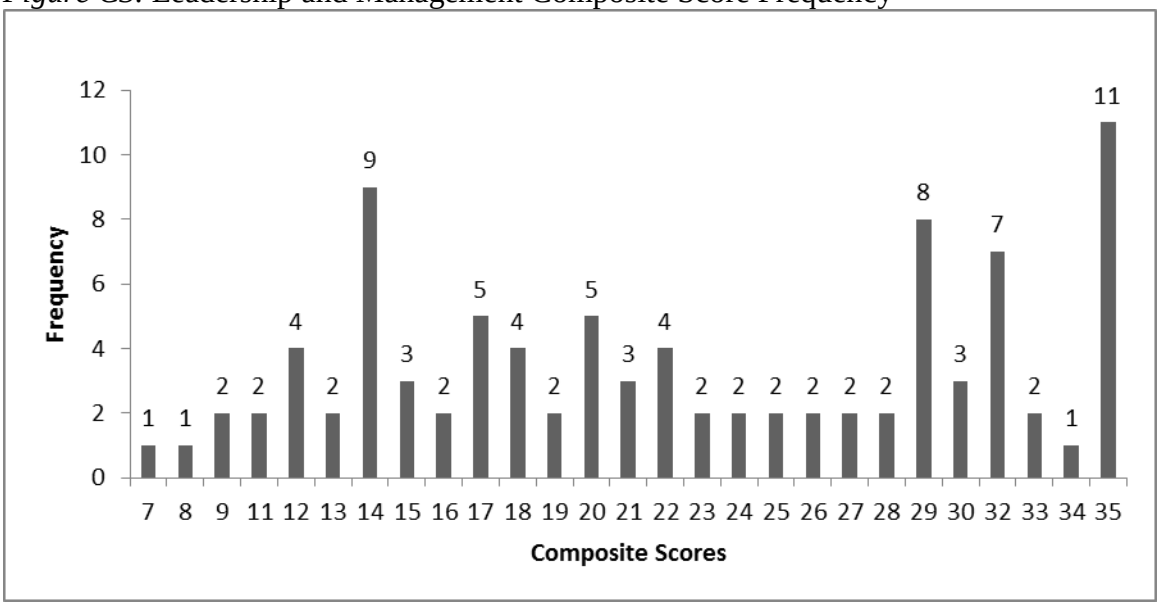


Figure C2. Data-Driven Decision Making Composite Score Frequency



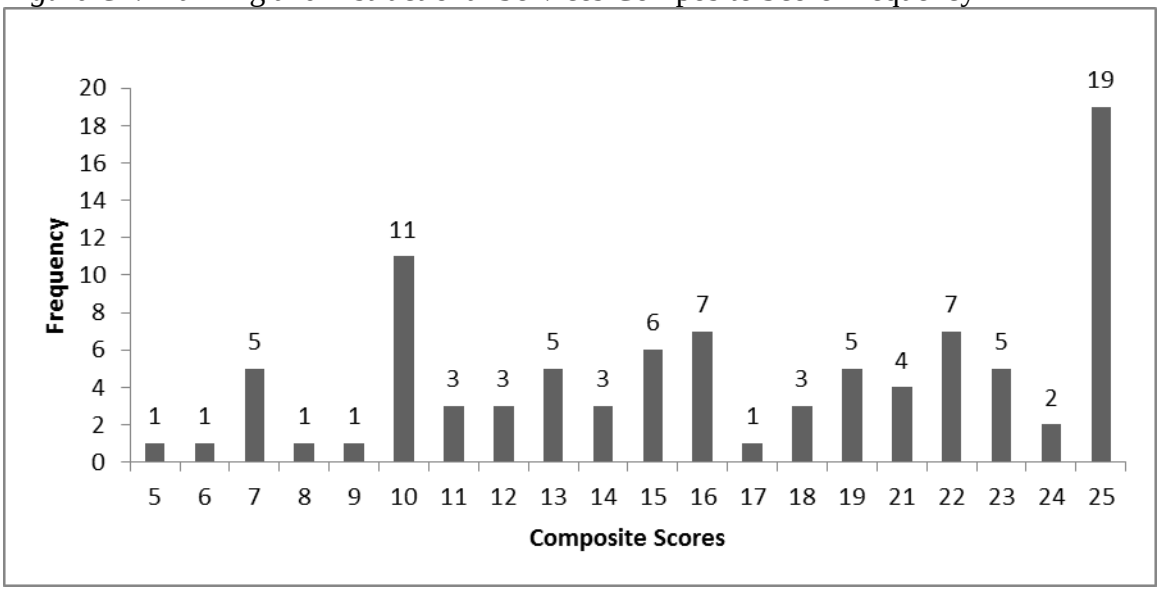
3 = Unknown, 6 = Strongly Disagree, 9 = Disagree, 12 = Agree, 15 = Strongly Agree

Figure C3. Leadership and Management Composite Score Frequency



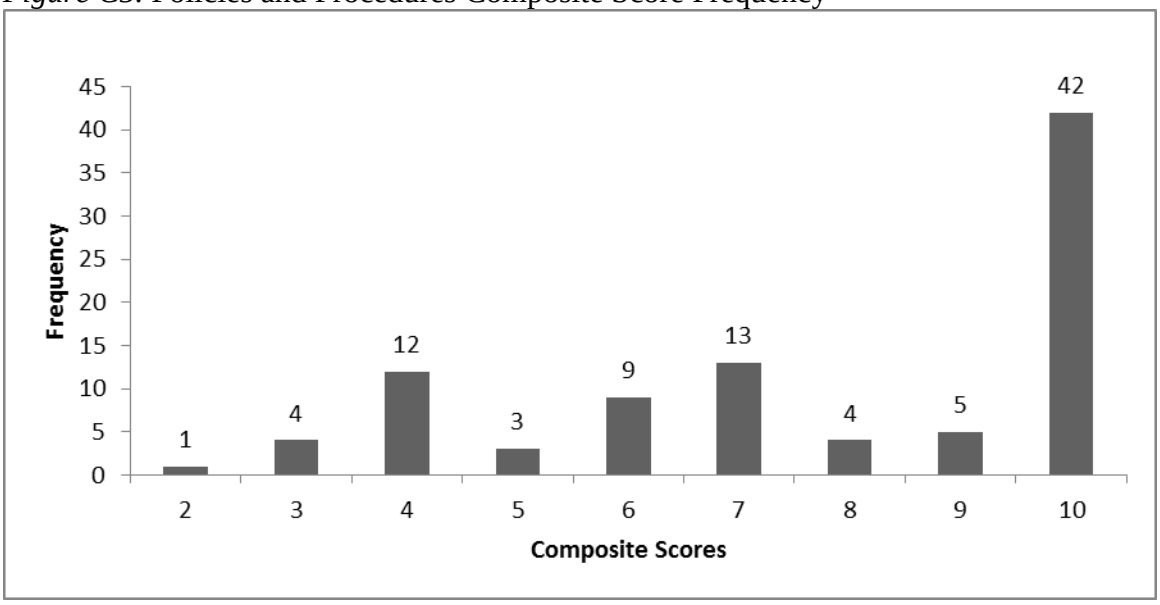
7 = Unknown, 14 = Strongly Disagree, 21 = Disagree, 28 = Agree, 35 = Strongly Agree

Figure C4. Planning and Instructional Services Composite Score Frequency



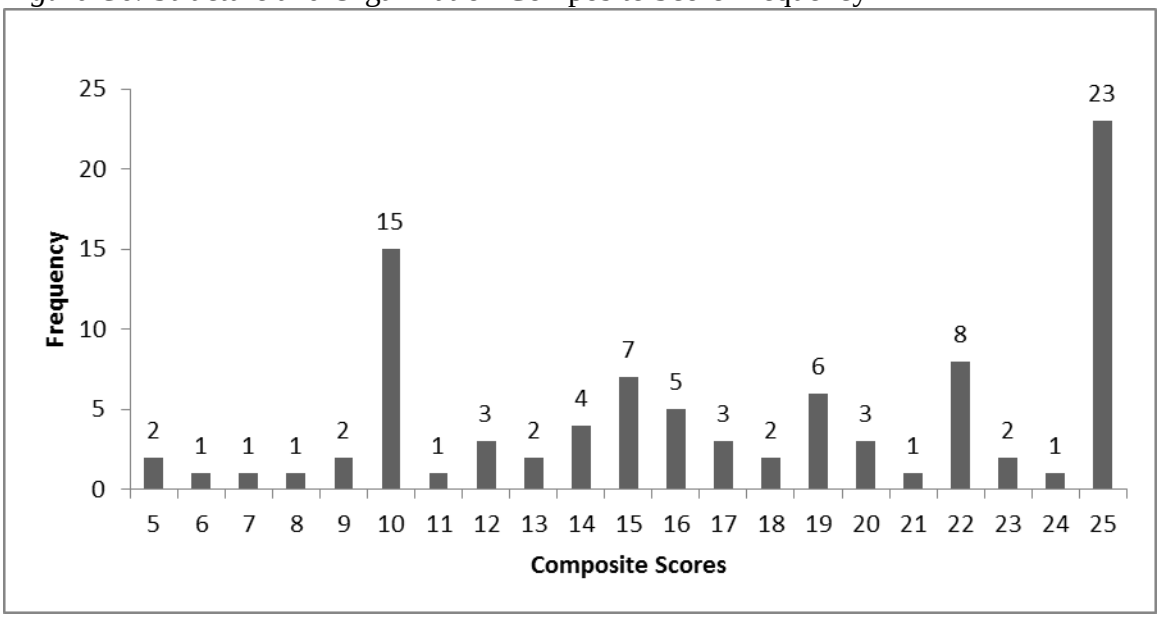
5 = Unknown, 10 = Strongly Disagree, 15 = Disagree, 20 = Agree, 25 = Strongly Agree

Figure C5. Policies and Procedures Composite Score Frequency



2 = Unknown, 4 = Strongly Disagree, 6 = Disagree, 8 = Agree, 10 = Strongly Agree

Figure C6. Structure and Organization Composite Score Frequency



5 = Unknown, 10 = Strongly Disagree, 15 = Disagree, 20 = Agree, 25 = Strongly Agree

Appendix D
Chi-Square and Cramer's V Results for Individual Questions - Fall 2011

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 51** The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	$x^2(8) = 17.874$, $p = .022$	$\varphi = 0.310$, $p = .022$
Leadership and Management	Question 52*** The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	$x^2(8) = 30.400$, $p < .001$	$\varphi = 0.404$, $p < .001$
Leadership and Management	Questions 53*** School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	$x^2(8) = 29.440$, $p < .001$	$\varphi = 0.398$, $p < .001$

*Eight cells (53.3%) have an expected cell frequencies less than five.
**Nine cells (60%) have an expected cell frequencies less than five.
***Ten cells (66.7%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 63* The school nurtures technology leadership capabilities across the organization.	$x^2(8) = 35.440$, $p < .001$	$\varphi = 0.437$, $p < .001$
Leadership and Management	Question 65*** The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	$x^2(8) = 26.173$, $p = .001$	$\varphi = 0.375$, $p = .001$
Planning and Instructional Services	Question 50** The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	$x^2(8) = 36.835$, $p < .001$	$\varphi = 0.445$, $p < .001$
Planning and Instructional Services	Question 56** Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	$x^2(8) = 30.036$, $p < .001$	$\varphi = 0.402$, $p < .001$

*Eight cells (53.3%) have an expected cell frequencies less than five.
**Nine cells (60%) have an expected cell frequencies less than five.
***Ten cells (66.7%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Planning and Instructional Services	Question 57** The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	$x^2(8)= 25.407$, $p = .001$	$\varphi = 0.370$, $p = .001$
Policies and Procedures	Question 55*** Adequate funds are allocated to support the new STEM Career Awareness Program.	$x^2(8) = 36.062$, $p < .001$	$\varphi = 0.440$, $p < .001$
Structure and Organization	Question 64*** The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	$x^2(8) = 27.178$, $p = .001$	$\varphi = 0.382$, $p = .001$
Structure and Organization	Question 68** The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	$x^2(8) = 23.860$, $p = .002$	$\varphi = 0.358$, $p = .002$

*Eight cells (53.3%) have an expected cell frequencies less than five.
**Nine cells (60%) have an expected cell frequencies less than five.
***Ten cells (66.7%) have an expected cell frequencies less than five.

Appendix E
Component Frequencies - Spring 2012

Figure E1. Community Partnership Response Frequency

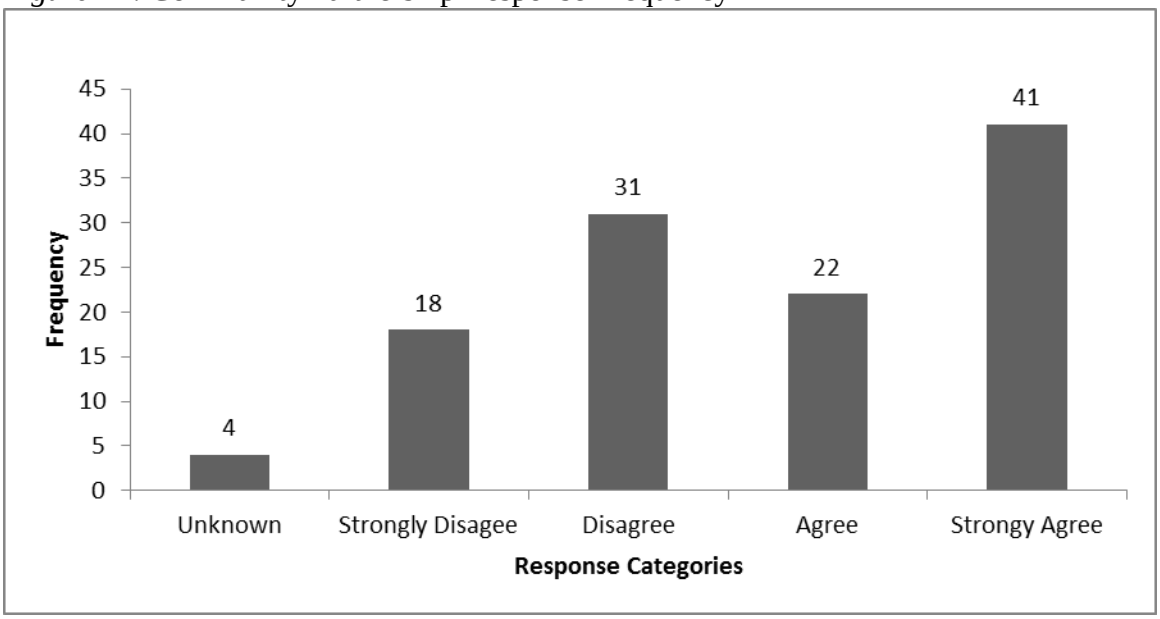
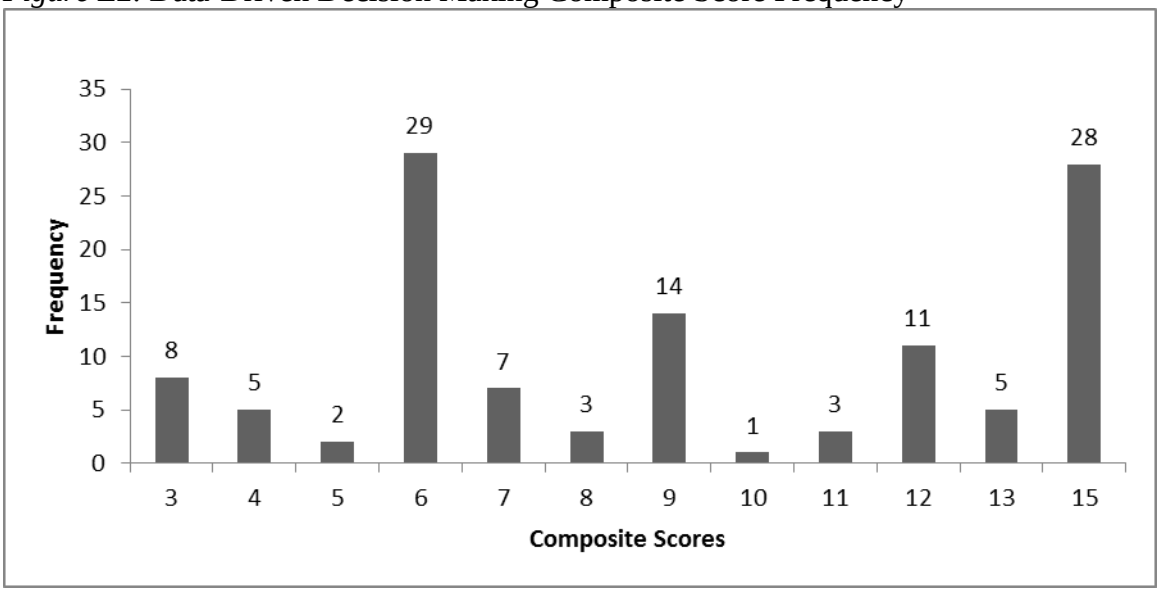
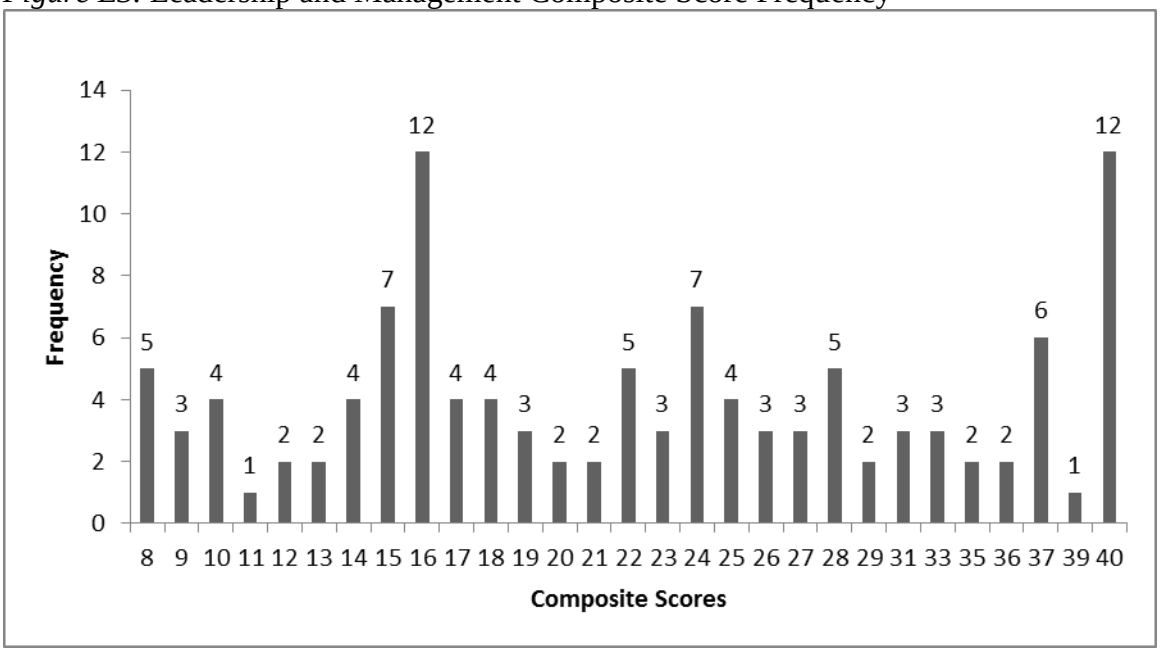


Figure E2. Data-Driven Decision Making Composite Score Frequency



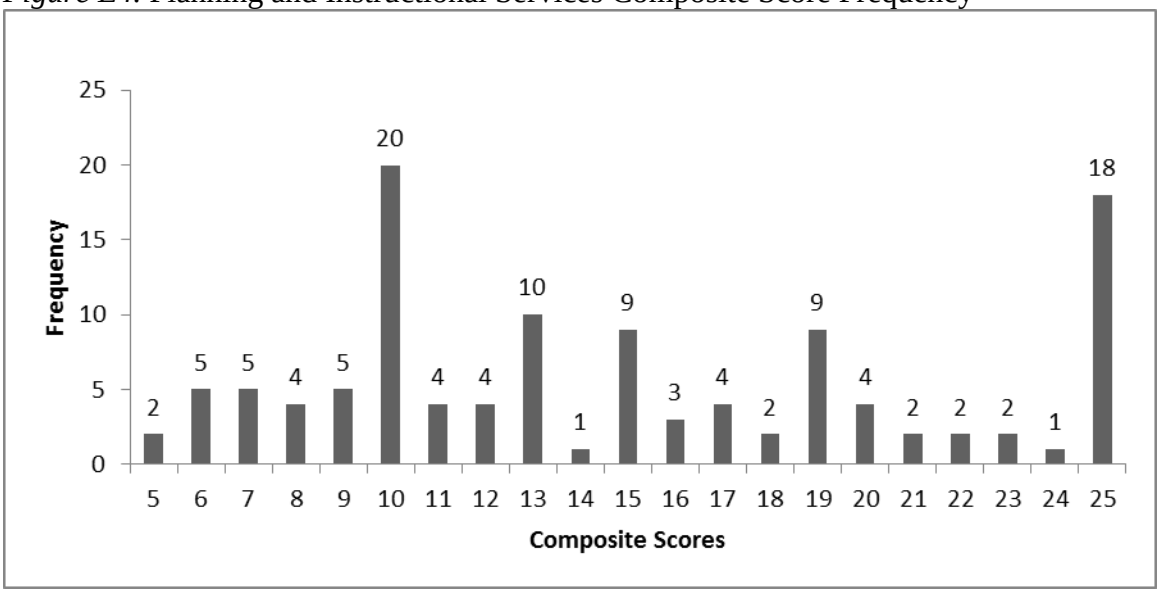
3 = Unknown, 6 = Strongly Disagree, 9 = Disagree, 12 = Agree, 15 = Strongly Agree

Figure E3. Leadership and Management Composite Score Frequency



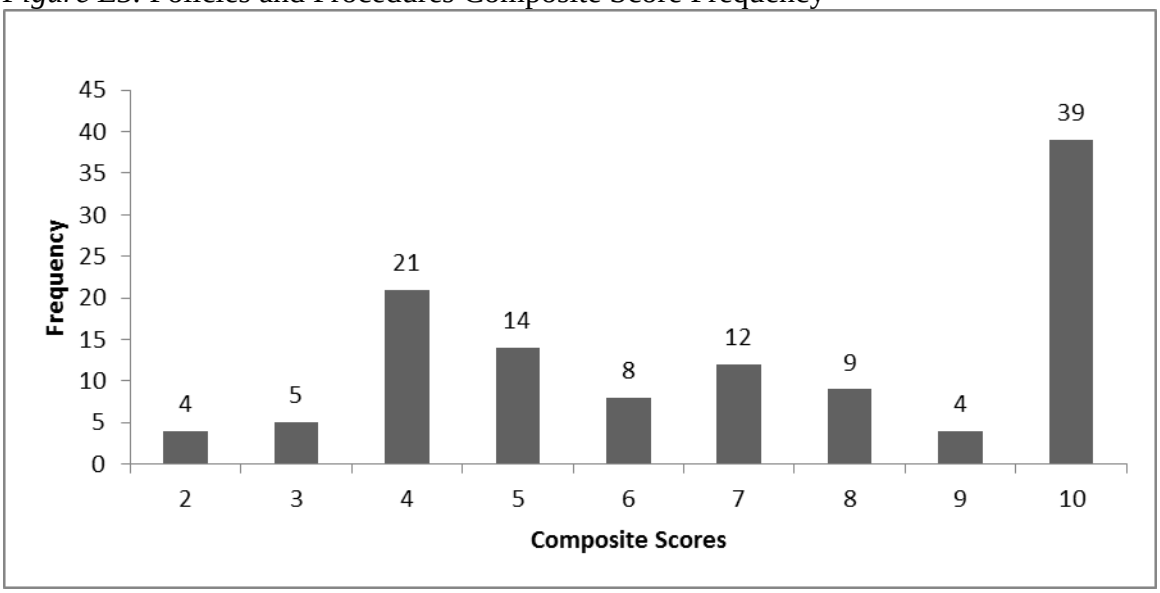
8 = Unknown, 16 = Strongly Disagree, 24 = Disagree, 32 = Agree, 40 = Strongly Agree

Figure E4. Planning and Instructional Services Composite Score Frequency



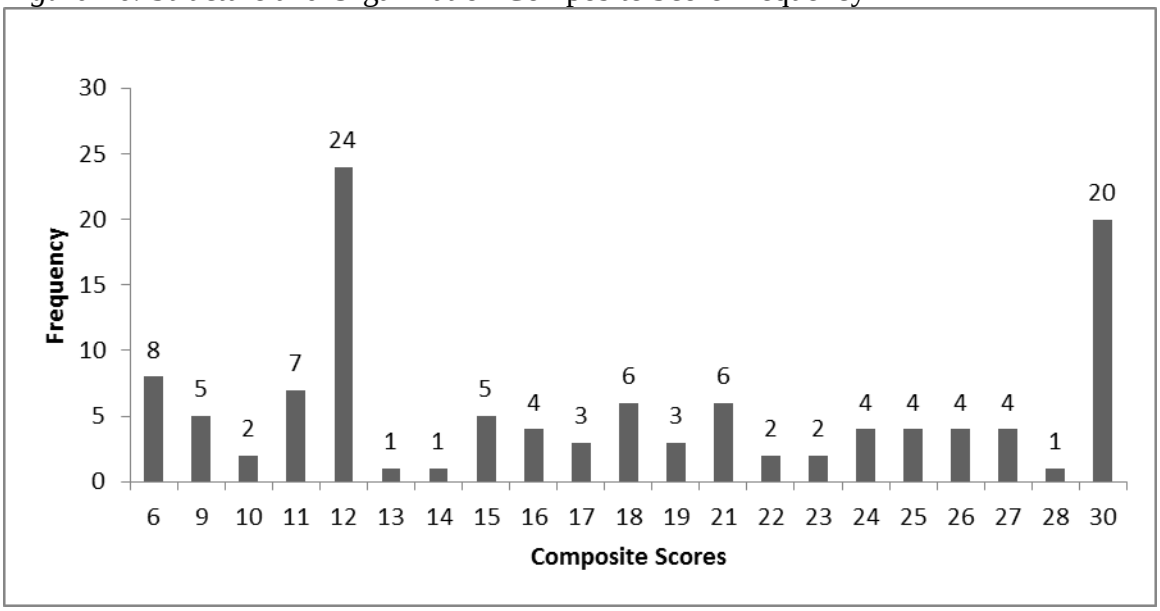
5 = Unknown, 10 = Strongly Disagree, 15 = Disagree, 20 = Agree, 25 = Strongly Agree

Figure E5. Policies and Procedures Composite Score Frequency



2 = Unknown, 4 = Strongly Disagree, 6 = Disagree, 8 = Agree, 10 = Strongly Agree

Figure E6. Structure and Organization Composite Score Frequency



6 = Unknown, 12 = Strongly Disagree, 18 = Disagree, 24 = Agree, 30 = Strongly Agree

Appendix F
Chi-Square and Cramer's V Results for Individual PCS Questions - Spring 2012

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Data-Driven Decision Making	Question 60** Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program	$x^2(8) = 20.139$, $p = .010$	$\varphi = 0.295$, $p = .010$
Data-Driven Decision Making	Question 61* The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	$x^2(8) = 29.796$, $p < .001$	$\varphi = 0.358$, $p < .001$
Data-Driven Decision Making	Question 62** The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	$x^2(8) = 29.448$, $p < .001$	$\varphi = 0.356$, $p < .001$
Leadership and Management	Question 51* The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the	$x^2(8) = 28.880$, $p < .001$	$\varphi = 0.353$, $p < .001$

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
	new STEM Career Awareness Program.		
Leadership and Management	Question 52* The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	x^2 (8) = XXX, $p < .001$	$\varphi = 0.349$, $p < .001$
Leadership and Management	Questions 53* School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	x^2 (8) = 19.220, $p = .014$	$\varphi = 0.288$, $p = .014$
Leadership and Management	Question 54*** School leaders are knowledgeable about the new STEM Career Awareness Program.	x^2 (8) = 25.365, $p = .001$	$\varphi = 0.331$, $p = .001$

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 58** The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	x^2 (8) = 21.248, p = .007	φ = 0.303, p = .007
Leadership and Management	Question 63*** The school nurtures technology leadership capabilities across the organization.	x^2 (8) = 35.680, p < .001	φ = 0.392, p < .001
Leadership and Management	Question 65** The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	x^2 (8) = 32.751, p < .001	φ = 0.376, p < .001
Leadership and Management	Question 70* Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	x^2 (8) = 34.445, p < .001	φ = 0.385, p < .001

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Planning and Instructional Services	Question 49* The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	x^2 (8) = 27.657, p = .001	φ = 0.345, p = .001
Planning and Instructional Services	Question 50* The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	x^2 (8) = 23.457, p = .003	φ = 0.318, p = .003
Planning and Instructional Services	Question 56*** Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	x^2 (8) = 31.148, p < .001	φ = 0.366, p < .001
Planning and Instructional Services	Question 57* The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	x^2 (8) = 22.979, p = .003	φ = 0.315, p = .003

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Planning and Instructional Services	Question 69** The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	x^2 (8) = 31.316, $p < .001$	$\varphi = 0.367$, $p < .001$
Policies and Procedures	Question 55** Adequate funds are allocated to support the new STEM Career Awareness Program.	x^2 (8) = 32.251, $p < .001$	$\varphi = 0.373$, $p < .001$
Policies and Procedures	Question 59*** Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	x^2 (8) = 29.191, $p < .001$	$\varphi = 0.355$, $p < .001$
Structure and Organization	Question 64*** The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	x^2 (8) = 34.017, $p < .001$	$\varphi = 0.383$, $p < .001$

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Structure and Organization	Question 66* The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	x^2 (8) = 35.844, $p < .001$	$\varphi = 0.393$, $p < .001$
Structure and Organization	Question 67* The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program	x^2 (8) = 35.954, $p < .001$	$\varphi = 0.394$, $p < .001$
Structure and Organization	Question 68** The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	x^2 (8) = 33.563, $p < .001$	$\varphi = 0.380$, $p < .001$

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Structure and Organization	Question 71*** School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	x^2 (8) = 34.408, p < .001	φ = 0.385, p < .001
Structure and Organization	Question 72*** School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program.	x^2 (8) = 26.762, p = .001	φ = 0.340, p = .001

*Seven cells (46.7%) have an expected cell frequencies less than five.
**Eight cells (53.3%) have an expected cell frequencies less than five.
***Nine cells (66.0%) have an expected cell frequencies less than five.

Appendix G
Component Frequencies - Fall 2012

Figure G1. Community Partnership Response Frequency

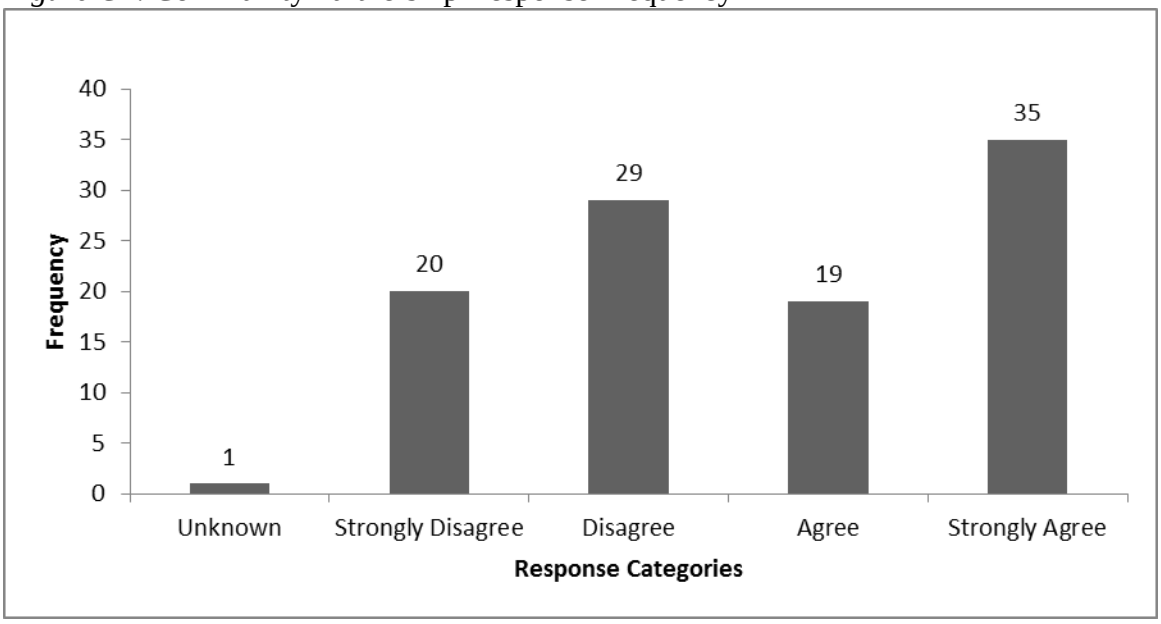
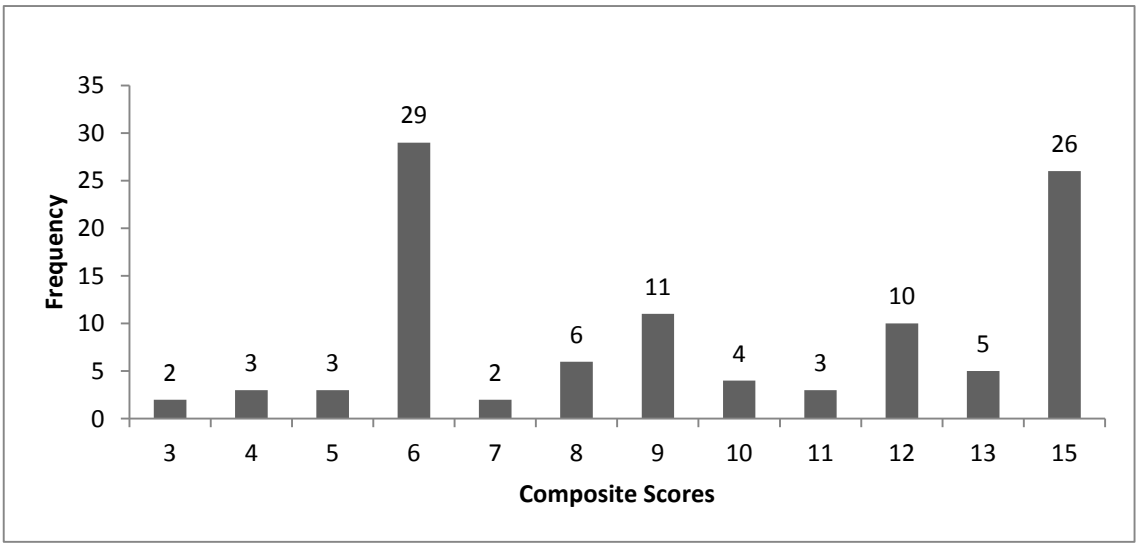
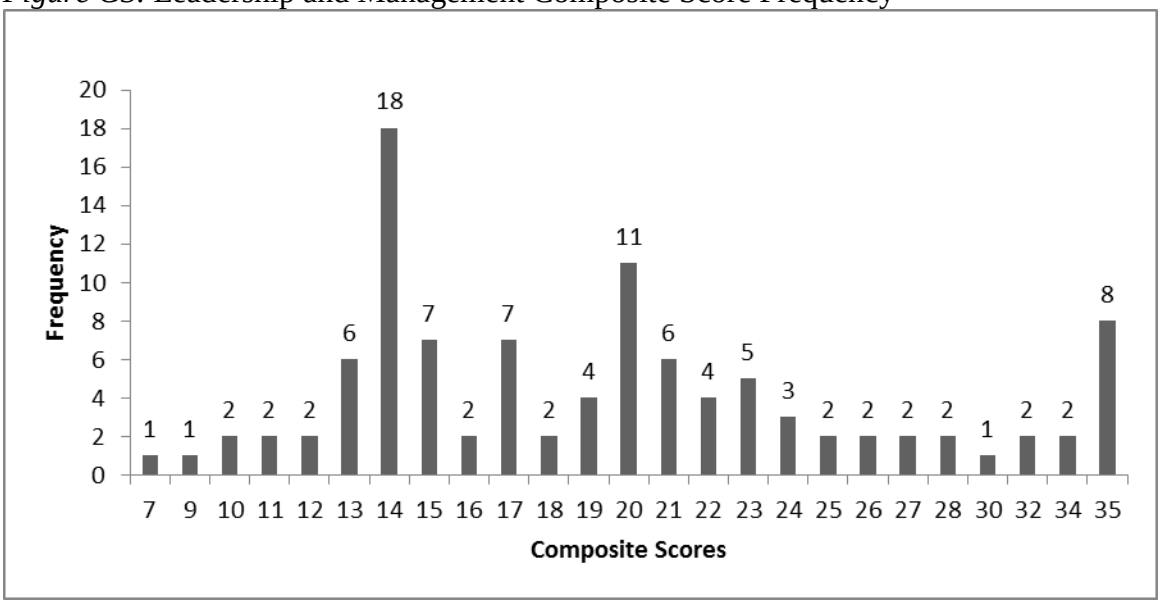


Figure G2. Data-Driven Decision Making Composite Score Frequency



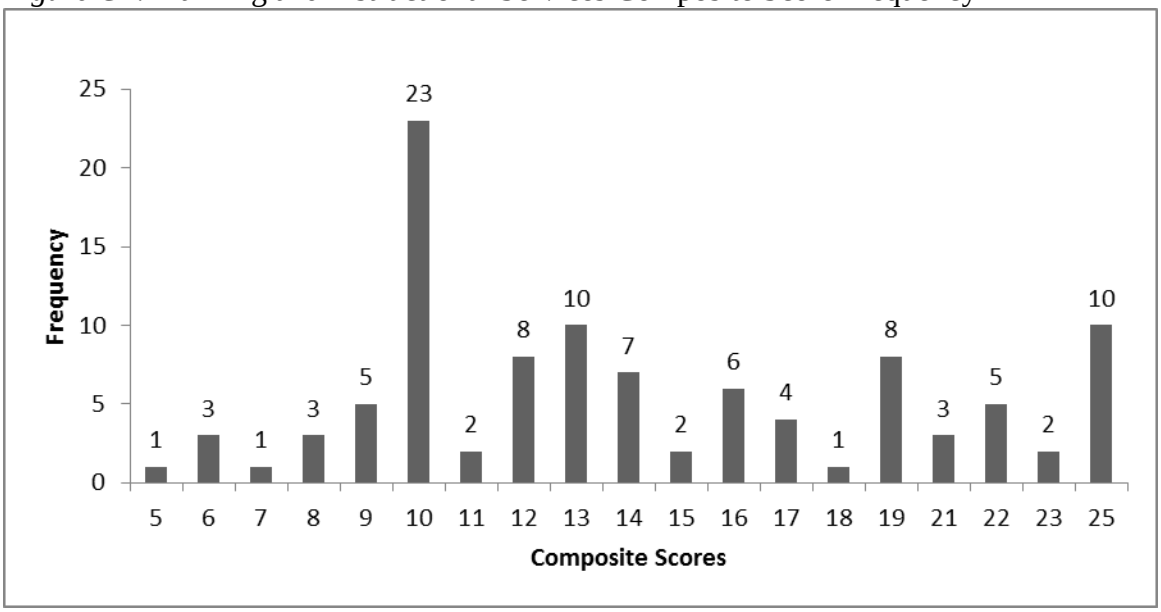
3 = Unknown, 6 = Strongly Disagree, 9 = Disagree, 12 = Agree, 15 = Strongly Agree

Figure G3. Leadership and Management Composite Score Frequency



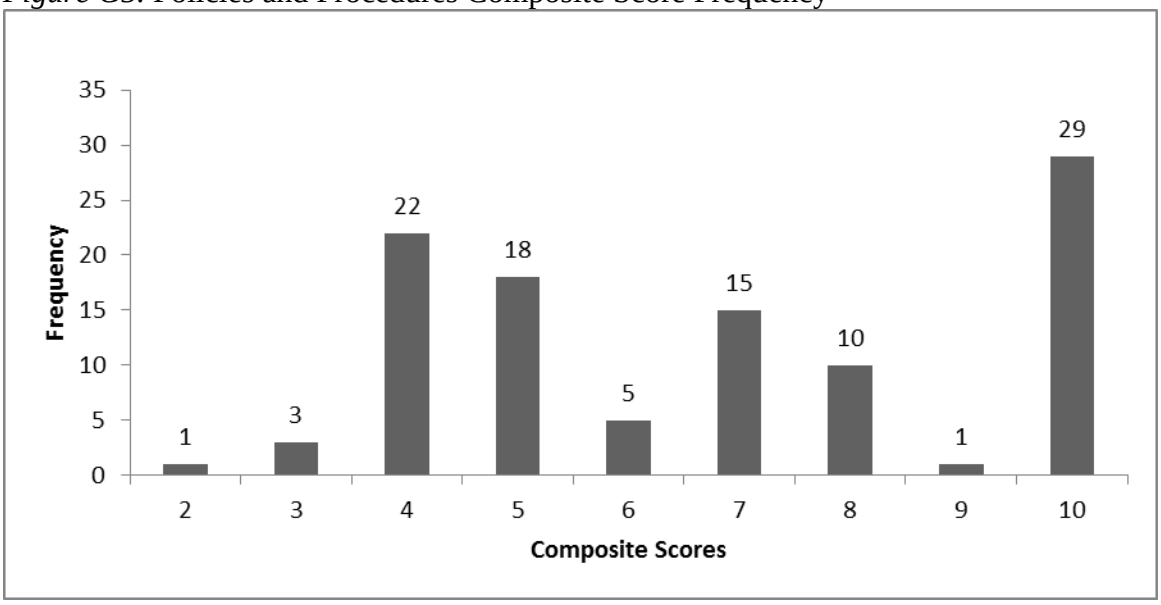
7 = Unknown, 14 = Strongly Disagree, 21 = Disagree, 28 = Agree, 35 = Strongly Agree

Figure G4. Planning and Instructional Services Composite Score Frequency



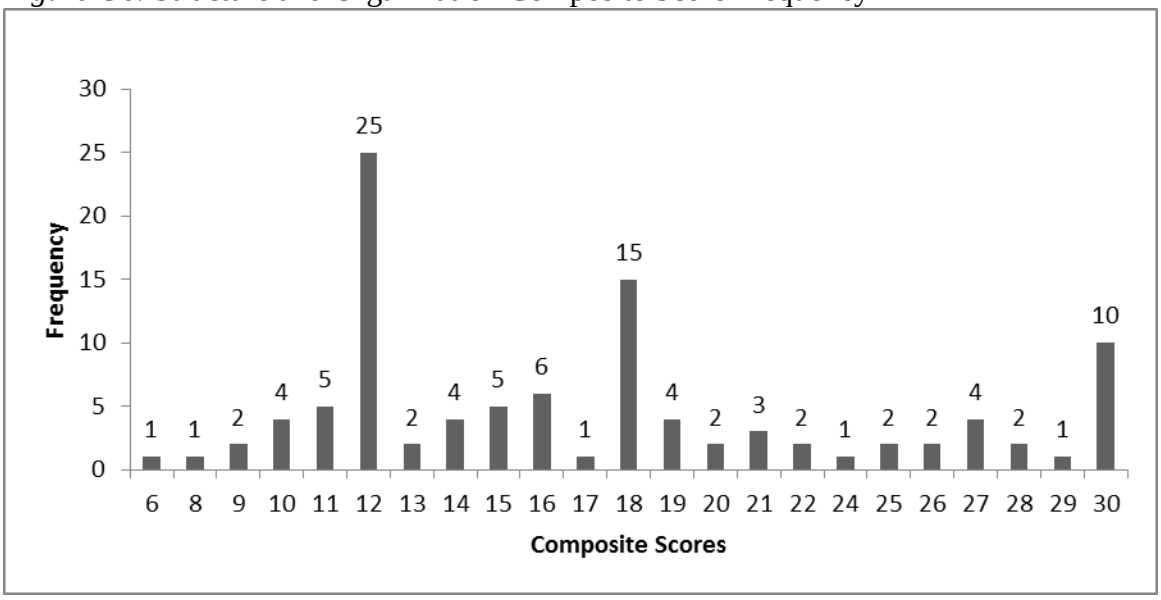
5 = Unknown, 10 = Strongly Disagree, 15 = Disagree, 20 = Agree, 25 = Strongly Agree

Figure G5. Policies and Procedures Composite Score Frequency



2 = Unknown, 4 = Strongly Disagree, 6 = Disagree, 8 = Agree, 10 = Strongly Agree

Figure G6. Structure and Organization Composite Score Frequency



6 = Unknown, 12 = Strongly Disagree, 18 = Disagree, 24 = Agree, 30 = Strongly Agree

Appendix H
Chi-Square and Cramer's V Results for Individual Questions - Fall 2012

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Data-Driven Decision Making	Question 60***** Staff roles are well defined in our school with set performance standards in the new STEM Career Awareness Program	x^2 (4) = 13.672, p = .008	φ = 0.363, p = .008
Leadership and Management	Question 51***** The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	x^2 (4) = 20.511, p < .001	φ = 0.444, p < .001
Leadership and Management	Question 52**** The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	x^2 (4) = 23.477, p < .001	φ = 0.475, p < .001

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Questions 53**** School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	x^2 (4) = 25.453, $p < .001$	$\varphi = 0.495$, $p < .001$
Leadership and Management	Question 54** School leaders are knowledgeable about the new STEM Career Awareness Program.	x^2 (4) = 20.599, $p < .001$	$\varphi = 0.445$, $p < .001$
Leadership and Management	Question 63*** The school nurtures technology leadership capabilities across the organization.	x^2 (3) = 20.944, $p < .001$	$\varphi = 0.449$, $p < .001$
Leadership and Management	Question 65* The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	x^2 (3) = 27.295, $p < .001$	$\varphi = 0.512$, $p < .001$

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 70* Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	x^2 (3) = 15.376, p = .002	φ = 0.385, p = .002
Planning and Instructional Services	Question 49**** The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	x^2 (4) = 18.446, p = .001	φ = 0.421, p = .001
Planning and Instructional Services	Question 50**** The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	x^2 (4) = 17.446, p = .002	φ = 0.410, p = .002
Planning and Instructional Services	Question 56**** Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	x^2 (4) = 15.277, p = .004	φ = 0.383, p = .004

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Planning and Instructional Services	Question 57***** The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	x^2 (4) = 22.908, p < .001	φ = 0.469, p < .001
Planning and Instructional Services	Question 69* The school solicits feedback from stakeholders concerning real and perceived barriers to success in the new STEM Career Awareness Program.	x^2 (3) = 18.199, p < .001	φ = 0.418, p < .001
Policies and Procedures	Question 55****** Adequate funds are allocated to support the new STEM Career Awareness Program.	x^2 (4) = 10.709, p = .030	φ = 0.321, p = .030
Policies and Procedures	Question 59**** Teachers are evaluated specifically on their success with the goals of the new	x^2 (4) = 10.603, p = .031	φ = 0.319, p = .031

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
	STEM Career Awareness Program.		
Structure and Organization	Question 64**** The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	x^2 (4) = 24.102, $p < .001$	$\varphi = 0.481$, $p < .001$
Structure and Organization	Question 66**** The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	x^2 (4) = 20.412, $p < .001$	$\varphi = 0.443$, $p < .001$
Structure and Organization	Question 67***** The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program	x^2 (4) = 20.284, $p < .001$	$\varphi = 0.442$, $p < .001$

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Structure and Organization	Question 68**** The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	x^2 (4) = 34.562, $p < .001$	$\varphi = 0.576$, $p < .001$
Structure and Organization	Question 71*** School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	x^2 (3) = 20.969, $p < .001$	$\varphi = 0.449$, $p < .001$
Structure and Organization	Question 72***** School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	x^2 (4) = 19.207, $p < .001$	$\varphi = 0.430$, $p < .001$

*Two cells (25.0%) have an expected cell frequencies less than five.
**Three cells (30.0%) have an expected cell frequencies less than five.
***Three cells (37.5%) have an expected cell frequencies less than five.
****Four cells (40.0%) have an expected cell frequencies less than five.
*****Five cells (50%) have an expected cell frequencies less than five.
******Six cells (60.0%) have an expected cell frequencies less than five.

Appendix I
Component Frequencies - Spring 2013

Figure I1. Community Partnership Response Frequency

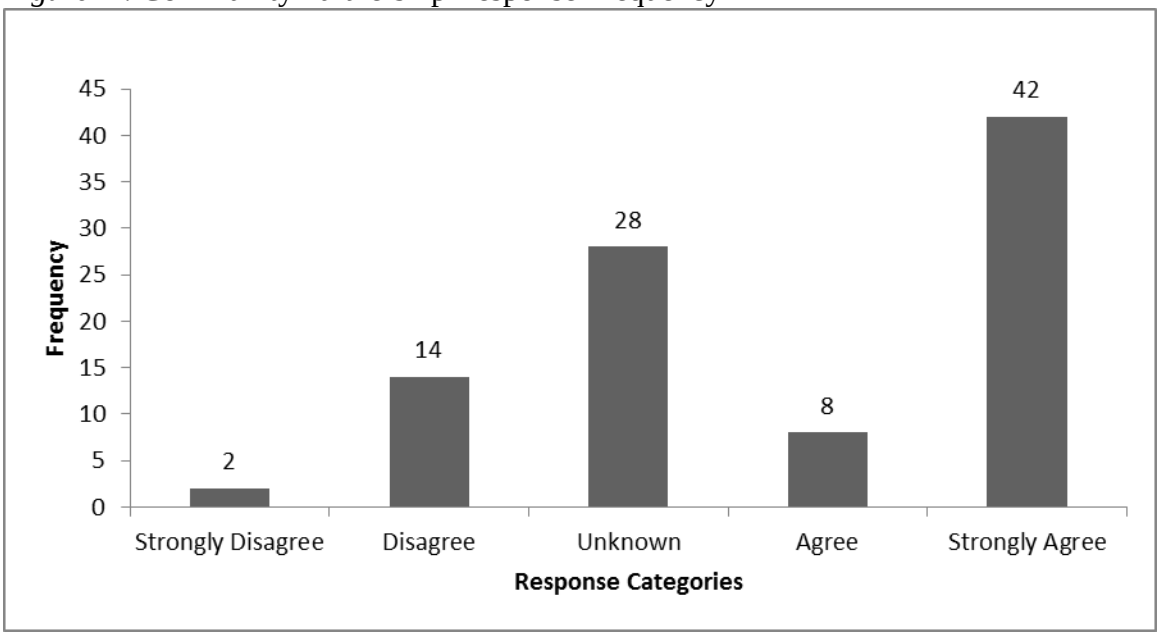
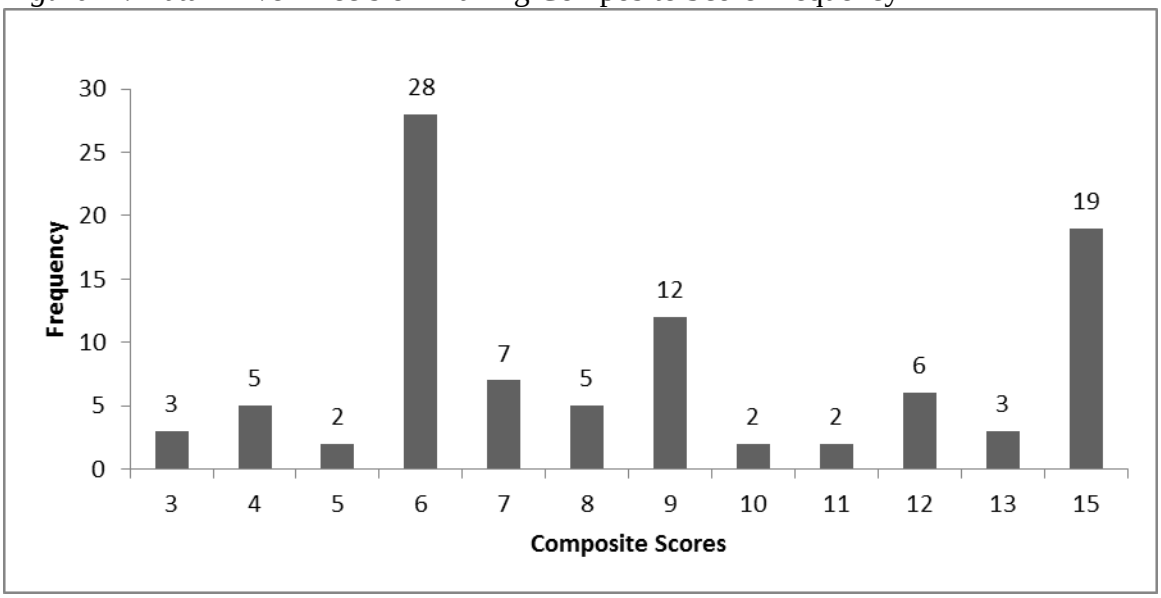
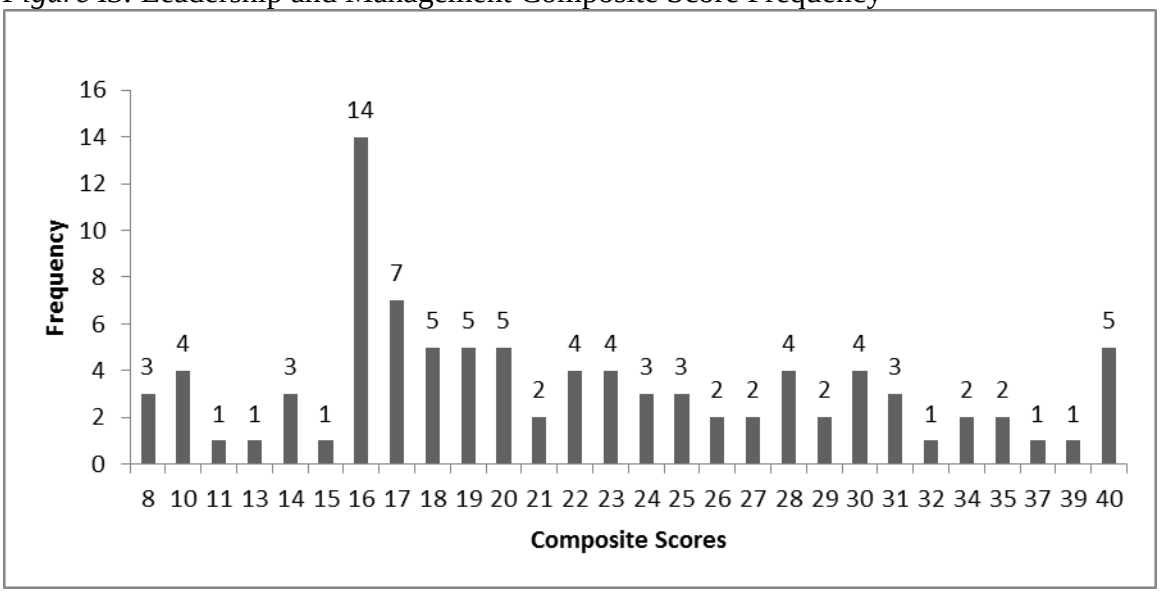


Figure I2. Data-Driven Decision Making Composite Score Frequency



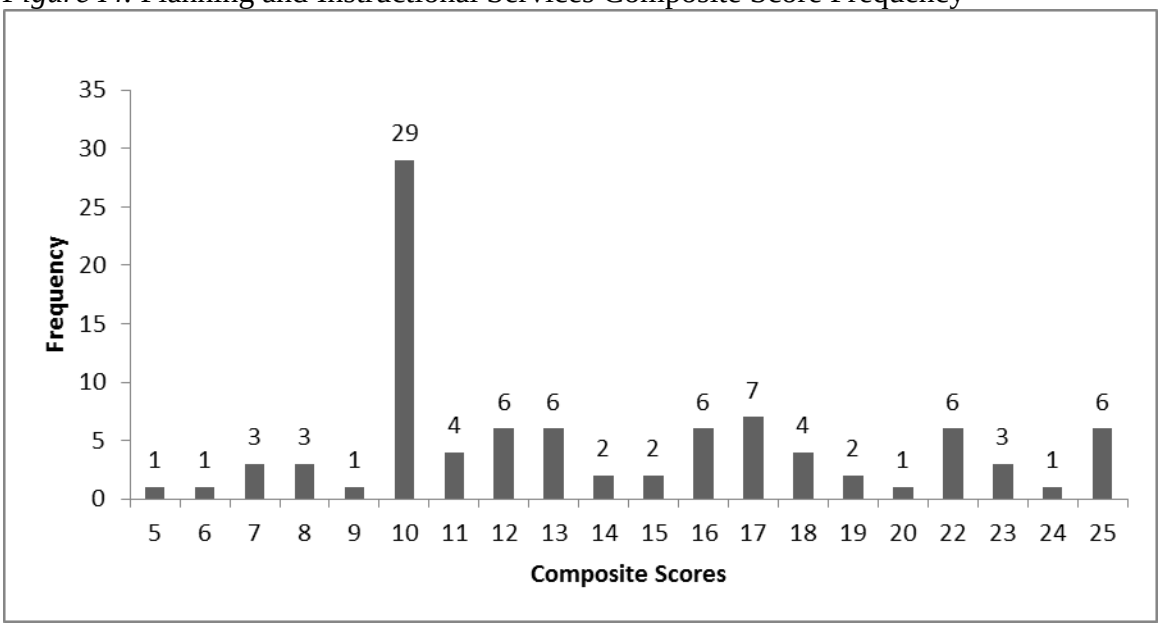
3 = Unknown, 6 = Strongly Disagree, 9 = Disagree, 12 = Agree, 15 = Strongly Agree

Figure I3. Leadership and Management Composite Score Frequency



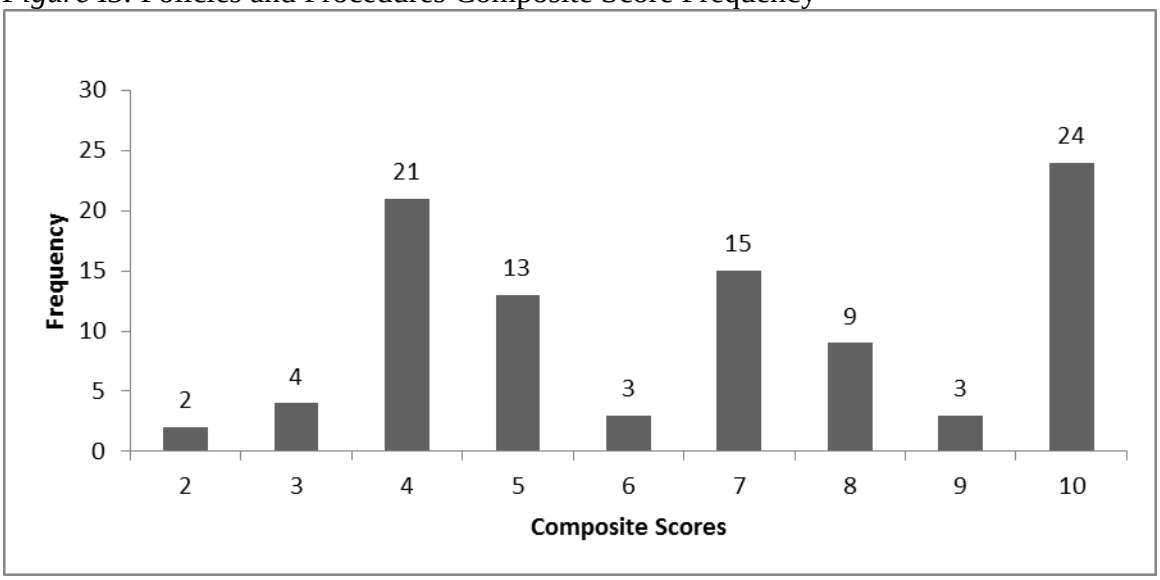
8 = Unknown, 16 = Strongly Disagree, 24 = Disagree, 32 = Agree, 40 = Strongly Agree

Figure I4. Planning and Instructional Services Composite Score Frequency



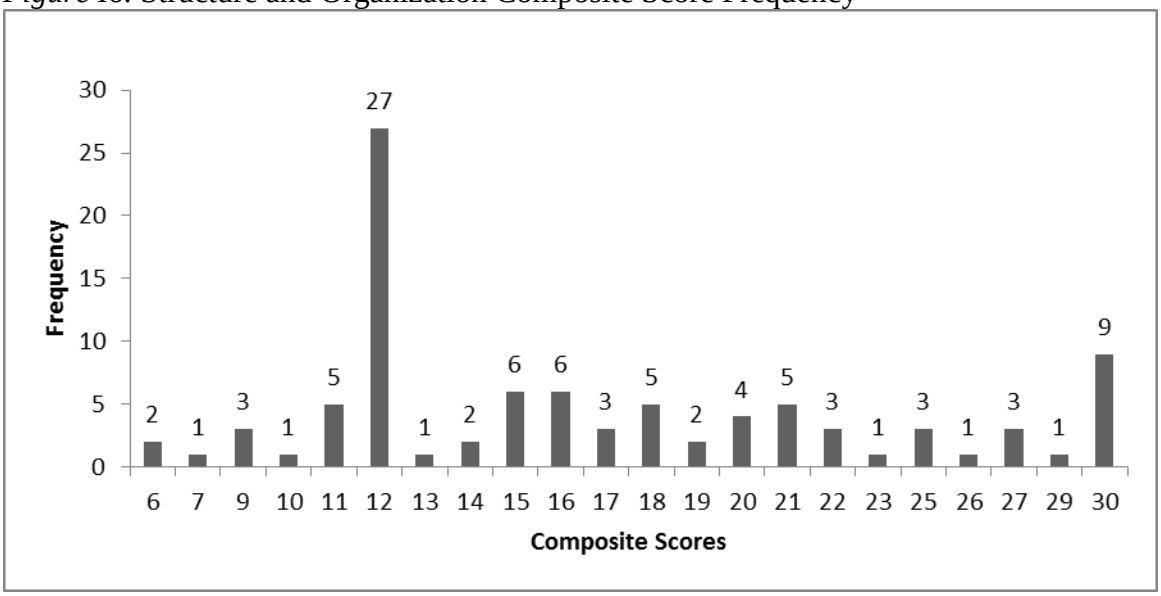
5 = Unknown, 10 = Strongly Disagree, 15 = Disagree, 20 = Agree, 25 = Strongly Agree

Figure I5. Policies and Procedures Composite Score Frequency



2 = Unknown, 4 = Strongly Disagree, 6 = Disagree, 8 = Agree, 10 = Strongly Agree

Figure I6. Structure and Organization Composite Score Frequency



6 = Unknown, 12 = Strongly Disagree, 18 = Disagree, 24 = Agree, 30 = Strongly Agree

Appendix J
Chi-Square and Cramer's V Results for Individual Questions - Spring 2013

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Data-Driven Decision Making	Question 61**** The school requires periodic monitoring and reporting of program effectiveness of the new STEM Career Awareness Program	x^2 (8) = 18.369, p = .019	φ = 0.313, p = .019
Data-Driven Decision Making	Question 62* The school requires the new STEM Career Awareness Program to have measurable goals based on identified data sources.	x^2 (6) =18.862, p = .004	φ = 0.317, p = .004
Leadership and Management	Question 51*** The school provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program.	x^2 (8) = 22.966, p = .003	φ = 0.350, p = .003

* Six cells (50.0%) have an expected cell frequencies less than five.
** Seven cells (58.3%) have an expected cell frequencies less than five.
*** Eight cells (53.3 %) have an expected cell frequencies less than five.
**** Nine (60.0%) have an expected cell frequencies less than five.
***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 52**** The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program.	x^2 (8) = 32.271, $p < .001$	$\varphi = 0.414$, $p < .001$
Leadership and Management	Questions 53**** School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program.	x^2 (8) = 19.183, $p = .014$	$\varphi = 0.319$, $p = .014$
Leadership and Management	Question 54***** School leaders are knowledgeable about the new STEM Career Awareness Program.	x^2 (8) = 17.982, $p = .021$	$\varphi = 0.309$, $p = .021$
Leadership and Management	Question 58***** The Principal regularly conducts teacher evaluation to monitor progress on goals specifically targeted in the new STEM Career Awareness Program.	x^2 (8) = 17.481, $p = .025$	$\varphi = 0.305$, $p = .025$

* Six cells (50.0%) have an expected cell frequencies less than five.
** Seven cells (58.3%) have an expected cell frequencies less than five.
*** Eight cells (53.3 %) have an expected cell frequencies less than five.
**** Nine (60.0%) have an expected cell frequencies less than five.
***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Leadership and Management	Question 63** The school nurtures technology leadership capabilities across the organization.	x^2 (6) = 28.816, $p < .001$	$\varphi = 0.392$, $p < .001$
Leadership and Management	Question 65**** The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program.	x^2 (8) = 22.420, $p = .004$	$\varphi = 0.345$, $p = .004$
Leadership and Management	Question 70*** Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	x^2 (8) = 17.775, $p = .023$	$\varphi = 0.307$, $p = .023$
Planning and Instructional Services	Question 49**** The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	x^2 (8) = 16.509, $p = .036$	$\varphi = 0.298$, $p = .036$

* Six cells (50.0%) have an expected cell frequencies less than five.
** Seven cells (58.3%) have an expected cell frequencies less than five.
*** Eight cells (53.3 %) have an expected cell frequencies less than five.
**** Nine (60.0%) have an expected cell frequencies less than five.
***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Planning and Instructional Services	Question 50*** The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program.	x^2 (8) = 26.039, p = .001	φ = 0.372, p = .001
Planning and Instructional Services	Question 56* Student success, not just test scores, is the top priority in the new STEM Career Awareness Program.	x^2 (6) = 43.573, p < .001	φ = 0.481, p < .001
Planning and Instructional Services	Question 57***** The school supports reward, consequences and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program.	x^2 (8) = 30.134, p < .001	φ = 0.400, p < .001
Policies and Procedures	Question 55****** Adequate funds are allocated to support the new STEM Career Awareness Program.	x^2 (8) = 45.319, p < .001	φ = 0.491, p < .001

* Six cells (50.0%) have an expected cell frequencies less than five.
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*** Eight cells (53.3 %) have an expected cell frequencies less than five.
**** Nine (60.0%) have an expected cell frequencies less than five.
***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
Policies and Procedures	Question 59**** Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	x^2 (8) = 21.000, p = .007	φ = 0.334, p = .007
Structure and Organization	Question 64* The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program.	x^2 (6) = 29.193, p < .001	φ = 0.394, p < .001
Structure and Organization	Question 66*** The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	x^2 (6) = 16.176, p = .040	φ = 0.293, p = .040
Structure and Organization	Question 67**** The school organizes opportunities for faculty to interact with educators outside of the school concerning the	x^2 (8) = 28.686, p < .001	φ = 0.391, p < .001

* Six cells (50.0%) have an expected cell frequencies less than five.
** Seven cells (58.3%) have an expected cell frequencies less than five.
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***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Components of Effective Organizations	STEM Career Awareness Program PCS Questions	Chi-Square	Cramer's V
	new STEM Career Awareness Program		
Structure and Organization	Question 68***** The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program.	x^2 (8) = 26.710, p = .001	φ = 0.377, p = .001
Structure and Organization	Question 71**** School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	x^2 (8) = 31.196, p < .001	φ = 0.407, p < .001
Structure and Organization	Question 72***** School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program	x^2 (8) = 15.833, p = .045	φ = 0.290, p = .045

* Six cells (50.0%) have an expected cell frequencies less than five.
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***** Ten (66.7%) have an expected cell frequencies less than five.
****** Eleven (73.3%) have an expected cell frequencies less than five.

Appendix K
Statistically Significant Questions Spanning Collection Periods

Table K1

Statistically Significant Questions Spanning All Four Collection Periods

Question Summary	Cramer's V			
	Year Two		Year Three	
	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Leadership and Management				
Question 51 "School provides a structure (common time and place) to support teacher collaborations aimed at improving student learning using the new STEM Career Awareness Program."	.310***	.353*	.444*	.350**
Question 52 "The school engages faculty and staff in decision-making regarding the new STEM Career Awareness Program."	.404*	.349*	.475*	.414*
Question 53 "School staffing policies and practices guide schools in selecting new personnel who will support and further the new STEM Career Awareness Program."	.398*	.288***	.495*	.319***
Question 63 "The school nurtures technology leadership capabilities across the organization."	.437*	.392*	.449*	.392*
Question 65 "The school promotes change through dialogue and collaboration rather than through directives in the new STEM Career Awareness Program."	.375*	.376*	.512*	.345**

Question Summary	Cramer's V			
	Year Two		Year Three	
	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Planning and Instructional Services				
Question 50 "The school encourages open discussion of problems and issues among staff concerning the STEM Career Awareness Program."	.445*	.318**	.410**	.372*
Question 56 "Student success, not just test scores, is the top priority in the new STEM Career Awareness Program."	.402*	.366*	.383**	.481*
Question 57 "The school supports reward, consequences, and, recognition systems to encourage high level of staff and student achievement in the new STEM Career Awareness Program."	.370*	.315**	.469*	.400*
Policies and Procedures				
Question 55 "Adequate funds are allocated to support the new STEM Career Awareness Program.	.440*	.373*	.321***	.491*
Structure and Organization				
Question 64 "The school encourages problem-solving that involves risk-taking in the new STEM Career Awareness Program."	.382*	.383*	.481*	.394*

Question Summary	Cramer's V			
	Year Two		Year Three	
	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Question 68 "The school allows you time and opportunity for your own creative thinking about the new STEM Career Awareness Program."	.358**	.380*	.576*	.377*

* ≤ .001 ** < .005 *** < .05

Table K2

Statistically Significant Questions Spanning the Last Three Collection Periods

Question Summary	Cramer's V		
	Year Two	Year Three	
	Spring 2012	Fall 2012	Spring 2013
Leadership and Management			
Question 54 School leaders are knowledgeable about the new STEM Career Awareness Program.	.331*	.445*	.309**
Question 70 Leaders set meeting agendas provide opportunities for meaningful discussion about the new STEM Career Awareness Program.	.385*	.449*	.307**
Planning and Instructional Services			
Question 49 The school solicits and is responsive to feedback from stakeholders concerning the STEM Career Awareness Program.	.345*	.421*	.296**

Question Summary	Cramer's V		
	Year Two	Year Three	
	Spring 2012	Fall 2012	Spring 2013
Policies and Procedures			
Question 59 Teachers are evaluated specifically on their success with the goals of the new STEM Career Awareness Program.	.355*	.319**	.334**
Structure and Organization			
Question 66 The school [sic] encourages schools to structure staff time and available resources to support brainstorming and creative problem-solving for the new STEM Career Awareness Program.	.393*	.443*	.293**
Question 67 The school organizes opportunities for faculty to interact with educators outside of the school concerning the new STEM Career Awareness Program.	.394*	.442*	.391*
Question 71 School plans are flexible enough to allow leaders to move in unforeseen directions in response to unexpected events in the new STEM Career Awareness Program.	.385*	.449*	.407*
Question 72 School communication patterns keep stakeholders informed in advance of issues and events allowing time to plan creative solutions in the new STEM Career Awareness Program.	.340*	.430*	.290**

* ≤ .001 ** < .05