AN INVESTIGATION OF IMPROVEMENT SCIENCE AS A STATE EDUCATION AGENCY'S FRAMEWORK FOR LOCAL SCHOOL DISTRICT SUPPORT

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Abstract

The purpose of this qualitative study was to analyze a modified grounded theory and determine how one school district engaged with a state education agency to do improvement science work. A case study research design and phenomenological research approach gathered participant perspectives. The theoretical framework was the Model for Improvement, and the conceptual framework was the CORE Support Framework. Credibility was achieved through triangulation of surveys, interviews, and focus group meetings. District-stored journal entries and artifacts provided a richer context for transferability. The participants included one director of schools, two school supervisors, one principal, one assistant principal, and eight classroom teachers. Data were collected and analyzed through open coding, axial coding, and selective coding. Selective coding suggested school districts partnering with state education agencies to do improvement science work require access to and openness for support, foster a caring culture of vulnerability and transparency, and provide the necessary structures to support growth and improvement. Similarly, data revealed the supports provided by the state academic consultant fostered a systematic process for engagement in the work, targeted learning and tools aligned to district needs, and cultivated a culture of high-quality, standards-aligned instruction. The study findings were corroborated through member checks, and a peer debriefer was used for confirmability. Study findings were compared against existing literature and alignments made to the theoretical and conceptual frameworks. Implications for the study suggested the use of improvement science as a model for school district support as a promising practice. Other topics for future research on improvement science as a framework for school district support were recommended.

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Dedication

I dedicate this study to my son Jackson. Thank you for believing in Mommy and helping her achieve her dreams! I also dedicate this study to all the little girls out there that might be living in difficult situations. Know the only thing that can hold you back is your lack of faith in God and your lack of faith in yourself. Dream big, work hard, and never give up!

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Table of Contents

Figures and Tables

Figures

Tables

Chapter One: Introduction

In the words of Benjamin Franklin, “Without continual growth and progress, such words as improvement, achievement, and success have no meaning.” In general, improvement means to enhance, upgrade, progress, expand, enrich, or perfect. More specifically, through the lens of improvement science, to improve means a change for the better. Improvement can be seen in all aspects of the world, and whether it be for practical purposes or a matter of survival, humans have been drawn to the concept. However, the act of scientifically grounded improvement does not happen by chance alone. Scientific research must be systematic, systematically planned before execution, systematically carried out during implementation, and systematically analyzed and interpreted upon completion (Çaparlar & Dönmez, 2016). Likewise, improvement research must be systematic, drawing on a range of disciplines to utilize and build knowledge (THIS Institute, 2019).

The field of improvement science provides both researchers and practitioners with the necessary framework for research-focused improvements (ISRN, 2010). Although there are some similarities across fields of study, the conceptual framework of improvement science allows numerous disciplines access to improvement strategies, which work best in complex adaptive systems (ISRN, 2010). Overall, the goal of improvement science is to base efforts of quality improvement as much on evidence as on the best practices being implemented (Shojania & Grimshaw, 2005). Further, the science of improvement is characterized by problem-solving centered on continuous inquiry and learning, where change ideas are systematically tested to inform system improvements (IES, 2017). Overall, the field of improvement science can be described as a specific approach for continual improvement to organizational systems (IES, 2017).

Educational improvement efforts, such as Back to Basics, A Nation at Risk, No Child Left Behind, Race to the Top, and Every Student Succeeds, have been pushing American schools for success since the 1970s (Strauss, 2018; Tennessee Succeeds, 2015). However, as Dr. Don Berwick, founder of the Institute for Healthcare Improvement (IHI), noted, "every system is perfectly designed to achieve exactly the results it gets" (Donahue, 2015, para. 4). Consequently, sweeping, large-scale reforms often fall short for the most vulnerable schools (Straus, 2018). As students across the nation continue to grasp at academic success, state education agencies are eager for strategies that work. Berwick suggested education leaders learn from quality efforts in the field of healthcare by applying a balanced approach to improvement (Donahue, 2015). Just as IHI wishes to infuse improvement science with practical capabilities into every facet, state education agencies must build the capacity of all district leaders, school leaders, and educators to speak the language of improvement (IHI, 2019).

Statement of the Problem

The idea of school reform is not new. However, after decades of initiatives, districts and states are still working to improve. Researchers argue that districts and states may lack the expertise or organizational capacity to support change ideas at larger scales (Bryk, Gomez, Grunow, & LeMahiey, 2017). The use of improvement science techniques offers a fresh perspective for school improvement by allowing districts to engage in small scale changes to reach big impacts at scale.

Because traditional structures for state support of districts continue to yield slow gains, the Tennessee Department of Education (2018) wishes to change the framework for district support. By drawing on developing research in the field of improvement science, the Tennessee Department of Education aims to develop a statewide knowledge base organized around

innovative practices for district support (TDOE, 2015). Thus, this study sought to investigate how a district interacts with the TDOE through a new vision of district support based on the principles of improvement science at both the state and regional level.

Purpose of the Study

The purpose of this qualitative case study was to look beyond traditional models of state education agencies (SEAs) support of local education agencies (LEAs) and investigate how one district interacted with a state department of education through the lens of improvement science training, coaching, and support. Thus, the purpose was three-fold. First, the study provided details on how one state education agency changed its framework for district support. Second, the study chronicled how one academic consultant applied the framework of support with school districts. Third, the study chronicled how one district, along with the support and coaching of the state academic consultant, applied the principles of improvement science within one school for district improvement.

Research Questions

The following research questions were formulated for this qualitative study:

1. How does a school district engage with a state education agency to do improvement science work?
2. How does a state academic consultant support a school district in improvement science work?

Theoretical Foundation

The theoretical foundation for this study was grounded in the Model for Improvement, specifically, how the Model for Improvement is used as a framework for school district support

and as a framework for state education agencies' (SEAs) support of local education agencies (LEAs).

The Model for Improvement was first introduced in 1996 in the first edition of *The Improvement Guide* and was largely based on the work of W. Edwards Deming and his *System of Profound Knowledge* (SoPK) and PDSA cycle for measuring improvement (Langley et al., 1996). Deming's work began following World War II and focused on improving car manufacturing efforts in both Japan and the United States. The SoPK, first published in *The New Economics* (1993), compiled decades worth of Deming's research into a framework, which deeply integrated thought with actions, consisting of four components: appreciation of the system, understanding variation, theory of knowledge, and the psychology of change (The W. Edwards Deming Institute, 2019; Langley et al., 1996; Berry, 2011).

Systems are complex in nature with many moving parts (Berry, 2011). To appreciate the complexity of any organizational system, leaders must navigate away from disjointed views of an organization and understand both the interconnectedness and interdependence that exists at all levels of the system (Berry, 2011, p. 2; Hunter, 2012). Deming also believed seeing the system meant a commitment to innovation and long-term planning for the future of the organization (Deming, 2000). Appreciation of the system takes the blame off of a single person or a single incident and looks beyond for contributing factors. By appreciating the system, leaders take ownership of their part in the system and look for what systematic drivers may have resulted in an event or outcome (Hunter, 2012). Thus, by applying Deming's SoPK and system-level thinking to a state framework for district support, SEAs, and state consultants provide LEAs a lens to view their organization differently (Langley et al., 2009).

While seeing and defining one's system is imperative; improvement comes from action. Authors Langley, Moen, Nolan, Nolan, Norman, and Provost (2009) defined The Model for Improvement, which outlines a framework for systematic, actionable change. The Model for Improvement combines a set of three fundamental questions with the Plan-Do-Study-Act (PDSA) cycle (Langley et al., 2009). In the Model for Improvement, three primary questions are asked/answered: "What are we trying to accomplish? How will we know that a change is an improvement? What change can we make that will result in improvement?" (Langley, Moen, Nolan, Nolan, & Provost, 2009, p. 24). As part of the Model for Improvement, PDSA cycles are used to help organizations implement and test change ideas.

Authors Bryk, Gomez, Grunow, and LeMahieu adapted the Model for Improvement as it was being used by the Institute for Healthcare Improvement to be used in American schools (2017). Three core improvement questions were defined: "What specifically are we trying to accomplish? What changes might we make, and why? How will we know that change is an improvement?" (Bryk, Gomez, Grunow, LeMahieu, 2017, p. 114). Again, the three improvement questions are paired with rapid evaluations of change, or PDSA cycles, to accelerate learning-by-doing (Bryk et al., 2017). The three questions, scaffold a learning dynamic by making hypotheses, testing predictions, revising a change idea based on what is learned, and testing again; essentially, a commitment to systematic, action-oriented, quality improvement. Thus, improvement science practices seek to measure the impact of change ideas. Through this framework, a district can implement and test change ideas to determine what constitutes an improvement. By starting small to change fast, districts can determine what works and use that knowledge to expand at a larger scale; for example, use one school's experience to then expand to more than one school and test within the second school's context.

The Model for Improvement, as adapted by Bryk et al. (2017), formed the conceptual framework and structure for this study. One district's interactions with a state regional field service office was chronicled through a qualitative case study to document how improvement science practices are used for district support.

Rationale for the Study

Federal, state, and local education agencies have spent over four decades on initiatives aimed at implementing practices to improve students' academic achievement (Unger, et al., 2008). However, despite these efforts, districts and schools continue to struggle to meet the needs of all students. Significant research confirms state education systems are fragmented and lack coherent frameworks for district support. With federal legislation such as the *No Child Left Behind* and *Every Student Succeeds Acts*, state education agencies are shifting models of district support from compliance and monitoring to ones grounded in support of the district and school improvement. Often, state education agencies lack the financial resources and technical know-how to provide proper supports to districts and schools (Unger et al., 2008; Dwyer, 2006; Lane & Gracia, 2005). Thus, state education agencies grapple to develop the leadership capacity needed to support underperforming districts and schools properly (Unger et al., 2008).

This study contributed to the continuation and expansion of a strategy in the Tennessee Department of Education's strategic plan, *Tennessee Succeed* (2015). Since 2016, the CORE offices have been focused on building internal knowledge and capacity around the disciplined approach of improvement science to better support districts toward improved student outcomes (TDOE, 2015; TDOE, 2018). However, this initial work has now influenced a new framework of state support for districts and expanded beyond the scope of literacy. As CORE consultants engage in this new framework of district improvement support, this study used a qualitative case

study approach to detail how improvement science efforts are used with stakeholders as a means of school improvement. No known current research indicates a state education agency's use of improvement science as the framework for district support. While the Carnegie Foundation has done some work with the state of California regarding regional improvement efforts to support ESSA requirements focused on the gaps in achievement for male minority students, no known research is available to indicate a SEAs plan of support of LEAs through an improvement science framework (Carnegie, 2019).

Significance of the Study

The success of Tennessee students is directly linked to the success of Tennessee schools. Stagnant state data suggest the need for new and innovative ways for district support (TDOE, 2015). This study provided important information to educational leaders on how to apply the practices for improvement science for district support. Also, the sample district, as well as the state of Tennessee, have access to unfolding practices in the field of improvement science. Lastly, studying both the successes and failures of this work will allow districts, and ultimately the TDOE to better understand and scale practices that demonstrate improvement.

First, this research was timely. The TDOE is transitioning to a new framework for district support, along with literacy and math learning walks as an integral component of the framework. The framework integrates multiple aspects of improvement science through system-level diagnosing as a model for district support. The practice of learning walks, or classroom observations, is modeled after the work of Richard Elmore's *Instructional Rounds in Education* (2010) and *The Instructional Core* (2008). The learning walk tools contain indicators that describe high-level actions and specific behaviors one would expect to see in strong standards-aligned instruction (Curran, n.d.). Through the new framework, Tennessee-specific learning walk

tools are used to collect data through classroom observations and use findings to inform district practice and decision-making.

Additionally, this research can add to the possibility of spread and scale. To achieve success in complex systems, organizations must recognize the unlikelihood of predicting the all the work that must be done ahead of time or all the possible unintended negative consequences that might ensue (Bryk, Gomez, Grunow, LeMahieu, 2017). Thus, the case study approach to this research is grounded in the improvement science practice of 'start small to grow fast'. By implementing a narrow scope, time is allotted to properly develop the infrastructure necessary for long-lasting change and success (Langley, Moen, Nolan, Nolan, & Provost, 2009). Through this study, change ideas were tested on a small scale to identify which practices to promote within the study school, district, region, and beyond. The results can aid any state, district, or school leader to build on any successes and adopt similar practices to support improvements at scale through the lens of improvement science.

Researcher Positionality Statement

Personal interest in the study resulted from being a current employee of the Tennessee Department of Education as a Regional Math Consultant. Having been engaged in improvement science training since July of 2018, as well as adopting a new Tennessee Department of Education (TDOE) model for district support, spurred an invested interest in the topic of study. Job-embedded improvement science learning opportunities have included the development of a Tennessee-specific math learning walk tool as well as norming training, through a partnership with the TDOE and The New Teacher Project (TNTP). Also, TDOE leaders and consultants have participated in studies, Webex courses, personal improvement projects, conferences, and regional shadowing opportunities through the Tennessee Early Literacy Network (TELN). In January

2019, math learning walks were piloted across the state of Tennessee and will continue to be part of a strategic plan of district support as detailed by the TDOE. Learning around the new framework for district support, called the CORE Support Framework, which is ground in the principles of improvement science, has been occurring since July 2018. Improvement science work is being integrated with multiple districts of varying contexts across the state. Math and English Language Arts (ELA) consultants support this work through regional CORE offices. This qualitative case study chronicled district support and coaching grounded in improvement science practices, as well as training on systems-level diagnosis and monitoring with the use of the TDOE Math Learning Walk tool.

Personal interaction during the study has the potential for bias. However, the study used peer debriefing, triangulation, and member checks to increase trustworthiness. Detailed descriptions of the context of the study are provided to inform transferability.

Limitations, Delimitation, and Assumptions

Delimitations of the study included sample size and sample population. The sample size and sample profile were limited to the population of the selected school district and school. Limitations of the study included the boundaries of the study and data collection. The boundaries were one Tennessee region in one school district. Data for the study are unique to one specific school, in one specific district, and one specific math consultant who would be providing interventions. It is assumed all participants recorded journal entries with integrity and fidelity, and all interview responses were answered honestly and with candor. It is also assumed the participating district took part in the study with sincere interest with no prompting or ulterior motives. Last, it is assumed the reported data are correct.

Definition of Terms

The following terms are defined to provide clarity:

- **Basic support:** Districts opting or identified for basic support will not partner with CORE consultants nor receive math learning walks for support but may take part in regional training and support opportunities.
- **Comprehensive support:** Districts opting in for, or identified for, comprehensive support partner with CORE consultants to engage in diagnosing, planning, implementing, and monitoring strategies for improvement. They also engage in networking opportunities that are relevant to their work. This level of support embeds a CORE consultant(s) within the work of the district on a consistent and regular basis.
- **CORE:** The CORE offices are part of Tennessee's statewide system of district support. The CORE offices work to empower Tennessee school districts to build educator capacity through basic, targeted, and comprehensive academic support resulting in student readiness.
- **LEAs:** a local education agency is all local public-school districts.
- **Literacy Learning Walks (LLWs):** a literacy learning walk (LLW) is an embedded training from CORE ELA consultants for district and school leaders; allowing leaders to take a snapshot of their current literacy reality, set goals around their desired state, and plan for interventions to bridge the gap between current reality and ideal state.
- **Math Learning Walks (MLWs):** a math learning walk (MLW) is an embedded training from CORE math consultants for district and school

leaders; allowing leaders to take a snapshot of their current mathematical reality, set goals around their desired state, and plan for interventions to bridge the gap between current reality and ideal state.

- **SEAs:** a state education agency is a state department of education.
- **Targeted Support:** Districts opting into or identified for targeted support partner with CORE consultants for support in one or two aspects of their improvement work. For example, they may partner in diagnosing and monitoring only. Districts engage with a CORE consultant(s) strategically several times a year at this level of support.
- **TELN:** The Tennessee Early Literacy Network (TELN) is a series of networked-improvement communities formed by The Tennessee Department of Education (TDOE) and the Carnegie Foundation for the Advancement of Teaching led by the state's regional offices (CORE).

Organization of the Study

Chapter One provides an introduction to the study, statement of the problem, purpose of the study, the research questions, the theoretical framework for the study, the rationale for the study, the significance of the study, the researcher's positionality statement, limitations, delimitations, and assumptions of the study, definition of terms, organization of the study and summary of the study. Chapter Two contains a review of the literature and previous research related to the study. Chapter Three outlines the methodology of the study, including procedures for gathering data, a description of the Model for Improvement, and a description of the CORE Support Framework. Chapter Four contains procedures for the study and the results of the study. Chapter Five contains

the findings of the study and recommendations for further research.

Summary

This study evaluated improvement science as a strategy for state support of districts. Tennessee has been on a trajectory of improved student outcomes, making large-scale changes, such as the adoption of more rigorous standards and assessments, since 2007 (TDOE, 2018). However, while Tennessee students have made significant gains, the work must continue (TDOE, 2018). Tennessee has been named the fastest improving state, yet most recent NAEP data still ranks Tennessee in the bottom half of states (TDOE, 2018). The Tennessee framework for district support is based on an adaption of The Model for Improvement paired with PDSA cycles (Langley et al., 2007; Bryk et al., 2017). The three improvement questions; "What specifically are we trying to accomplish? What changes might we make and why? How will we know that the change is an improvement?"; paired with PDSA cycles, were used to guide district support during this study (Bryk, Gomez, Grunow, LeMahieu, 2017, p. 114).

Chapter Two: Literature Review

The evolution of improvement science has been a journey over many centuries. From investigating by way of Galileo's scientific method as early as 1591 to the post-WWII revolutionary work on cycles of improvement by Dr. Walter Shewhart and Dr. Walter Edwards Deming, the science of improvement has influenced numerous fields of study. More recently, improvement practices have begun to influence other fields of study, such as healthcare and education, where the 'products' are people rather than parts on an assembly line. Pivotal work, such as The Model for Improvement, has inspired new and innovative ways for all types of organizations to learn how to 'get better at getting better' (Langley et al., 2009; Bryk et al., 2017).

This chapter provides a review of the literature and research related to this study. The review of literature is divided into (a) founding fathers of quality improvement, (b) improvement as a process, (c) educational improvement, (d) and improvement in state education agencies.

Founding Fathers of Quality Improvement-Pre-Deming

Galileo Galilei and the scientific method. Galileo Galilei is considered by many to be the father of modern science (Moen & Norman, 2010). His contributions to the sciences highlight combining designed experiments with mathematics. According to the compiled works of Vincenzo Viviani, Galileo Galilei's assistant and secretary, Galileo conducted one of the first controlled scientific experiments in 1591 (Van Helden, 1995; Lienhard, 2018; Hillman, 2005). In this monumental Leaning Tower of Pisa experiment, Galileo disproved a longstanding claim by Aristotle, asserting objects' rate of fall was proportional to the weight of the objects (Van Helden, 2019). However, Galileo used a three-step process, intuition or resolution, demonstration, and experiment, to drop objects of varying weight to prove objects' rate of fall

was not proportional to their weight (Burtt, 1993). Through this method, the practice of conducting experiments became known as a cornerstone of scientific investigation (Moen & Norman, 2010).

The scientific method is defined as both a logical and systematic method used to discover how concepts and ideas in the universe work (Bradford, 2017). Thus, science is based on fact, not opinion, and is designed to test ideas through research (Bradford, 2017). The work of Galileo and the scientific method links directly to the use of disciplined inquiry to drive improvement. Improvement work resembles small experiments that begin with a series of inquiries whose outcomes guide the next change cycle (Bryk, Gomez, Grunow, LeMahieu, 2017).

Sir Francis Bacon and inductive reasoning. Sir Francis Bacon spent much of his young adulthood in an attempt to alter the face of natural philosophy (Biography.com, 2019). Bacon pioneered a new framework on how knowledge is developed, basing scientific research on the necessity of tangible proof (Biography.com, 2019; Moen & Norman, 2010). Also, in contrast to the works of Aristotle and Plato, Bacon emphasized experimentation and interaction (Biography.com, 2019). At the time, most scientists insisted nature was to be interpreted through deductive reasoning. Bacon's new scientific method, which he believed could become a tool for the betterment of humanity, involved organized observations and careful experimentation (Biography.com, 2019). Bacon was an advocate of the inductive method and insisted science and the study of rules in which the universe operated should proceed from observation, to axiom, to the law (Burtt, 1998; Moen & Norman, 2010). The works of both Galileo and Bacon are remembered because of their marriage of inductive logic and deductive reasoning through the use of observations, experiments, and mathematics (Brill, 1998). Similarly, improvement

science challenges users to complement theories, or evidence-based practices, with inquiry and practice-based evidence (Byrk, Gomez, Grunow, LeMahieu, 2017).

Charles Peirce, William James, John Dewey, Charles I. Lewis, and pragmatism. The work of Peirce, James, Dewey, and Lewis supports problem-specific and user-centered work. These founding fathers of practical inquiry, known as pragmatism, believed a claim to be true if and only if it was useful (Legg, 2019). With user-centered investigations, researchers seek to examine a problem of practice from the person who is experiencing a problem firsthand (Byrk, Gomez, Grunow, LeMahieu, 2017). Embracing a user-centered lens of inquiry allows organizations to not only consider *what* issues need to be addressed, but also pushes leaders to investigate *why* the organizational system is producing current outcomes and *how* these systems may be modified for better results. (Byrk, Gomez, Grunow, LeMahieu, 2017). In a 1979 NBC news broadcast, W. Edwards Deming stated,

> In almost all the solutions to the problem of productivity, there is a common thread. Each of them includes, in some way, worker participation, or job security, or both. Every expert to whom we talked agreed that no solution can succeed fully unless it includes the active participation of the people who actually do the work (Hunter, 2015).

Walter Shewhart, quality control, and the Shewhart Cycle. In the early 1900s, American statistician, engineer, and physicist, Walter A. Shewhart, was working for Western Electric when he was solicited by Bell Telephone to improve voice clarity for the company's telephone headsets (O'Connor & Robertson, 2006). Shewhart used his expertise in statistical control, industrial process management, and measurement processes for science to challenge the status quo. Before Shewhart's work with Bell Telephone, industrial quality control cycles

consisted of creating a product, inspecting upon completion, and discarding defective items after production was complete. Shewhart's boss, George Edwards, stated,

> Dr. Shewhart prepared a little memorandum only about a page in length. About a third of that page was given over to a simple diagram which we would all recognize today as a schematic control chart. That diagram, and the short text which preceded and followed it, set forth all of the essential principles and considerations which are involved in what we know today as process quality control. (O'Connor & Robertson, 2006, para. 2).

The schematic control chart, called the Statistical Process Control (SPC) chart, used statistical tools to manage process control; defining parts specifications prior to production, inspecting parts during and throughout production, and examining what corrective actions must be applied to the process to minimize defective output for quality control (O'Connor & Robertson, 2006). Shewhart's work, summarized in *Economic Control of Quality of Manufactured Product* (1931), defined the basic principles of quality control, brought the need for reduced variation to the forefront of industrial manufacturing and earned him the title of the Grandfather of total quality management (O'Connor & Robertson, 2006; American Society for Quality, 2019; Skymark, 2019). Shewhart's work brought the study of variation to the forefront. While variability in performance is a natural expectation in any complex organization, the reduction of harmful variation and improvement of overall quality should continue to be the aim of improvement efforts (Byrk, Gomez, Grunow, LeMahieu, 2017).

Shewhart believed the lack of ongoing information greatly inhibited the efficiency of production and quality control (Skymark, 2019). Thus, in 1939, Shewhart revised his previous work into a new book, *Statistical Method from the Viewpoint of Quality Control,* and created the first cycle of improvement, called the Shewhart Cycle (Moen, 2010). In Shewhart's new model,

three linear steps - specification, production, and inspection, were replaced by a cycle. Shewhart believed the cyclic, rather than linear, pattern would create a more dynamic scientific process of acquiring knowledge, much like the steps in the process of the scientific method. Through the years, Shewhart's work continued to be modified and later became the basis for the modern-day Plan-Do-Check-Act (PDCA) or Plan-Do-Study-Act (PDSA) cycles (Moen, 2010).

Consequently, a key contributor to the study of cycles of improvement, Walter Edwards Deming, was the editor of Shewhart's 1939 book. Later, in 1940, Deming, in his work with the United States Census Bureau, brought Shewhart's principles to the first non-manufacturing problem by applying statistical quality control to clerical operations around the 1940 U.S. census (ASQ, 2019). The two men continued to improve upon their work for the better part of the next six decades, defining the Deming Wheel, the Plan-Do-Check-Act (PDCA) cycle, and the Plan-Do-Study-Act (PDSA) cycle (Moen, 2010). The PDSA cycle is an integral part of the Model for Improvement.

Founding Fathers of Quality Improvement-Deming

About Walter Edwards Deming. While the concepts of total quality management and continuous improvement trace back to Shewhart, Deming's work was comparable to Eli Whitney's cotton gin for U.S. mass manufacturing, sparking a third industrial revolution (Skymark, 2019; ASQ, 2019; Hunter, 2015).

Following WWII, the American engineer was solicited by the Ford Motor Company to determine why American customers preferred Japanese-made transmissions over those constructed in the United States (Hunter, 2015). Through his work with the Japanese motor companies, Deming discovered Japanese-constructed transmissions had far less variance than American-made counterparts, and thus, translated to smoother rides, and fewer issues from

Japanese made cars. Through Deming's work around total quality management, the Deming Wheel and the System of Profound Knowledge (SoPK) were born, revolutionizing the world of manufacturing. Further, Deming's perspective on the necessity and impact contributions from the factory floor workers altered the then-popular top-down management styles.

The Deming wheel. Before the work of Shewhart and Deming, American manufacturing was a linear process. Recall the Shewhart Cycle consisted of three phases: specification, production, and inspection. However, in 1950, Deming modified the Shewhart Cycle to include research, a fourth step, which promoted market research as a method for redesign considerations. Deming stressed the importance of constant interaction, iterations, and the inclusion of market research for quality product design and service (Moen, 2010). Later in 1950, the Japanese executive, Masaaki Imai, rebranded the Deming Wheel as the Plan-Do-Check-Act (PDCA) cycle (Moen, 2010).

The system of profound knowledge. Much of Deming's work contributes to system-level thinking. By investigating the system that produces the current outcomes, users can investigate many perspectives that influence an organization and make visible the many hidden complexities within the organization (Byrk, Gomez, Grunow, LeMahieu, 2017). Deming's SoPK includes four components, or lenses, through which one should view the world simultaneously: an appreciation of the system, knowledge about variation, epistemology; or the theory of knowledge; and knowledge of psychology (Deming, 1982; Berry, 2011; API, 2019).

Deming strongly believed system-level thinking provided leaders tools to create better cultures of leadership by supporting individuals within the organization, which would subsequently improve the overall outcomes and the quality of the improvement efforts (Boden, 2019). The first component, appreciation of the system, is based on the principle that

optimization of any organizational system at large must rely on the delicate balance among each smaller interrelated component (Berry, 2011). Thus, Deming believed one should think of manufacturing not as bits and pieces, but as a system in need of improvement (Halwes, 1998).

Both the second and third components of SoPK are grounded in Shewhart's Cycle of Improvement and PDCA cycles (Berry, 2011). The second component, knowledge, understanding, and appreciation of variation, links directly to Shewhart's focus on variation in performance or outcomes. The purpose of component two is to strive to reduce variation through continuous investigation and adjustments (Deming, 1982; Berry, 2011). The third component, the theory of knowledge, promotes the continuous study of the organization (Berry, 2011). Through systematic analysis, revisions, and extensions to the theory, users can build and improve upon knowledge of the system. Last, SoPK brings power to the people by making the work user centered. Deming (1982, p. 53) stated that "The greatest waste in America is failure to use the ability of people" (Deming, 1982, p. 53). While the fields of industry and manufacturing in Deming's time often operated with command and control, Deming promoted a new style of leadership based on valuing and empowering all people within the organization with shared leadership and ownership in the organizations' vision for success (Berry, 2011). Deming argued one's natural characteristics of intrinsic motivation, such as curiosity, joy of learning, and dignity must be harnessed to optimize improvement (The W. Edwards Deming Institute, 2018).

Thus, according to Deming, to reimagine prevailing management styles, leaders must understand true quality means balancing the organizational goals for optimization with the aim of the system (Berry, 2011). For this reason, Deming stressed, the four components, which comprise the system, cannot be separated because the knowledge of psychology, variation,

theory of knowledge and the appreciation of the processes of a system must be managed with a delicate balance.

14 points to management. Deming believed that in order to improve the effectiveness of a business or organization, management principles must be grounded in optimism (The Deming Institute, 2019). Deming (1982) offered 14 Points to Management. Of the fourteen points, several are relevant outside the fields of manufacturing and business. First, Deming proposed that organizations must create a constancy of purpose. Rather than getting bogged down in the happenings of today, organizations must look beyond immediate operations and remain constant in consideration of potential problems of tomorrow and the future. By investing in innovation, resources for research and education, and the constant pursuit of improvement in design and service, members of the organization gain the faith required to operate, knowing preparations are being made for the future. Second, with the ever-growing market of competition, an organization wishing to survive must adopt a new philosophy of operation and management. Deming warned against the commonality of acceptance of the status quo and the lack of demand for excellence. Thus, successful organizations cannot assume that which has always worked in the past will continue to work in the future. Therefore, to remain successful, organizational leaders must avoid complacency and adopt philosophies in support of continued pursuits of improvement. Third, organizations should cease dependence on mass inspection to achieve quality. Inspection to improve quality is ineffective and inefficient, and quality should come from the production process. While inspection alone does not improve quality, small scale inspection, inside statistical guidelines of quality production, provide a more desirable, effective, and timely response to quality control. Fourth, organizations must constantly improve systems of production and service by ensuring quality is required at inception. Deming believed because

there was only one chance to optimum success, efforts for quality must be built in at the onset of design. Therefore, through processes, such as PDCA or PDSA cycles, organizations cannot only continually check and test the process, but must also continually adjust and improve testing methods through study for optimum success. Fifth, organizations must restructure mindsets around one-size-fits-all training models and institute training, which honors the differences people bring to an organization and fosters learning in new and innovative ways. Sixth, education should be encouraged as self-improvement for everyone within an organization. Deming warned against organizations relying on good employees alone and stressed the need for good employees that continue to improve with education. Seventh, there needs to be a shift from managing to leading. In order to lead rather than manage, managers must understand the details of the job they are being asked to supervise while simultaneously stepping back to discern the larger system in support of that job. Eighth, organizations must drive out fear. Deming argued that workers are unable to put forth their best efforts in the presence of fear. Thus, organizations must cultivate cultures where workers are not afraid to ask questions, challenge the status quo, or express innovative ideas. Ninth, managers must break down barriers between staff areas where sub-optimization is allowed to thrive. Successful organizations promote teamwork by soliciting the voices from diverse perspectives of all stakeholders. By removing compartmentalized facets of the system at large, organizations gain the ability to complement areas of weaknesses with newfound strengths. Last, management must take action to accomplish the necessary transformations. To transform any organization, Deming (1982) suggested leaders have courage to break with tradition, clear communication with and inclusion of all members of the organization, and intentional cycles of improvement, which allow leaders to study the results of

changes and move forward with the acquired knowledge accumulated as a result of the investigative process.

Seven deadly diseases. Likewise, management must also prepare for the negative, or pessimism, and work to drive out what Deming called 'diseases', which can stall progress. In *Out of Crisis*, Deming outlined seven deadly diseases: the lack of constancy of purpose, emphasis on short-term profits, personal merit systems to drive performance, mobility of upper management, use of arbitrary figures to drive production, excessive medical costs, and excessive costs of liability (Deming, 2000; Berry, 2011). The seven practices describe the most critical barriers; often with the biggest problems being self-inflicted, management potentially faces within any organization (Osgood, 2012; Vanguard Consulting, n.d).

The pivotal work of Deming, including the Deming Wheel, the 14 Points to Management, and the Seven Deadly Diseases, lay the foundation for the Model for Improvement, the Six Improvement Principles, and the CORE Support Framework discussed later in the chapter.

Founding Fathers of Quality Improvement-Post-Deming

Masaaki Imai on kaizen and lean. Masaaki Imani (1930) of Tokyo is one of the founders of the Kaizen Institute (1985) and Lean manufacturing practices (The Arizona Quality Alliance and ON Semiconductor, 2005). The Japanese concept of Kaizen means change for the better and has been a foundational business model since the 1950s (Graves, 2012a). The Kaizen philosophy suggests taking a system-wide view to see the system that produces the current outcomes, focusing on seven key areas: logistics, costs, quality, safety, technology, staff motivation, and environment (Graves, 2012a). A key characteristic of the Kaizen philosophy is both a top-down and bottom-up approach (Vliet, 2009a). Making the work problem-specific and user-centered are evident in Kaizen practices as all employees, from all levels of the workplace,

are encouraged to share suggestions for improvements, no matter how minor they may seem (Graves, 2012a).

Many of the Kaizen practices are based on the work of W. Edwards Deming. In an interview with The W. Edwards Deming Institute, Masaaki shared that Deming greatly influenced the Kaizen practices, and his teachings were great revelations to Japanese management (Hunter, 2012).

Masaaki's work also supported the improvement practice of measuring for improvements. Like Deming, Masaaki grounded his theories in the use of statistical tools. Similar to Deming's control charts, Lean is a data-driven quality approach used for eliminating defects and waste (CTM, 2019). However, the Japanese word *Kaizen* is different from the English word improvement in that Kaizen refers to continuous accumulations of small progress rather than innovative improvement (Monden & Hamada, 1991). Masaaki described control charts as statistical tools for solving quality-related problems. In contrast, Lean uses *any* tools to solve problems and is not limited to those which are statistical in nature (Hunter, 2012). There are three main categories of Lean: muri, mura, and muda. Muri deals with irregularities in demand; mura deals with irregularities in processes; and muda deals with waste (Vliet, 2009b). In improvement science, measurement tools inform efforts of change and different types are measurement tools are used for varying purposes (Byrk, Gomez, Grunow, LeMahieu, 2017).

As suggested in Deming's 14 Points to Management, one big advantage of the Lean manufacturing principles is coherence; all aspects of an organization are focused on optimization and customer satisfaction (Vliet, 2009b). However, Lean has its disadvantages as well. Lean is unlike Deming's 14 Points to Management in that innovation is minimized. Lean Manufacturing is limited to improving current products, which decreases the likelihood for new or innovative

techniques (Vliet, 2009b). Also, preparations for implementing a Lean system take time to plan and show results. Thus, users may struggle with patience in the short-term, waiting for long-term gains (Vliet, 2009b).

Together, Kaizen and Lean lay the foundation for Masaaki's philosophy of *Gemba Kaizen,* where Kaizen is the Japanese word for improvement, and Gemba is the Japanese technique for optimization (Vliet, 2012). *Gemba Kaizen* has given way to several movements in quality improvement, including Total Quality Management (TQM) and Just in Time (JIT). However, *Gemba Kaizen* is more than a philosophy of quality improvement. These practices also recognize the effectiveness and efficiency that results from creating positive working environments. Thus, Gemba Kaizen also focuses on cultivating positive mindsets in the workplace by showing respect and seeking input from all levels within the organization.

5S is an approach of applying Lean to workspace organization and management (Graves, 2012b). Much like Deming's deadly diseases, the 5S system, sort (seiri), set in order (seiton), shine (seiso), standardize (seiketsu), sustain (shitsuke); focuses on eliminating eight wastes as defined by Lean. These eight wastes in manufacturing include an excess in inventory, unnecessary or awkward operator motions, unnecessary processing due to unclear customer requirements, over-production of the product, wasteful transport or delivery practices, corrections due to manufacturing errors, unacceptable waiting times between operations, and unused employee talent (Graves, 2012c). For example, an organization might consider applying the 5S principles to create a highly organized crash cart in an emergency room or toolbox for a mechanic. The first step companies usually take for Lean implementation is applying the 5S principle, which allows organizations to reduce waste while also preserving energy and raw

materials (Graves, 2012a). In the practices of improvement science, this means organizations must identify barriers for success and remove or reduce those barriers when possible.

Joseph Juran and pareto principle. Joseph Juran, who also spent some time in the Japanese industry, began his study of quality control around the same time as Deming (ASQ, 2019c). Ishikawa (1954) described Juran's interactions with the Japanese top and middle management as an experience which helped expand the idea of quality control to a tool of management, and thus defining quality control as we know it today (ASQ, 2019c). Juran is known for recognizing the widespread application of the Pareto Principle, or the 80/20 rule, beyond economic situations (JURAN, 2019). The original Pareto Principle (1895), coined by Italian economist Vilfredo Pareto, noted that 80% of the world's wealth came from 20% of the population. This concept was used to expand to many other applications. Specifically, when dealing with a system, 80% of organizations' outcomes results from the work completed by 20% of the organization's workers. Juran used the Pareto Principle to train top management of industry in the effects of the 'vital few' and 'useful many', which he described as those few who have the power to contribute the largest effects to an organization versus numerous others who attribute a smaller proportion of the effect. Thus, Juran believed that improvement efforts are most effective when the vital few are addressed first (JURAN, 2019). This meant understanding one's system to a great degree in order to identify these vital few.

John Kotter and 8-step change model. Born in 1947, Harvard Business School Professor Emeritus John Paul Kotter, continues to be a leader in organizational change. Kotter's *Leading Change* (1995), considered by many colleagues to be groundbreaking work in the field of change management, argued 70% of change initiatives fail while only 30% of change initiatives succeed (Dewar & Keller, 2009). Kotter (2008) proposed an 8-Step Change Model,

which outlined an action-oriented process for implementing change initiatives. The 8-Step Change Model summarized over four decades of Kotter's research with global 5000 companies implementing large-scale changes in the business environment (Matsushita, 2019). The eight steps change processes included establishing a sense of urgency, creating a guiding coalition, developing a change vision, communicating the vision for buy-in, empowering broad-based action, generating short-term wins, not letting up, and making change stick. The enhanced eight steps, revised by Kotter International (2018), consisted of eight similar guiding tenants called accelerators paired with four change principles. The first change principle, leadership and management, defined leaders' roles as ones that transcend essential managerial process and execution to ones who possess vision, promote action, inspire innovation, and value celebration. The second change principle, select few and diverse many, mirrors Juran's work by honoring contributions from all levels of an organization rather than of the few in top management alone. Kotter called the diverse many of the organization the guiding collation or volunteer army. Change principle three, called head and heart, married logic with the human desire to contribute in meaningful ways. Kotter believed leaders must appeal to peoples' feelings rather than through data and logic alone. The last change principle distinguished between 'have to' and 'want to' and encouraged leaders to create cultures where workers want to contribute to the overall success of the organization rather than feeling as if they are required to do so. Kotter believed the marriage of change processes with change principles poised organizations for rich, self-sustaining networks ready for complex change (Kotter, Inc., 2018).

Bill Smith, Bob Galvin, and Jack Welch on six sigma. Six Sigma (1981) originated as a quality production metric created by Motorola engineer Bill Smith and executive Bob Galvin to improve Motorola pager production quality by significantly reducing the number of defects

(O'Farrell, 2019; CorporateTrainingMaterials.com, 2019; Trainer, 2013). In 1995, Jack Welch of General Electric (GE) championed Six Sigma to global recognition as a standard business practice and management methodology (Trainer, 2013; BPI, 2019). Six Sigma, which is based on Sir Aylmer Fisher's statistical analyses and methods taught by Shewhart and Deming, uses the statistical term *sigma*, which represents the number of standard deviations from a normal distribution (O'Farrell, 2019; BPI, 2019). In Six Sigma, Smith argued products manufactured within six standard deviations from the average (mean) fell into the curve of natural variation and used a process average to define lower and upper limits for measurement specifications. Following the success of GE, the Six Sigma method was quickly adopted by Fortune 500 companies such as Samsung, Amazon, Boeing, and Ford, securing its place as a prevailing business practice (Trainer, 2013; White, 2018).

Motorola quickly realized the broader application of Six Sigma and applied the methodology to organizational improvement strategies in the Six Sigma Management System (Trainer, 2013). As a management philosophy, businesses define a common goal with strategies aligned to improvement efforts, activate teams to tackle highest potential impact projects first, accelerate proven business practices for the greatest results, and plan and prepare for the sustainability of improvement efforts and improved business results (O'Farrell, 2019). Six Sigma mimics the work of Shewhart and Deming through various cycles of improvement. For example, one iteration, called DMAIC, provides a framework of improvement as define, measure, analyze, improve, control (White, 2018).

Don Berwick, Institute for Healthcare Improvement, and model for improvement. The Institute of Healthcare Improvement (IHI) began in 1991 as a project on quality improvement in healthcare (IHI, 2019a). For over 25 years, IHI worked in the healthcare

industry to grow awareness that change was possible, build the capacity for change through knowledge and training, collaborate to identify and spread identified best practices, foster innovation and creative designs and solutions, and promote unity and healthcare for all as a means to provide quality care at affordable costs. IHI successes are largely accredited to their commitment to the science of improvement (IHI, 2019c). With an emphasis on innovation backed by rapid cycles of field testing, IHI has spread knowledge and best practices at scale. The cycle of investigation used by IHI, called The Model for Improvement, was adopted from the Associates for Process Improvement (API) and married statistics and psychology with clinical science and systems theory for a multidisciplinary approach to improvement (IHI, 2019c).

Improvement as a Process

The model for improvement. The Associates in Process Improvement (API), comprised of authors Gerald J. Langely, Ronald D. Moen, Kevin M. Nolan, Thomas W. Nolan, Clifford L. Norman, and Lloyd P. Provost, combine various subject matter knowledge from various fields of service, including business, healthcare, government, and education with Dr. Deming's System of Profound Knowledge (API, 2019b). API believes in applying the science of improvement properly; there must exist integration of improvement methods with knowledge of the subject matter to develop tools to test, implement, and spread change (API, 2019).

The Improvement Guide (API, 2009) outlined strategies for organizations to enhance performance. The newest edition of this manual for improvement is slowly becoming a mainstay for educational improvement initiatives. The Model for Improvement (Figure 2.1) consists of three questions of inquiry, followed by a cycle of improvement. The three fundamental questions are:

1. What are we trying to accomplish?

2. How will we know that a change is an improvement?
3. What changes can we make that will result in improvement? (Langley, et al., 2009).

Figure 2.1. The Model for Improvement

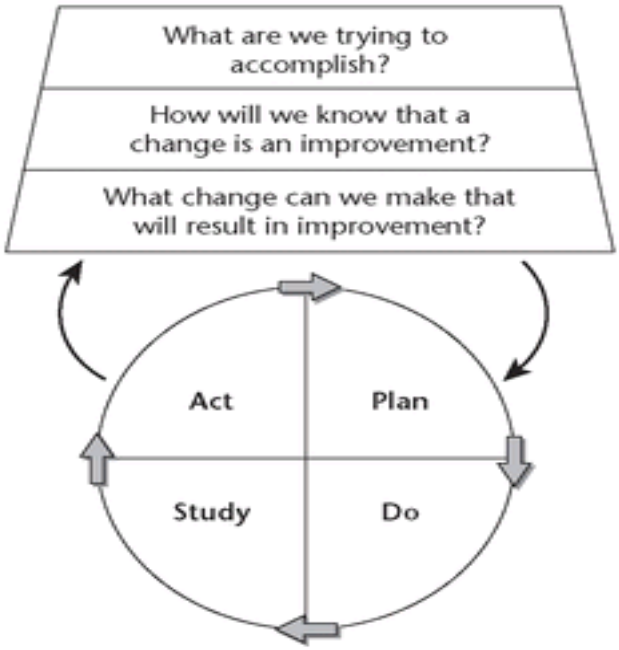

Figure 2.1. The model for Improvement (used with permission by Langley, et. al, (2009) *The improvement guide, 2nd Edition).*

To answer question one, organizations must be very specific and define an aim. Question two defines the measurement pieces of a study, while question three requires analysis of the system before arriving at appropriate ideas for change. Additionally, the PDSA cycle allows users to employ disciplined inquiry to drive improvement.

A revised model for improvement. *Learning to Improve* (Bryk, Gomez, Grunow, & LeMahieu, 2017) modified the three improvement questions more specifically for the context of education to help America's schools get better at getting better.

three improvement questions. Improvement science is a disciplined activity of asking three deceptively simple questions:

1. What specifically are we trying to accomplish?
2. What change might we introduce, and why?
3. How will we know that a change is an improvement? (p. 114).

Like the original Model for Improvement, the Three Improvement Questions are also supported by disciplined inquiry through the use of PDSA cycles. The Three Improvement Questions require users to make a hypothesis about a change idea and then test the hypothesis against the evidence collected. Through the use of PDSA cycles, change ideas can be revised based on the test results and tested again for another cycle. This cycle continues until best practices surface and can be spread and scaled through networked improvement communities. However, the revised approach differs from the original model in that the products are not parts on a manufacturing line, in the field of education; the products are people, which inherently adds complexity to a seemingly simple process. Thus, the revised model is supported by six guiding principles of improvement and supported by a network of learners.

networked improvement communities. The term *Networked Improvement Communities* (NICs) was coined by American engineer, research and design (R&D) specialist, and inventor Douglas Engelbart who emphasized the importance of collective problem solving and technology-assisted social learning during the development of world's first computer mouse (Doug Engelbart Institute, 2019; Brown, 2018; Bryk, Gomez, Grunow, & LeMahieu, 2017; Russell, Bryk, Dolle, Gomez, LeMahieu & Grunow, 2017). Engelbart believed in the power of learning from one's peers and fellow experts to form what he coined as the collective IQ (Doug Engelbart Institute, 2019). Also, Engelbart recognized the multiple layers of learning which

occurred within the networks. Engelbart summarized three basic layers of social learning as Level A learning—learning represented by the knowledge from front-line workers, Level B learning—learning shared by individuals across a workplace, and Level C learning—learning across multiple institutions (Bryk, Gomez, Grunow, & LeMahieu, 2017).

In the field of education, a new spin on NICs, called the Networked Improvement Model, merged Engelbart's R&D practices with the discipline of improvement science to bring together researchers and practitioners who collaborate on common problems of practice (Brown, 2018; Bryk, Gomez, Grunow, & Lemahieu, 2017; McKay, 2017; Russell, Bryk, Dolle, Gomez, LeMahieu & Grunow, 2017). Level A learning might represent an individual teacher improving practice, while level B learning might look more like a professional learning community within one school. However, for Level C learning, many more individuals must come together to systematically explore diverse contexts in order for collective capabilities to grow exponentially (Bryk, Gomez, Grunow, & LeMahieu, 2017). The Network Improvement Community Model is made up of five domains: (1) developing a theory of practice improvement, (2) learning and using improvement research methods, (3) building a measurement and analytics infrastructure, (4) leading, organizing, and operating the network, and (5) fostering the emergence of culture, norms, and identity consistent with network, which serve as the framework for initiating any new network aims (Russell, Bryk, Dolle, Gomez, LeMahieu & Grunow, 2017).

In order to establish an aim, network members use the four essential characteristics of NICs. First, the network member agrees on a well-specified aim. By utilizing perspectives from both researchers and practitioners, NICs develop a shared understanding of the problem to be solved (McKay, 2017). Second, network members must have a deep understanding of the problem, the system which produces it, and a shared working theory on how to improve it. The

six core improvement principles aid researchers and practitioners and govern this inquiry process. Third, network members must be disciplined in improvement research and begin testing in small scales through the use of PDSA cycles. Fourth, networks coordinate to share refined interventions so that best practices can be rapidly dispersed into the field (McKay, 2017). Overall, the networked improvement model forms a practical approach connected to the overarching theory of improvement and allows researchers and practitioners access to meaningful, timely, and logical data to accelerate learning among the network.

six improvement principles. The six improvement principles (Bryk, Gomez, Grunow, & LeMahieu, 2017) represent the foundation for improvement science implemented in networked improvement communities. The six improvement principles are as follows:

1. Make the work problem-specific and user-centered
2. Focus on variation
3. See the system that produces the current outcomes
4. We cannot improve at scale what we cannot measure
5. Used disciplined inquiry to drive improvement
6. Accelerate learning through networked improvement communities

PELP coherence framework. In 2003, Harvard Business School and Harvard Graduate School of Education launched a joint partnership, through the Public Education Leadership Project (PELP), to improve management and leadership competencies of public-school leaders (Childress, Elmore, Grossman, & King, 2011). Throughout the next decade, the project worked with school leaders to highlight the interdependence or coherence, which exists among numerous aspects of school districts. A critical component of the PELP mission was to drive greater educational outcomes for all children. In order to accomplish this goal, PELP strove to

investigate all elements of organizational district influence. These elements included the school district's culture, structure and systems, resources, stakeholders, and environment. As a result, Harvard President and Fellows released the PELP Coherence framework, which helped district leaders identify and connect key elements for district-wide improvement strategies. The PELP Coherence Framework is illustrated in Figure 2.2.

Figure 2.2. *The PELP Coherence Framework*

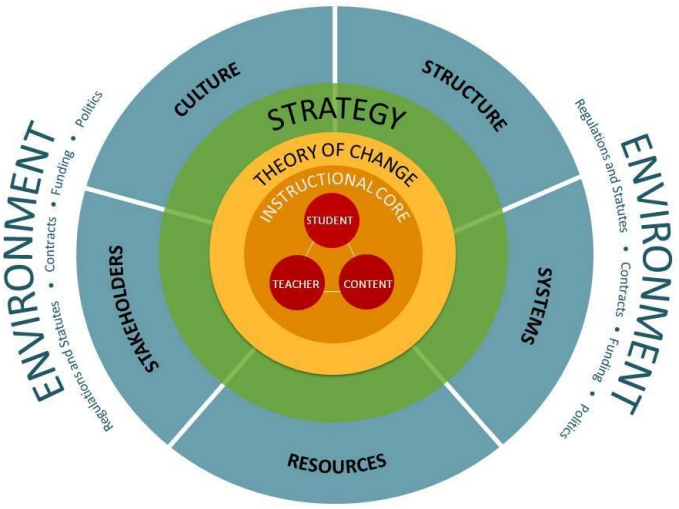

Figure 2.2. The Public Education Leadership Project (PELP) Coherence Framework

achieving district coherence. The PELP Coherence Framework, modeled after Tushman and O'Riley's Congruence Model (2002) was influenced by Cohen and Ball's Instructional Triangle (1999). This framework sought to achieve district coherence by attending to four key practices. First, district-wide strategies for improvement must be connected to the instructional core. The instructional core includes the instructional triad: students, teachers, and content. More specifically, the instructional core emphasizes the connections that must exist between the content made accessible to students, the teacher's knowledge of the content and skills to engage students in the content, and the manner in which students interact with the work of the lesson and the teacher (Cohen & Ball, 1999; Childress, Elmore, Grossman, & King, 2011). Additionally,

districts must identify elements of the district that either support or hinder implementation. Districts must also identify the interdependence among these elements. Also, districts must recognize environmental factors that may impact the implementation of a strategy (Cohen & Ball, 1999). A strategy is a set of actions a district takes in support of a theory of change and directly linked to the instructional core and student outcomes. Organizational elements that influence district strategies include culture, stakeholders, structure, systems, resources and the overall environment, which include factors such as educational contracts, regulations, statutes, policies, and funding (Cohen & Ball, 1999).

Educational Improvement

Richard DuFour and professional learning communities. Richard DuFour (1947-2017) was an American educator, researcher, and well-known author whose publications, dating back to the 1980s, advocated Professional Learning Communities (PLCs) for school improvement (DuFour, 2017). PLCs bind leaders and teachers by common vision and values and provide teachers the autonomy to learn together and make decisions based on common interactions (Will, 2017). A key aspect of DuFour's work was the emphasis on the learning component of a PLC. DuFour stressed that PLCs could not simply be meetings but must be structured to engage educators in ongoing, collaborative cycles of collective inquiry paired with action research (Will, 2017). DuFour warned against pseudo-convenings of professionals and emphasized true PLCs are ones focused on learning by all members of the community (Thiers, 2016). Leaders also play a role in the successful PLCs by ensuring educators have access to necessary information for informed decision making. Both the development of shared knowledge and common learning experiences are essential ingredients for effective PLCs.

DuFour outlined three critical ideas for effective PLCs. First, there must be an emphasis on the monitoring of student learning. "Education is not simply to ensure that students are taught but to ensure that they learn. This simple shift—from a focus on teaching to a focus on learning—has profound implications for schools" (DuFour, 2004, p. 1). Second, PLCs must operate on structures that support a culture of collaboration. DuFour (2004) defined collaboration during PLCs as a process of systematic analysis for the improvement of classroom practice and improved student outcomes. Additionally, DuFour insisted that PLCs operate through ongoing routines focused on student results paired with a collective responsibility for student learning and success (Will, 2017). PLCs must consist of a systematic, cyclic approach to identify students' current levels of achievement, collaborating to establish appropriate learning goals, working together to achieve those goals through a thoughtful and evidence-based collection of student work and student data (DuFour, 2004).

Michael Fullan. Michael Fullan is a Canadian educational researcher, renowned educational author, and worldwide authority on educational reform. Fullan's work focuses on strategies for education leadership, change, and reform. Like Juran, Fullan's work emphasizes the need for leaders in education, the 'top-managers,' to be agents of change while simultaneously advocating the ethical responsibility to the most vulnerable 'products,' students (Fullan, 2002).

moral purpose. Fullan's work promoted the concept of a moral purpose, arguing any change process must first be driven a greater moral purpose (UNRWA, n.d.). Much like the beliefs of the pragmatists, acts of moral purpose affect the lives of people positively. Fullan (2011) argued that the best organizations are those with the desire to develop people and foster environments where others can learn and grow.

the change leadership framework. Fullan promoted effective leadership as the key to long-lasting system-level school reform and designed a framework, The Change Leader Framework (2002), to guide leaders in reflective processes, informed by deliberate practice. The Change Leader Framework is defined by a foundation, a core, and outside influences, which affect the core. The foundation is built on deliberate actions paired with simple endeavors. Fullan argued that the definition of school principal must be expanded beyond 'instructional leader of the school', otherwise desired school reform outcomes would be sure to fall short (Fullan, 2002). This framework charged instructional leaders to be resolute, motivate the masses, collaborate to compete, learn confidently, know one's impact, practice drive theory, and sustain simplexity. Simplexity embraces the notion that change is both simple and complex and urges educational leaders to choose a small number of core priorities on which to focus, pursue each priority by building users' capacities, and make sure to embrace a two-way, transparent learning relationship between practice and results (Fullan, 2011).

7 key insights. Seven key insights were offered for leaders to become more effective and influence change. Effective change leaders actively participate as learners to help the organization improve, combine resolute moral purpose with impressive empathy, leverage effectiveness to motivate, support collaborative competition, balance humility with confidence, recognize power and limitations of statistics, and find simplexity in complex situations (Fullan, 2011). Fullan argued that leadership must return to its natural habitat, determine what people do every day, and investigate how to improve what people do every day. The key message behind Fullan's work is that deliberative practices drive better practices. Thus, Fullan (2011) proposed to make change simple, uncluttered, and focused on a small number of action steps for accelerated, sustainable results.

Richard Elmore, the instructional core and instructional rounds. Richard Elmore is known for his networked approach of improving teaching and learning through the use of instruction rounds. Elmore (2008) believed leaders often tried to improve the performance of schools without knowing what is happening in classrooms. Thus, learning was promoted for leaders in three areas: the content put before students, the knowledge and pedagogical skills teachers bring to teaching that content, and students' active engagement in learning the content. Elmore (2008) defined these three elements; content, teaching, and students; as the instructional core and boldly argued, no other factors play as great a role in student learning and performance yet by way of the core.

Instructional rounds, adapted from medical rounds, are used for school improvement by placing leaders and educators in classrooms for direct observation followed by discussions of the instruction observed. Just as medical rounds provide opportunities for physicians to diagnose patients, develop one's knowledge through collaboration with peers, and establish common treatment practices and norms, instructional rounds allow educators to work together to solve shared problems, improve one's practice, and identify a set of shared practices of improvement. Through a common problem of practice, one which transcends all silos of the system, learning from instructional rounds is lifted to a larger context for system-level improvement. Further, the more developed the strategy observed, the more likely rounds will add to the overall system's improvement strategy.

Improvement Science in State Education Agencies

Improvement science Tennessee. Since federal laws such as the *No Child Left Behind Act* (2001) and *Every Student Succeeds Act* (2015) went into effect, state education agencies have been charged with supporting school districts' improvement, particularly underperforming

districts and schools, in new ways. As a result, state education agencies needed to expand beyond traditionally defined roles of monitoring, setting policy, and the disbursement of funds to build the capacity of leaders to fulfill obligations to support struggling districts and schools (Unger, et al., 2008). Educational leaders, researchers, and policymakers agreed state education agencies needed to rethink how the business of state education agencies was done and establish new organizational structures with intentional coherence, realistic expectations, and equitable allocation of resources. Since 2012, state education agencies have been granted flexibility in meeting requirements under the Acts with options to develop state-specific comprehensive plans with rigorous expectations for closing achievement gaps, reducing inequity among student subgroups, improving quality instruction, and increasing student outcomes for all students.

Several state education agencies began to turn to the field of improvement science for strategies, techniques, and a framework for structured support of districts. For example, California, Kentucky, and Tennessee have all taken part in integrating improvement science into school districts (Carnegie, 2018).

Tennessee succeeds. In *Tennessee Succeeds* (2015), Tennessee's then Commissioner of Education Dr. Candice McQueen outlined three strategic goals and five priority areas for the Tennessee Department of Education (TDOE). Priority five, district empowerment, was aimed to provide districts with increased autonomy and supporting tools to make the best deicisions possible for students (TDOE, 2015). More specifically, Strategy D promoted innovation and idea-sharing through district NICs. This strategy drew on developing research in improvement science to develop a statewide knowledge base around top priority problems of practice. As a part of this strategy, the TDOE provided districts opportunities to take part in district networks

aimed at making a change in high-need areas as well as pilot programs organized around innovative practices in improvement science (TDOE, 2015).

Tennessee early literacy network (TELN). In February 2016, the TDOE took the first steps along an improvement journey. With funds from the Gates Foundation and a partnership with the Carnegie Foundation for the Advancement of Teaching, the TDOE formed the Tennessee Early Literacy Network (TELN) (TDOE, n.d.). TELN aimed to bring districts from across the state of Tennessee together to work on a common problem of practice, improving reading outcomes for the students of Tennessee (Idealist, 2016; TDOE, 2016).

The Carnegie Foundation was recognized across the country for leading work around school improvement and innovation (TDOE, 2016). The TELN engaged districts and Tennessee regional offices, called the centers of regional excellence (CORE), in principles of improvement science, as defined by Carnegie (Idealist, 2016; TDOE, 2016). TELN used tools of improvement science to investigate the current literacy landscape across the state, analyze the systems that may be impeding K–3 reading achievement, enter into PDSA cycles for rapid tests on change ideas, and measure progress toward meeting the network aim (TELN, 2017a). The Model for Improvement, the three improvement questions, and five critical activities of improvement science, including theory, inquiry, test, measure, and revisit and retry, were integral components of the TELN network (TELN, 2017b).

As the department's CORE offices worked to build a series of NICs, districts within each region focused on engaging in a disciplined set of ‘improvement protocols’ designed to identify strategies for improving student reading outcomes (TDOE, 2016). Peers within networks worked collaboratively to identify and test effective and practical strategies for improving elementary literacy practices that could eventually be scaled across the state.

The long-term goal of the network was to shift how the TDOE empowered districts' problem-solving capacity to find better solutions, transfer learning to their unique contexts, and improve overall student achievement (Idealist, 2016). To measure the progress of the network, TDOE partnered with The New Teacher Project (TNTP) to develop a Tennessee-specific literacy walkthrough tool. Adapted from a nationally vetted observation tool from Student Achievement Partners, the Literacy Learning Walk Tool measured the three instructional shifts for literacy by focusing on research-based, high-level behaviors and actions tied most closely to teaching and success for Tennessee students. Through literacy learning walks (LLWs) TELN network members were provide a common network-wide measure, a shared vision of high-quality literacy practices, and a shared language of networked improvement (Bradford, Fillers, McLeroy, McManus, Wells, 2019).

CORE framework for district support. The Tennessee Department of Education uses regional field offices to provide school districts embedded support. There are eight such offices, called the Centers of Regional Excellence (CORE), across the state. Each CORE office is staffed by one executive director, one administrative assistant, and seven academic consultants specializing in English language arts, mathematics, data analysis, teacher and principal preparation, intervention, career and technical education, and school nutrition. The mission of CORE is to impact student readiness and build educator capacity through targeted differentiated academic support (TDOE, 2019).

Tennessee's CORE offices are an integral component of the Tennessee Department of Education's Every Student Succeeds Act state plan (TDOE, 2018). Districts failing to meet federal guidelines for minimum progress for student achievement, growth, participation rates, or subgroup expectations are identified as *In Need of Improvement*. In which case, identified

schools and districts receive priority support from the CORE office located in their region. Through targeted and differentiate support, CORE consultants work to assist school and district turnaround efforts with resources and support in capacity building and continuous improvement.

CORE support framework. According to Fullan, the problem with system-wide reform encompasses the lack of focus on both specific strategies on changes in instructional practice and what it takes to bring these changes about in classrooms (2016). The CORE Support Framework (Figure 2.3), designed with system-wide thinking in mind, was implemented for the first time with Tennessee school districts during Fall 2019 in response to the Tennessee Department of Education's effort to reimagine traditional frameworks for district and school support. Differentiated district support continued to be a state priority. However, lessons learned from TELN, such as the benefits of integrated improvement science practices, surfaced the need for a more systematic approach to district and school support.

The CORE Support Framework consists of three concentric circles and a center or core, which serves as a grounded mechanism. First, the outer circle, modeled after the work of Shewhart and Deming, is a modified PDSA cycle consisting of four similar steps. In Step 1, diagnosing, is where CORE consultants use data-driven tools, such as math learning walkthrough tools or root cause analysis tools, to measure strengths and weaknesses of the district and schools. In Step 2, planning, is where district leaders work with CORE consultants and use the knowledge gained during diagnosis to develop a plan that establishes the vision for excellent instruction. By using a modified version of the Model for Improvement (Byrk et al., 2017), clear goals are defined, which are tied to the vision and specific systems and structures needed to meet the goals as defined. In Step 3, implementation, is where districts enact their plan in which on-

Figure 2.3. *CORE Support Framework*

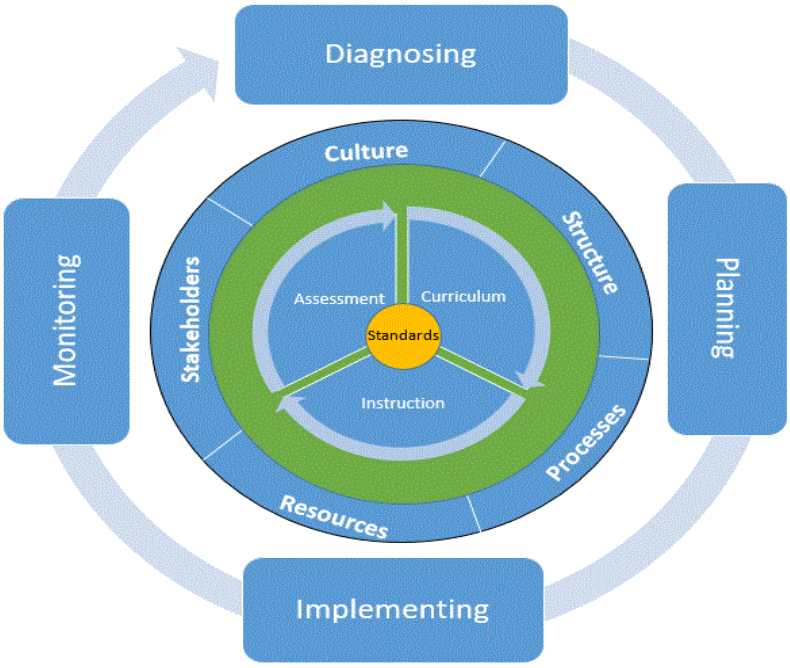

Figure 2.3. The CORE Support Framework (used with permission from Tennessee Department of Education, 2018)

paper strategies become lived practices in the schools. During the implementation phase, districts engage in rapid cycles of improvement, or PDSA cycles, testing change idea as determined during the planning phase. In Step 4, monitoring, is where districts, along with CORE support, engage in active, ongoing monitoring of results, real-time strategy revisions, and stakeholder and system accountability (TDOE, 2018). Overall, the outer circle provides the structure for ongoing support and analysis of progress toward district goals for improvement.

Second, in order to truly understand a district's system, one must attend to the influences on the system. Modeled after the PELP Coherence Framework, layer two of the CORE Support Framework defines six elements of district coherence. The elements of district coherence are identified and described as:

- Culture: The norms, values, and behaviors that define and drive behavior in a district.

- Stakeholders: The people and groups that make up a district. This includes internal groups like central office staff, principals, teachers, and students, as well as external groups like parents, businesses, organizations, and unions.
- Resources: This includes financial resources, instructional materials, human capital, and technology.
- Structures: Both formal and informal structures define how decisions get made and how people interact. Examples of structures are PLCs, regularly scheduled meetings, organization hierarchies, etc.
- Processes: These are the processes and procedures through which work gets accomplished. Examples of processes include protocols used in PLCs, student assignment procedures, rules for hiring and promotion, etc. (TDOE, 2018, slide 13).

According to Bryk (2017), improvement is a systems problem that requires a systems solution because the outcomes of education are a result of multiple processes interacting among classrooms, schools, districts, families, community organizations, and public social services. Thus, CORE considers the outside cycle, helping districts see their systems and identify the root causes that are contributing to their results, as imperative.

Third, the innermost circle of the CORE Support Framework is based on Elmore's instructional rounds and the instructional core. The alignment of Elmore's teachers (instruction), students (as measured performance on state assessments), and content (curriculum) center around the bullseye of the circle, which is defined as standards. While Elmore's three ingredients are necessary, the support of CORE must be grounded in supporting districts to be successful on state assessments, which are a measure of students' mastery of Tennessee Academic Standards.

Classroom observations and math learning walks. Modeled after TDOE's work around literacy and TELN, the math learning walk (MLW) tool was introduced to districts beginning in January 2019. The TDOE MLW tool, developed in conjunction with TNTP, also reflects a modified version of the Student Achievement Partners' Instructional Practice Guide (IPG). The MLW tool blends components of the IPG through defined teacher and student behaviors, which exemplify high-quality, standards-aligned K-12 mathematics instruction. However, the TDOE MLW tool also brings a system-level lens through indicators that investigate the culture and content used in math classrooms. The TDOE MLW tool is used in conjunction with district leaders to provide district and school leaders an opportunity to observe and learn alongside CORE consultants during the diagnosing and monitoring phases through partnered classroom observations.

The purpose of the MLW process is to allow CORE consultants to lead conversations with district and school leaders, which support planning around system-level improvements. By using the MLW tool to identify trends across classrooms, CORE consultants guide district and school leaders in strategy selection and plan development to support math-specific improvements grounded on research-based, high-level actions and specific behaviors that can move the district forward toward its vision for standards-aligned math instruction. Lastly, the MLW tool is not designed to provide evaluations or teacher-specific feedback.

Summary

Despite countless school reform efforts, American schools struggle to make significant gains. The principles of improvement science may offer an alternative for state leaders eager to support local school districts' efforts for real change. Through the use of the CORE Support Framework, state education agencies have a guideline to facilitate district improvement efforts.

The framework, based on Plan-Do-Study-Act cycles, the Model for Improvement, Three Improvement Questions, Six Improvement Principles, and the Instructional Core, offers state consultants tools to drive disciplined inquiry, system analysis, and support district planning and monitoring of specific changes in a systematic and embedded capacity. “Change is occurring so rapidly in our society that [state education leaders] have no choice but to embrace it and make it work in [their] favor. [Everyone has] a choice to make: to accept passively the changes that are thrown at [them], or to use [their] resources to create [their] own changes resulting in improvement" (Langley, Moen, Nolan, Nolan, Norman, & Provost, 2009, p. xv).

Chapter Three: Methodology

This chapter includes a description of the research questions and approach, data collection and analysis procedures, participants, and setting of the study, a description of the instrument, and ethical considerations. Due to the social nature of the study, a qualitative case study approach was utilized. First, because education is considered a social activity, or applied social science, practitioners often deal with the everyday dealings of the lives of those involved. As such, an invested interest in knowing more about improving one's practice is best approached through a qualitative research design (Merriam, 2009). Second, a case study research method was chosen due to the bounded nature of the system under analysis and the field-oriented context of the unit of study (Yin, 2009). Further, the case study was preferred due to the necessity of direct observation through math learning walks and soliciting the perspectives of the district members involved through focus groups, journals, interviews, and artifacts. The case study differs from a history with the addition of direct observations of the events being studied and interviews of participants (Yin, 2009).

This project, through a qualitative case study approach, detailed one CORE math consultant, partnered with one school district, to research the integration of improvement science practices for the district and school support. District support was grounded in the CORE Support Framework and took place during the 2019-20 school year. The timeframe for collecting data was from January 2020-March, 2020. Data were stored through the use of digital storehouses on the district's network, a password protected device, and locked filing cabinets then coded to identify trends and summarize findings.

CORE Support Framework

The CORE Support Framework, as described in Chapter 2, was used to drive how one CORE consultant interacted with one school district for the qualitative case study. Recall a four-step process that drives the outer circle of the CORE Support Framework: diagnosing, planning, implementing, and monitoring. The outer cycle of the CORE Support Framework establishes the foundation for the structure of the study. The four-step process is outlined in the case study through multiple sources of data collection to provide sufficient documentation of the improvement journey taken by the school district. Phase one, the diagnosing phase, occurred before the onset of the study, and information was collected through participant interviews, focus group interviews, and journal entries. The study began after an IBR approval and amid the planning and implementation phases. Planning occurred in December 2019 and implementation occurred during December 2019-January 2019. Last, the monitoring phase occurred in February.

Research Questions

The following research questions were formulated for this qualitative study:

1. How does a school district engage with a state education agency to do improvement science work?
2. How does a state academic consultant support a school district in improvement science work?

Description of the Specific Research Approach

When qualitative research is supported by the researcher as the primary instrument for data collection and analysis, a case study approach allows a richly descriptive end product aimed to contribute to the knowledge of an individual, group, or organization (Merriam, 2009; Yin, 2009). In this study, one state education consultant researched with one school district, local

education agency (LEA), to determine how the implementation of a new framework of state education agency (SEA) support, grounded in the principles of improvement science, was developing in the field. Through a structured inquiry process, called the CORE Support Framework, the consultant worked to coach and build the capacity of district and school leaders in diagnosing problems of practice, planning for interventions, implementing strategies and action steps, and monitoring progress toward identified goals of improvement (Swartz, 2018; TDOE, 2018). Through the case study approach, a sufficiently copious description of the context of the work and journey in improvement coaching and learning allows others to transferability to other unique contexts.

Interviews. Interviews serve as one of the most important sources for case study research (Yin, 2009). While surveys allowed data to be collected and compared throughout the study on the same set of structured questions, interviews allowed a more conversational set of inquiry. Interviews were conducted with both school and district leaders taking part in the study. The case study interview satisfied both the line of inquiry, gathering facts of the study, while simultaneously providing the opportunity to gather opinions as well through friendly, non-threatening, open-ended question sequences. A list of guiding questions used during interviews is in Appendix I.

Surveys. Surveys are standard operating procedures for the CORE office. When any training is provided, there is a survey used to determine the value of the session from the perspective of the participants. Typically, surveys are only administered following training or professional development sessions. Thus, the same protocol was followed for this study. Surveys were administered following each teacher's professional development/learning session. There was a total of two sessions offered throughout the study, and surveys were collected

following each session. Surveys were then submitted to the CORE office administrative assistant to enter the data as assigned by the TDOE, store hard copies as assigned by the CORE director, and share results in with the CORE consultant for review. Due to the protocol for survey administration and data collection, a historical perspective of surveys was also available through the CORE office archive, beginning with the work with the district of the study from the 2018-19 and 2019-20 school years. A copy of the survey template is provided in Appendix J.

Focus groups. Focus groups were used to gain additional insight from a cross section of stakeholders. As part of the CORE's partnership with the district, the majority of improvement science coaching was conducted with district and school leaders. Thus, the study wished to gain a historical perspective from a diverse group of participants. Additionally, teachers' interactions with the state academic consultant provided additional perspectives and context. Three focus group meetings were conducted throughout the study. The first focus group meeting included the director of schools, two district supervisors, one school principal, one school assistant principal, and two teacher leaders. A second focus group meeting included the case study school principal and four grade one teachers, which had participated in the TDOE TELN network. The third focus group meeting was conducted with four grades 2-5 math teachers from the case study school. The grades 2-5 math teachers were part of the school's 2019-2020 partnership with CORE, which included the inaugural implementation of the CORE Support Framework and math learning walks. A predetermined set of open-ended questions were used to gather additional data and insight from the teachers' lens to corroborate the emerging trends from both the school and district leaders' interviews and focus group meetings. Focus group meetings scripts and guiding questions are in Appendices F to G.

Journals and Artifacts. In addition to interviews, digital journals were kept by and

collected from the school principal, assistant principal, district supervisor, and CORE math consultant. Participants had the freedom to access and document in personal journals whenever they saw fit. Because school and district leaders interacted with school staff outside the windows of training or professional development, it was necessary to gather information in the action periods. In addition, artifacts of sample student work and teachers' lesson plans were collected during the action period and stored by school and district leaders as part of the digital journals. School and district leaders shared their journals with the CORE math consultant to gather data through the action period and analyze against other data collected through other means.

Triangulation. The case study approach allowed for the opportunity to gather multiple sources of data. To meet the necessary conditions of triangulation, investigators who use a case study research design must use multiple sources of data to establish a broad range of historical context converge multiple lines of inquiry (Yin, 2009). Data triangulation was met because at least three sources of data were collected and analyzed for the study.

Description of the Participants and Setting

The setting for the study was in one rural Tennessee school district. The district was identified as in need of additional targeted support and interventions (ATSI) based on federal guidelines as outlined by the *Every Student Succeeds Act*. In particular, the school has a high population of students identified as economically disadvantaged, and the school district is district-wide Title 1. The school selected for the case study was chosen by the CORE director, CORE math consultant, and district leaders based on this designation.

The participants of the study included individuals from the district leadership team as well as teachers and leaders from one K-5 elementary school. The elementary school had one

math teacher per grade level in grades 2-5. The school had one principal and one half-time assistant principal who split time at the neighboring middle school.

Areas of need for the school included strategies to support academic achievement and growth on state assessments, as well as strategies to support interventions for a high rate of chronically absent students. Although the district had a total of four elementary schools, due to the rural nature of the district as well as financial constraints, the school in the study housed all students with disabilities in grades K-5 for the district.

Research Design

The study reflects a single-case design. The rationale for a single-case design was to describe the circumstances and conditions of an everyday or common school (Yin, 2009). Because the work of the CORE office, supporting local school districts, is a part of an everyday occurrence, the case study approach was needed to chronical how the integration of improvement science techniques, through the CORE Support Framework, effected the day-to-day interactions of school districts. Through the study of one school district, lessons learned from the study have the potential to inform the average educational institution. “Erickson (1986) argues that since the general lies in particular, what we learn in a particular case can be transferred to similar situations” (Merriam, 2009, p. 51).

Data Collection Procedures

Data collection. Instruments for qualitative data collection, such as journals, surveys, interviews, and artifacts, were kept throughout the study by a diverse sample of stakeholders. By conducting interviews, data were collected at onset as well as throughout the study. Interviews and focus group meetings added context to defining the unit as well as gaining perspective from various stakeholders. Surveys were also used to collect user data on feedback from training

provided by the CORE math consultant teachers following training sessions. Journals allowed each stakeholders' perspective to be part of the story and aid in avoiding the personal bias of the researcher. Artifacts were collected throughout the study to document what happened. Artifacts included student work, district plans, teacher plans, teacher reflections, images collected from training or learning walks, and learning walks data debrief and trend reports.

Management of the data. The majority of the data was collected digitally within a cloud storage device on the district network server. First, digital journals and artifacts, kept by the school principal, assistant principal, district supervisor, and CORE math consultant, were all stored in a shared network drive. Second, paper copies of surveys were collected following each training session with teachers and then uploaded by the CORE office administrative assistant to a shared drive within the CORE office. Also, paper copies were filed in a locked filing cabinet at the CORE office. Third, focus group meetings and individual interviews were recorded to ensure accuracy and then transcribed at a later date. These recordings and transcripts were also uploaded to the district server, which allowed participants access to review for accuracy if desired. Each document and folder contained a unique access link, allowing access only to those who participated in each piece of data collection.

Protocols for participant protection. Permission from prospective participants was sought through a three-tier process. First, the CORE director sought permission from the assistant commissioner of education for the study to take place in the designated region. Second, IRB permission were granted from Carson-Newman University and presented to the director of schools for review and approval. District supervisors were informed of the partnership. Third, school leaders and teachers were informed of the partnership. Participants were informed that journal entries, survey responses, interview transcripts, and artifacts would be collected as part of

the study. All data collected, including data collected from classroom observations during math learning walks, would be coded anonymously and would include no identifiable information. All data were co-collected in digital documents, where the participants could observe notes being documented in real-time, to ensure the accuracy of data collection throughout the study. Member checks were used to provide participants the opportunity to review, revise, or reject any data as part of the report. Last, records will be protected on a secure server and device for 7-10 years.

Data Analysis and Procedures

First, the school principal, the CORE math consultant, and a district supervisor began the year with keeping journals in a Google Docs template on the district's secure server. The principal and supervisor permitted the researcher access to the drive. Having digital documentation provided increased accuracy and efficiency. Interviews and surveys were collected throughout the study. Typically, a survey followed each training/coaching session, which occurred monthly. Interviews were conducted as pre/post format in small focus groups, and some were one-on-one. Artifacts were collected from each planning session with leaders, training/coaching session materials, as well as district-submitted work from their PLC meetings. Math learning walk artifacts were collected as pre and post as well.

Coding process. The coding of the data follows both an open-coding to axial-coding format as well as a selective-coding format. First, open coding was used to sort through the various perspectives of different levels of participants. Interview transcripts, surveys, focus group transcripts, and journal entries were reviewed to identify emerging trends across various participant groups. Subsequently, axial coding was used to determine trends across all participant groups. Next, selecting coding format was used identify trends.

Rigor and Ethics in Qualitative Research

Any research in schools should be conducted with the highest integrity. Educators have an imperative obligation to students, and the research in this study was done so that no teacher nor student was put at risk (Ary, Jacobs, Sorensen, Walker, 2014). Due to the everyday nature of the study, the interventions introduced through the CORE framework were presented with the intention of positively impacting district support based on the evidence collected through improvement work, which had already had positive impacts in the state of Tennessee. The study's intent was to document the interactions of a state consultant, and local education agency's operating strategies under the new framework of district support, and to use feedback for better district and consultant practices.

Credibility. Through various tools, such as the math learning walk tool, which measures changes in teachers in practice over time, and district-created planning, instruction, and student-work analysis tools, relevant data were collected using the same tools multiple times throughout the study. By analyzing the data collected and comparing from one collection point to the next, trends, such as changes in teacher practice or changes in student work, were analyzed for patterns. Through the Model for Improvement and the PDSA cycles, continuous improvement efforts were analyzed against the improvement practice of 'adopt, adapt, or abandon' for various interventions bi-monthly, weekly, and daily on some measures. Credibility was also achieved through multiples sources of data collection and member checks.

Dependability. To protect the privacy of the participants, audit trails for documentation purposes could not be provided to the general public. Thus, dependability for the study was established with corroboration through triangulation. Through the use of multiple sources of

data, such as journals, interviews, focus groups, and artifacts, the reliability and dependability of the study were confirmed. Additionally, a peer debriefer was used throughout the study.

Transferability and Confirmability. Descriptive adequacy was used to provide a sufficiently copious description of the context of the study, the participants, interactions among the core math consultant and school and district participants, and interactions within the school among the school principal and teachers. An accurate, detailed, and complete description of the study was provided to allow readers sufficient information to transfer findings to other contexts.

Triangulation of data, as well as peer reviews and member checks, were used to confirm the data collection and analysis of the study. Further, through a personal reflective journal, research bias was controlled through reflexivity.

Ethical Considerations. Following IRB approval, permission was acquired by both the district superintendent and CORE office director. Participants' anonymity was protected by a coding process, ensuring no names or revealing factors were shared. All materials were stored in a secure, password-protected server located on school grounds.

Summary

Chapter Three describes the methodology and procedures of a qualitative case study where one school in one school district interacted with a state education math consultant through improvement science coaching support. A qualitative case study was chosen to capture the everyday dealings of school and district leaders with teachers, as well as document how state education agencies are part of those interactions. Due to the social nature of these interactions and the desire to provide context for other school districts interesting in improvement science work, a case study approach was the best fit for the study. The case study documented how one

school district engaged with a state education agency to conduct improvement science work and how a state academic consultant supported a school district in improvement science work.

The methodologies and procedures applied a new framework of state support of districts, called the CORE Support Framework. Through the CORE Support Framework, interactions were documented through the lens of various stakeholders. Both district and school data were gathered through the use of journals, surveys, interviews, focus groups, and artifacts. All participants gave consent to participate in the study, were assured anonymity through coding procedures, and took part in member checks to ensure accuracy.

Chapter Four: Presentation of Findings

The qualitative study was designed to investigate how one local education agency (LEA) engaged with a state education agency (SEA) to do improvement science work. The study the CORE Support Framework, a modified grounded theory, which incorporates principles from three grounded theories: the Instructional Core, the PELP Coherence Framework, and the Model for Improvement. Data to answer the two research questions were collected from surveys, interviews, focus group meetings, journal entries, and artifacts. This chapter includes descriptive characteristics of the case study, including demographics of the district/school, participants, and setting. Details of data collection, coding, and analysis are provided in correspondence to each research question. Coding tables are provided to illustrate the data analysis process. Additionally, the summary briefly highlights trend findings in relation to the two research questions, which are discussed in greater detail in Chapter Five.

Role of Researcher

The researcher in the study was a state math consultant for the case study school district and school. The Tennessee Department of Education served as the SEA for this study. Logistically, the TDOE has central staff located in Nashville, Tennessee, and eight field service offices called the Centers of Regional Excellence (CORE), who are stationed in eight regions throughout the state. The researcher was engaged with the case study district for the 2018-19 and 2019-20 school years through a partnership for school district support and improvement. As a state academic consultant, the researcher engaged in improvement science training during the 2018-19 school year. TDOE's work in improvement science led to the development of a new framework for school district support, called the CORE Framework, which was grounded in the practices and principles of improvement science. For the 2019-20 school year, the consultant

engaged with the school district under the new framework of support. However, the researcher acted as a non-participant for the duration of the study. To enhance objectivity and neutrality, the researcher solicited feedback from participants through member checks to corroborate findings and on-going peer reviews from colleagues outside of the scope of work.

Research Methodology Applied to Data Analysis

The research methodology for the data analysis required the researcher to engage in a data spiral with an intense and reflective review of field notes, transcripts, survey responses, recordings, journal entries, and artifacts. Advanced audio software was used for both real-time recording, to preserve the authenticity of participant responses, and simultaneous transcribing, for increased accuracy, for all focus group meetings and interviews. The researcher maintained field notes, during focus group meetings and interviews to capture highpoints of participant responses, to serve as benchmarks during the review, as well as any non-verbal information, such as gestures, tone, and volume, which may have accompanied a response. Each transcription was reviewed and modified only in the removal of any identifiable information. For example, all speech nuances were preserved, while some nouns, such as specific school names or individual names, were replaced by [the school], [the principal], or [the consultant] to protect the anonymity of participants. Data were revisited through multiple reviews and reflective logs were used to identify keywords, thoughts, or themes as they began to surface. This process of horizontalization, or the identification of significant statements or quotes to develop meaning, is a key characteristic of qualitative phenomenological research (Ary, Jacobs, Sorensen, & Walker, 2014). All printed and digital data were stored in locked filing cabinets and/or password-protected servers/devices.

Next, to reduce the data from the compilation of data sources, each data entry relevant to the first and second were transcribed to reflect singular data points. Direct quotes were preserved to avoid potential bias. Singular data points were then sorted, organized, and categorized through open coding. Upon the first review of the data, *a prior* codes, aligned to the research and CORE framework, began to surface. However, upon subsequent reviews, an alternate set of *in vivo* themes began to emerge, which were more reflective of the data. As *in vivo* codes were reduced, the themes for axial coding were defined. Peer reviews were used to solidify confidence in the coding process and selective coding was used to answer the first and second research questions. The summary of the coding process is displayed in Figure 4.2 and 4.3.

Phenomenological Research Method

A phenomenological research method was used to investigate the experiences as perceived by the people who have participated in improvement science work in partnership with a state education agency and a state academic consultant. While it can be assumed that there are many ways one may interpret an experience, the purpose of a phenomenological approach is to gather the essence of the study as perceived by the participants (Ary, Jacobs, Sorensen, & Walker, 2014). A single case was selected for the study to investigate a representative or typical case. In a single case study approach, the objective is to capture average circumstances and conditions of typical situations as a mechanism to inform the experiences of the average person or situation (Yin, 2009).

The purpose of the phenomenological approach for this case study was two-fold. First, the study provided insight into the phenomenon of a SEA's support of a LEA through an improvement science-based framework as experienced by the participants. Second, the study was

designed so that insights gained could inform and support better practices of improvement for SEA's support of LEAs.

Theoretical and Conceptual Framework

The theoretical framework for the study is based on The Model for Improvement, whose intellectual foundation dates back to W. Edward Deming's science of improvement through practical applications of processes, such as the Deming Wheel and the System of Profound Knowledge (Langley, Moen, Nolan, Nolan, Norman & Provost, 2009). Dramatic results from the implementation of this model, which is driven by improvement based on developing, testing, and implementing change ideas, have been seen throughout industry and healthcare organizations throughout the world (Langley et al., 2009; Bryk, Gomez, Grunow & LeMahieu, 2017). In addition, a practical application of the model was adapted for improvement in the field of education (Bryk et al., 2017). The modified improvement model adapted the inquiry piece to include the Three Improvement Questions, which are a slight revision from the original model, maintained the PDSA cycle, and paired the application of the process with the Six Improvement Principles.

The conceptual framework for this study is a modified grounded theory based on elements of the Model for Improvement, the PELP Coherence Framework, and the practice of instructional rounds and classroom observation. The researcher believed the modified grounded theory provided the best explanation for the progression of the integration of improvement science in the context of the study. The theory was used to inductively build a theory around the CORE Support Framework through the use of focus group meetings, interviews, surveys, and review of past journal entries and artifacts provided by a typical district.

Research Questions

The following research questions were formulated for this qualitative study:

1. How does a school district engage with a state education agency to do improvement science work?
2. How does a state academic consultant support a school district in improvement science work?

Demographics

The rural Tennessee school district in the study consists of four elementary schools, 1 middle school and one high school serving a total of approximately 2,400 students. The elementary school for the case study has one full-time administrator, one half-time administrator, 27 teachers, and serves approximately 370 K-5 students. Grades K-1 have three teachers per grade-level and are self-contained. Each teaches all four core subjects of reading, math, science and social studies. Grade 2 has four teachers who team teach either English Language Arts (ELA) and social studies or math and science. Grades 3, 4, and 5 have three teachers per grade-level and are departmentalized, teaching either ELA, math, or science/social studies.
The case study school is a Title 1 school, which means at least 40% of the total student population was identified under federal guidelines as economically disadvantaged.

In 2018, the case study school was designated as in need of Additional Targeted Support and Improvement (ATSI) by the TDOE as part of the *Every Student Succeeds Act* (ESSA). An ATSI designation, as outlined in Figure 4.1, identifies schools falling in the lowest 5% of schools on the state's accountability model for two or more subgroups. In 2018, the case study school failed to meet expectations for both economically disadvantaged students (45% of the total population) as well as the white student subgroup (87% of the total population).

Figure 4.1. *Tennessee Department of Education ATSI Eligibility Scenarios*

ATSI Eligibility Scenarios	
Pathway 1	*Pathway 2*
A school is eligible for ATSI if it: • Earns an overall school accountability rating of **1.0 or less** based on 2017-18 data **AND** • Ranks in the bottom five percent across all accountability indicators in terms of performance for **at least one** of the four accountability groups (i.e., Black, Hispanic, or Native American combined; Economically Disadvantaged; English Language Learners; and Students with Disabilities)	A school is eligible for ATSI if it: • Ranks in the bottom five percent across all accountability indicators in terms of performance for **at least two** of the four accountability groups or six federally defined racial groups (i.e., Asian, Black, Hawaiian-Pacific Islander, Hispanic, Native American, and White) *For example, a school in the bottom five percent for both its Economically Disadvantaged students and its Hispanic students would be eligible for ATSI.*

Figure 4.1. In 2018, the Tennessee Department of Education was required by the federal Every Student Succeeds Act (ESSA) to designate schools in need of Additional Targeted Support and Improvement (ATSI). The department used one of two pathways to identify those schools with the lowest performance across accountability indicators and student groups using 2017-18 data. Adapted from Tennessee Department of Education (TDOE). (2018). ATSI resource guide.

Descriptive Characteristics of Participants

The participating district for this study was selected in collaboration with a regional state education agency office's executive director and mathematics academic consultant. The selected district was chosen based on current work streams already occurring between the district and CORE. The selected district had been partnering with its regional CORE office for the past three years, which were the 2017-18, 2018-19, and 2019-20 school years. Once the district was chosen and IRB approval granted by Carson-Newman University, permission to conduct research was sought and granted by the district's director of schools. Upon receipt of approval, the state academic consultant collaborated with the director of schools to select one school within the district to take part in the case study. The chosen school was selected based on current school-improvement workstreams and a current partnership with CORE.

The participants from which data were collected spanned a cross-section of district leaders, school leaders, and teachers. The district superintendent, as well as one district elementary supervisor and one district secondary supervisor, participated in the study. At the school level, one principal and one assistant principal from the case study school participated in the study. Additionally, participants included eight classroom teachers, all from the case study school. All participants were selected based on their experiences, areas of expertise, and engagement with the CORE office and the CORE Framework for district support. Participants from all levels of district roles were selected to capture each unique perspective of how improvement science work occurred within the varying classroom, school, and district contexts.

Data Collection

Data collection process. The researcher first obtained permission from the director of schools to conduct the study and access to journey entries and artifacts, which are stored on the district's secure server (see Appendices A and B). Next, the researcher obtained consent from participants, including two district supervisors, one principal, one assistant principal, and eight classroom teachers. The researcher provided information detailing the purpose and research questions of the study. The participants were informed their engagement in the study was voluntary. Informed consent of volunteer participants was sought and collected through the use of content forms; samples of consent forms can be viewed in Appendices C, D, and E.

Data for the qualitative case study included four data sources— three focus group meetings, two interviews, two surveys, and access to district stored journal entries and artifacts from the 2018-19 and 2019-20 school years. The district granted access to district-stored journal entries and artifacts, which were documented by one school principal and one district supervisor

during the 2018-19 and 2019-20 school years. Triangulation was reached with the inclusion of at least three data sources and increased dependability of the study.

The anonymity of district and school participants were protected by removing all identifying factors, such as district name, school name, and names of participants. Audio recording devices and transcribing software were used for each interview and focus group meeting to accurately document participant responses. Participants were granted access to the study transcripts and the final report. All data were stored in a secure location. Member checks and peer reviews were used for confirmability.

Data collection methods. Data collection methods were selected with the intention of gathering data that best provided insight related to the context of the participants of the study. The data collection methods included surveys, interviews, focus group meetings, journal entries and artifacts. Samples of each data collection instrument can be found in Appendices F and G.

focus group meeting. The study included three focus group interviews. Focus group one included a cross-section of district stakeholders, including: one director of schools, two district supervisors, one school principal, one school assistant principal, and two classroom teachers. The principal, assistant principal, and teachers were all members of the case study school. Focus group two included four 1st grade teachers from the case study school. Focus group three included a cross-section of math teachers from grades 2-5 from the case study school.
Each focus group meeting began with a set of chosen questions unique to the context of the group and was used to guide the conversational style group interview. In the semi-structured approach, questions were modified, or additional questions asked as they arose. Participants were encouraged to add to, build upon, or challenge comments of the other members of the group.

interviews. Four interviews were conducted throughout the duration of the study. A pre- and post-interview was conducted with one school principal from the case study school and one district supervisor, whose district role included support of the case study school. First, a more structured interview was used to collect quantitative data and qualitative data, such as those outlined in the description of the demographics of the school district and details of the initial partnership with the state education agency. One principal and one district supervisor were interviewed individually and were asked the same set of six questions (see Appendix F). Next, semi-structured interviews were used to collect additional qualitative data of participants' experiences, opinions, and beliefs regarding improvement science work. For the semi-structured interviews, an initial set of guiding questions were used to conduct each interview, one with the school principal and one with the district supervisor, and additional questions were integrated as they developed in conversation.

surveys. Surveys were a current practice between the state consultant and district. Permission to access and use post and current survey data from the 2018-19 and 2019-20 school year was sought and granted from both the district and state education agency. A sample of the survey, found in Appendix G, contains both quantitative and qualitative data. As this was a quantitative study, only the last question was used to gather participants' beliefs and opinions regarding state-provided training.

***journal entries and artifacts*.** Journal entries and artifacts were used to provide additional context in relation to interview or focus group meeting responses.

Data Analysis

Data analysis process. Data analysis began with a review of raw data. All transcripts and survey responses were read. Recordings were used to ensure the accuracy of the translation.

Raw data were coded by aligning participant responses to the corresponding research question. Next, open coding was used to identify and quantify reoccurring themes. Then, axial coding was used to categorize open codes. As references to artifacts were detailed in the transcripts, a note was made to access that artifact, download, and save a copy to import as appendices entries. Last, axial coding themes were summarized to answer each research question.

Data analysis displays. The data analysis for raw data, open coding, axial coding, and selective coding is displayed in Figure 4.2 and Figure 4.3. Figure 4.2 is the data display for the first research question. Figure 4.3 is the data display for the second research question.

Data analysis findings for research question one. Data analysis findings for research question one revealed three major themes. In order for a school district to engage with a state education agency to do improvement work, three critical ingredients must be present: access to and a desire for support from a state education agency, an openness and desire for change from the director of schools down to a cross-section of stakeholders, and purposeful and systematic engagement through structures targeted for growth and improvement.

access to and desire for support. In order for a school district to engage with a state education agency to do improvement science work, there must first exist the opportunity to do such work. Interview and focus group meeting transcripts revealed improvement science work began in the case study district through a partnership with one of eight CORE offices. The CORE offices are part of a statewide system of support and consultants are charged with providing targeted, differentiate, academic support to the school districts in their assigned region (TDOE, 2018). Focus group meetings and interview responses stated improvement science training, as well as targeted support through the use of literacy and math learning walks, were part of CORE support. In addition, engagement with the state education agency provided the

Figure 4.2. *Data Sorted in Levels of Coding for Research Question One: How does a school district engage with a state education agency to do improvement science work?*

Raw Data	Open Coding	Axial Coding	Selective Coding
"I don't know that it would have all been possible without CORE support." (Focus Group 1) "I guess you can try to hire people to do that, but we didn't have the necessary means to do that." (Focus Group 1) "…have specialized understanding that benefits our teachers that I think sometimes people don't have the opportunity to get." (Focus Group 1) "…there was just a sense of urgency…I don't know if we went too fast early on, but I also don't think we felt like we had time to wait on things." (Focus Group) 1 "We were open to support." (Focus Group 1)	Access to opportunity Access to specialized support Knowledge of need Willingness to engage	Access to and desire for support	District leaders must come from a place of acceptance and vulnerability, foster a supportive, transparent, and caring culture, and provide structures for targeted support for growth and improvement.
"When you look at the big picture of why it works here verses why it may or may not work someplace else—it's culture…mindset, vulnerability." (Focus Group 2) "I think there is a vulnerability our team brings to the table." (Focus Group 1) "I think we all have such a heart for kids and think, gosh, we know we have to change for these kids, we don't have time to wait around on it." (Focus Group 1) "Transparency from the top down or bottom up, that's from the onset." (Focus Group 1) "For growth to happen in a district, you have to have high expectations and there has to be low risk." (Focus Group 1)	Vulnerability Transparency Inclusive Collaborative Growth mindset High expectations Low Risk Trust Perseverance Caring	Openness and desire to change	
"This is very, much more, targeted to what our needs are." (Focus Group 1) "This model included on-going support as opposed to this one-time professional learning." (Focus Group 1) "Improvement science taught us to be really intentional about saying 'we need to find to find what works…and stick with it'." (Focus Group 1) "We put tools and structures in place that are affecting practice." (Focus Group 1)	Layered Embedded Ongoing Focused Targeted Coherent	Purposeful and systematic engagement	

case study district with access to specialized support. One participant described the state academic consultant as one with "specialized understanding that benefits our teachers that I think sometimes people don't have the opportunity to get." Quotes such as, "I don't know that it would have all been possible without CORE support," and "…honestly, I don't know, I shudder to think about, where we might be if we didn't have the support of that partnership," revealed the partnership with CORE to be an integral part of the integration of improvement science work into the district and case study school.

In addition to access, a school district must also have a desire for support. Having a desire for support includes being both knowledgeable of a need for support and the willingness to engage in improvement work. One participant stated, "We were in a place where we knew we needed support," while a second participant said, "there was just a sense of urgency…I don't know if we went too fast early on, but I also don't think we felt like we had time to wait on things."

openness and desire to change. A school district engaging with a state education agency to do improvement science work must possess both an openness and desire to change. The open coding for this theme revealed much evidence geared toward the mindset and culture of a school district who is engaging in improvement science work. The tally of key characteristics, which occurred numerous times throughout the study, are displayed in Table 4.1. These characteristics of a positive school culture appeared among multiple sources of data. Phrases, such as "transparency from the top down," "heart for kids," and "growth mindset" solidified the need for openness and desire for change.

purposeful and systematic engagement. Participants responses also revealed school districts wishing to engage with state education agencies to do improvement science work must

Table 4.1. *Characteristic of District Culture Identified*

Open Code Characteristics of Culture	N
Transparency	22
Collaborative	18
Growth mindset	15
Perseverance	15
Vulnerability/Openness	12
High expectations	9
Trust	8
Inclusive/All Stakeholders	6
Low Risk	6
Caring/Honoring/Heart for Kids	5

Note. These 10 identified characteristics had the most responses by participants during the study.

have a purposeful and systematic way to engage in the work. Open coding described purposeful engagement as layered, embedded, and on-going. Participants compared engagement in the CORE Support Framework as a model that "…included on-going support as opposed to this one-time professional learning." Additionally, open coding described systematic engagement as targeted and focused interactions driven by coherent structures of support.

Data analysis findings for research question two. State academic consultants provide districts with a systematic process for engaging in improvement science work, offer targeted learning and tools aligned to diagnosed needs, and foster a culture of high-quality, standards-aligned instruction.

a systematic process for engagement in work. Engagement in improvement science work with state academic consultants begins with a systematic framework of support. Open coding revealed a district's systematic engagement with a state academic consultant to do improvement science work included three key strategies. The state academic consultant supported district leaders and school leaders in the implementation of a systematic process for planning and engaging in improvement science work. According to one participant, the state academic consultants supported the district by "equipping administrators with the training necessary to

Figure 4.3. *Data Sorted in Levels of Coding for Research Question Two: How does a state academic consultant support a school district improvement science work?*

Raw Data	Open Coding	Axial Coding	Selective Coding
"I think the math walks I would consider a structure and support piece for us…" (Focus Group 1) "The challenge for us in the beginning was the variation and I think just not seeing the system." "The improvement science is one thing, but then the support to implement and strategies to implement…the protocols around what does this actually look like…is where [the consultant] helped district and school leaders…" (Focus Group 2) "One thing that's been helpful to me as a school leader is [the state academic consultant] provided a way for me to make sure I was following up on things." (Focus Group 1)	A structured process for planning and engaging in the work Diagnostic tool to focus the work Ongoing support and accountability throughout the work	A systematic process for engagement in the work	State academic consultants provide districts with a systematic process to engage in improvement science work, offer targeted learning and tools aligned to diagnosed needs, and foster a culture of high-quality standards aligned instruction.
"…took time to train their teachers well." (Focus Group 3) "We put tools and structures in place that are effecting practice." (Focus Group 1) "You can read any book, but you have to have some learning, some job-embedded professional learning to be able to *see* what that looks like…and the modeling part." (Focus Group 3)	Job-embedded professional learning Professional learning toolkit Targeted support	Targeted learning and tools aligned to needs	
"I feel like I'm doing a better job now with the standards…because of the support that's been given to me." (Focus Group 1) "It has helped me be more confident in my own teaching abilities and strategies." (Survey 2) "I mean…there's the added piece of 'we've got to figure out where we are academically too'…sometimes that would've gotten pushed down the road…but now we have the urgency that we can't do that." (Focus Group 1)	Build the capacity of teachers and leaders Build the confidence of teachers and leaders Evidence driven practice	Foster a culture of high-quality standards-aligned instruction	

conduct walks…to determine overall trends…formulate action steps…test our hypothesis and continue to monitor…" In addition, one district leader said, "The improvement science is one thing, but then the support to implement and strategies to implement…the protocols around what does this actually look like…is where [the state academic consultant] helped district and school leaders…"

Additionally, state academic consultants supported the district and school leaders in diagnosing trends to focus the work. The participants reported one such tool to be called a "learning walk tool." District artifacts defined learning walk tools as "an observation tool" used to "guide system-level improvements…identify trends across classrooms…guide strategy selection …develop plans to support [content] specific improvements…monitor improvements…" The case study district reported participating in both literacy and math learning walks as a mechanism for the integrating improvement science practices. One school leader stated, "Our team learned how to use the math learning walk tool and accompanying toolkit to systematically analyze the content put before students." The case study school principal also said, "The learning walks, whether you are talking about math or ELA, have been significant support for us in terms of just being able to really measure, to look at our classrooms and know what is going on."

Also, the state academic consultant provided ongoing support and accountability throughout the work. One school principal stated, "One thing that's been really helpful to me as a school leader is [the state academic consultant] provided a way for me to make sure I was following up on things." This trend continued beyond the administrative level. One classroom teacher said, "I know between visit A and visit B, there was a layer of accountability, which helps because there's something to keep me focused and on track." A second teacher stated, "I

think the walks have to be there too because we have to have people in our room to make sure that we're doing well. I need that input from the outside."

targeted learning and tools aligned to needs. Data revealed learning and tools aligned to diagnosed needs as an integral component of a state academic consultant's support of school districts engaging in improvement science work. Open coding revealed job-embedded professional learning for teachers and leaders, the development and training around improvement specific tools, and learning and support aligned to diagnosed and targeted needs to be important components of a consultant's support. One classroom teacher stated, "You can read any book, but you have to have some learning, some job-embedded professional learning to be able to *see* what that looks like…and the modeling part." In addition, leaders noted the importance of learning as well. One district leader said, "You first have to do the learning piece to get to the part where you can kind of condense that." Further, a school principal, referring to a printed copy of the math learning walk tool said, "I would have just read it, but I don't know I would have applied it as well without [the state academic consultant's] support."

foster a culture of high-quality, standards-aligned instruction. Data supported that in order for a state academic consultant to support school districts in improvement science work, there must be an intentional focus on fostering a culture of high-quality, standards-aligned instruction. To impact an instructional driven culture, state academic consultants must build both the capacity and confidence of teachers and leaders and ground implementation in evidence-based practices. One teacher stated, "I feel like I am doing a better job now with the standards…because of the support that's been given to me." The director of schools echoed this trend and said, "I mean…there's the added piece of 'we've got to figure out where we are

academically too'…sometimes that would've gotten pushed down the road…but now we have the urgency that we can't do that."

Summary

The purpose of this study was to determine the perspective of how a typical school district might engage with the state education agency and a state academic consultant to do improvement science work. This chapter presented findings from a qualitative case study with one school district and one school. The consultant used a modified grounded theory, based on The Model for Improvement, to collect and examine data. Upon IRB approval, district permission was granted to collect data in the spring of 2020 through the use of three data sources, including surveys, interviews, and focus group meetings. Permission was granted for the researcher to access journal entries and artifacts stored on the district's server from the 2018-19 and 2019-20 school years. All participants were volunteers and granted consent prior to participation in the study. The researcher in the study was the state mathematics academic consultant for the case study school. Raw data were analyzed through open coding, axial coding, and selective coding to answer each research question. Peer reviews and member checks were used for confirmability.

The first research question one sought to better understand how a school district engaged with a state education agency to do improvement science work. The first research question was answered through a data spiral, resulting in three themes. The three themes were: access to and desire for support, openness, and desire to change, and purposeful and systematic engagement. Thus, for a school district to engage with a state education agency to do improvement science work, district leaders must come from a place of acceptance and vulnerability, foster a supportive, transparent, and caring culture, and provide structures for targeted support for growth and improvement.

The second research question sought to better understand how a school district engaged with the support of a state academic consultant to do improvement science work. The second research question was answered through a data spiral, resulting in three themes: a systematic process for engagement in the work, targeted learning and tools aligned to needs, and providing support to district and school leaders to foster a culture of high-quality, standards-aligned instruction. Thus, a state academic consultant provides districts with a systematic process to engage in improvement science work, offers targeted learning and tools aligned to diagnosed needs, and fosters a culture of high-quality, standards-aligned instruction.

Chapter Five: Conclusion, Implications, Recommendations

The purpose of this qualitative study was to investigate how one state education agency used improvement science as a model for school district support. A phenomenological research method was used to gather the perspective of one case study school. Participants from the study included district leaders, school leaders, and classroom teachers. This research was timely due to work already underway by the Tennessee Department of Education. The researcher in the study was a state academic consultant for the Tennessee Department of Education and held a current partnership with the case study school. The framework used by the state education agency was the modified grounded theory that was influenced by The Model of Improvement, the PELP Coherence Framework, classroom-level observations, and instructional rounds. This chapter includes a review of the theoretical and conceptual frameworks, the research questions, and the design of the study. Also, limitations, delimitations, and assumptions are shared. Details for the data collection and analysis are also provided. The chapter concludes with a presentation of the findings of the study, the implication of the study, and recommendations for future research.

Theoretical Framework and Conceptual Framework

The theoretical framework for the study was based on The Model for Improvement (Langley et al., 2009; Bryk et al., 2017). The conceptual framework for the study was a modified grounded theory based on The Model for Improvement, the PELP Coherence Framework by Harvard and Fellows, and the concept of Instructional Rounds and the Instructional Core as implemented by R. Elmore (2008). The conceptual framework, called the CORE Framework, serves as the framework of school district support and improvement for the Tennessee Department of Education.

Research Questions

The following research questions were formulated for this qualitative study:

1. How does a school district engage with a state education agency to do improvement science work?
2. How does a state academic consultant support a school district in improvement science work?

Design of Study

This was a qualitative study of one school district and one case study school within the district. The study was designed to gather the perceptions of both teachers and leaders on the integration of improvement science as a model of school district support. The school district in the study was located in rural East Tennessee and was designated a district-wide Title 1. The case study school was a K-5 elementary school led by one principal, one half-time assistant principal, employed 27 teachers, and served approximately 370 students. The timeframe of the study was from January 2020 through March 2020.

Limitation, Delimitation, and Assumptions

The study was limited to one region in the state of Tennessee. The region in the study was limited to the region currently served by the state math consultant. The data collection for the study was limited to one school district and one school. Delimitations for the study included the sample size and sample population of the case study school. The study assumed all participants responded honestly in all surveys, interviews, and focus group meetings. The study also assumed all journal entries and artifacts shared by the district were accurate and without bias. Last, the study assumed all data were reviewed and reported with accuracy.

Data Collection and Analysis

The data for the study included surveys, interviews, and focus group meetings. Also, access to district-stored journal entries and artifacts from the 2018-19 and 2019-20 school years was granted. Data were collected through the use of advanced recording and transcribing software for increased accuracy. Secondary field notes were recorded by the researcher to increase reliability and provide context. Data analysis included the review of raw data through a data spiral of open coding and axial coding, which resulted in selective codes to answer each research question.

In reference to the first research question participant responses supported three main themes. First, in order for districts to engage with a state education agency to do improvement science work, there must be access to and a desire for support. Second, participants expressed the necessity for those engaging in improvement science work to possess both an openness to and willingness to change. Third, districts implementing improvement science work with a state education agency must have a purposeful process and a systematic approach to engaging in the work.

Data collected for the second research question also revealed three main themes. Similar to the first research question, district support from a state academic consultant also required a systematic process for engaging in improvement science work. Embedded in the methods for improvement science work, state academic consultants were reported to provide districts with job-embedded professional learning and toolkits to support diagnosed needs. Last, participants said the support of the academic consultant fostered a culture focused on high-quality, standards-aligned instruction.

Conclusions

Findings for the study had numerous connections to the literature, particularly to elements found both in the theoretical and conceptual frameworks.

Connections to the model for improvement. The Model for Improvement (Langley et al., 2009) is driven by three primary questions, followed by a plan-do-study-act (PDSA) cycle. While varying versions of the model exist, each version offers a systematic process for engagement in improvement science work. The data from the study, for both research questions, one and research question two, supported the need for a systematic process for engagement in improvement science work. For example, The Model for Improvement aims to assist users in determining and clearly defining what they wish to accomplish and what needs improvement. Through the study, multiple pieces of data emphasized the need for districts to both diagnose a focused need and align targeted interventions to that need.

Further, the state academic consultant in the study was reported to use tools, such as the math learning walk tool, to aid districts in diagnosing a targeted area of need and support. Improvement questions two and three ask users to define the changes to be implemented and the measurement piece to help determine if adjustments are impacting improvement. Multiple participants in the study commented on the level of accountability provided by the model of support, such as that found in the measurement piece defined by improvement question two and the implementation of the PDSA cycles.

Connections to the PELP coherence framework. Many connections from the study link to the PELP Coherence Framework. In particular, the influences on the instructional core, such as culture, structures, and stakeholders, proved to be a large part of how districts engage with a state education agency to do improvement science work (Childress, Elmore, Grossman,

King, 2011). In particular, the study revealed the culture of the school district doing improvement science work to be a significant factor. Participants' perceptions of success cited a positive district culture, driven by characteristics such as vulnerability, transparency, and trust, to be critical in improvement science work. Further, the inclusion of all levels of stakeholders in the engagement of improvement science work was perceived to be another key ingredient of success in improvement efforts.

Connections to the instructional core. The instructional core is defined to include the content students are taught, the skills and knowledge teachers bring to that content, and students' engagement in learning the content (Elmore, 2008). Study data supported the necessity of the instructional core. Theme three of research question two revealed a state academic consultant's support of a school district focused on improvement science work to include fostering a culture of high-quality, standards-aligned instruction. Multiple sources of data mentioned the shift in the district to a more instructional grounded way of doing business. This theme of high-quality, standards-aligned instruction included content materials, best teaching practices, and evidence of student learning, which permeated comments from all levels of teachers and leaders in the case study district.

Connections to the CORE support framework. The CORE Support Framework, which served as the conceptual framework for this study, integrates elements of The Model for Improvement, the PELP Coherence Framework, and the instructional core. Aside from the connections mentioned thus far, the CORE Support Framework specifically notes content standards for the center of the framework. Again, as elucidated in the third theme of research question two, participants in the study stressed the importance of improvement work being

grounded in content standards, proper materials to support those standards, and building teachers' and leaders' knowledge and capacity to execute the standards.

Implications

Implications for the study include those to be considered by the Tennessee Department of Education, other state education agencies, state academic consultants, and school districts.

Implications for the Tennessee Department of Education. The CORE Support Framework, which served as the conceptual framework for this study, began as a new framework of school district support for the Tennessee Department of Education's regional field offices during the 2019-20 school year. Study findings support the continued use of both the framework and practices based on improvement science. Participants in the study reported an increased focus on academics, the benefits of specialized support the state education agency provided, and the necessity of targeted and systematic engagement through the framework. The director of schools described the model of support to be transformative for his district. Thus, study findings support the Tennessee Department of Education in the continued use of improvement science practices and this model of support.

Implications for state education agencies. Study findings suggested the use of improvement science as a model of SEAs support of LEAs as a promising practice. Participants of the study supported the use of improvement science as a driving factor to the growth and improvement the district has experienced over the last two years. Also, having a state academic consultant to support learning for teachers and leaders was perceived by participants to be a critical link in the process. Thus, study findings suggested having structures in place to provide specialized support an integral part of LEA support.

Implications for school districts. School districts wishing to partner with state education agencies to do improvement science work must first consider if state structures are in place to support the effort. Otherwise, districts might seek out third-party vendors to provide such support. Second, the culture of the district proved to be a major factor that all participants cited as a necessary piece for beginning and sustaining improvement work. District leaders are encouraged to analyze their current system and choose a case study school with a culture of a positive, can-do mindset to begin work. Last, school districts will need to consider additions or modifications to current structures, tools, and resources to support improvement efforts. District leaders in the case study discussed the reallocation of fiscal dollars and adjustments in personnel to support their improvement effort.

Implications for state academic consultants. Last, the study supported the need for academic consultants in specialized areas of expertise. For example, the case study district had access to specialized support through its local CORE office, which included support from ELA and math consultants who received specialized training in improvement science and learning walks prior to engaging in district partnerships. The district supervisors, school principals, and classroom teachers all praised the level of support that was provided by the state academic consultant. Also, participants insisted the support provided by the state academic consultant must be embedded and on-going. Through sustained support, data revealed both teachers and leaders reported increased knowledge in content standards, improved skills in content delivery, and improved confidence in assessing student learning and understanding.

Recommendations

Research in the field of improvement science as a state education agency's framework for school district support is somewhat limited. No other known studies have documented other

SEAs adopting such a model for state-wide school district support and improvement. The data extracted from the case study school lay the initial groundwork for future studies. Potential areas of interest include continued research with a larger sample size of participants or the addition of districts with varying demographics or success standings in the state of Tennessee. By continuing to research the impact of improvement science as a framework for district support, state education leaders can use information gained to inform state-wide practices. Researchers outside of the state of Tennessee might consider a comparison research study to compare current research models to a model for improvement based on improvement science. Additionally, researchers in states other than Tennessee might consider a pilot study that could provide interesting data for SEAs or LEAs wishing to implement improvement science on a small scale. Last, one might wish to research SEAs support through improvement science versus similar support provided by outside vendors.

Summary

This case study sought to gather the perceptions of how one local education agency engaged with a state education agency for school district support and improvement. A modified grounded theory, based on principles of improvement science, was used as the theoretical and conceptual framework for the study. Two questions were researched in the study. The first question investigated how the school districts engage with a state education agency to do improvement science work. Three themes emerged in response to the first research question. The data from the study supported the district leader wishing to partner with state education agencies to do improvement work must come from a place of acceptance and vulnerability.

Further, there must be a transparent and supportive culture that provides stakeholders a caring and low-risk environment in which to learn and grow. District leaders must provide the

structures and support necessary for systematic engagement in work. The second research question investigated how a state academic consultant engaged with a local education agency to support improvement science work. The study revealed a state academic consultant supported districts in implementing improvement practices, such as the Model for Improvement and PDSA cycles, through a target and systematic process. That process included diagnosing specific needs and then providing training, tools, and resources to support improvement aligned to those needs. Additionally, the state academic consultant aided the district in fostering a culture focused on standards-aligned materials, instruction, and student learning.

The study provided a lens into one state education agency's support of one local school district. However, education leaders can use the findings of the study to consider how improvement science practices, whether they are at the state, local, school, or classroom levels, might inform their improvement efforts.

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Appendices

Appendix A

Letter to Director of Schools Requesting Permission to Conduct Research

November 21, 2019

REQUEST FOR PERMISSION TO USE (DISTRICT NAME) SCHOOLS DATA FOR RESEARCH

Dear Mr. (Director of Schools),

I am currently a doctoral candidate at Carson-Newman University. The research I wish to conduct for my dissertation involves collecting and analyzing Improvement Science as a State Education Agency's Framework of Local School District Support in grades 3-5 at (Elementary School) during the 2019 -2020 school year. I also would like to share the data with district supervisors and principals of the elementary school to gain their perception of the data/findings.

I am hereby seeking your consent to use and analyze the data, materials, and artifacts collected through the partnership with (Region) Tennessee Center of Regional Excellence and to conduct surveys, interviews, and focus groups interviews with district supervisors, principals, and teachers of (Elementary School).

If you require any further information, please feel free to contact me. Thank you for your time and consideration.

Sincerely,

Tara T. Harrell

Tara T. Harrell

Appendix B

Approval of Director of Schools Regarding Research Collection

[redacted]

[redacted]

Date: 11-26-2019

To Carson-Newman University

As a representative of [redacted] I confirm that the school district grants permission to Tara Harrell for the proposed research Improvement Science as a State Education Agency's Framework of Local School District Support to be conducted once IRB approval has been obtained. The research will take place at [redacted] School, in [redacted] In addition, I confirm Tara Harrell has permission to access stored data, journal entries, and artifact relevant to the study at [redacted]

[redacted]

Director of Schools

Appendix C

Supervisor Consent Form

Supervisors - Informed Consent Form

Title of research study: Improvement Science as a State Education Agency's Framework of Local School District Support

Please read this consent document carefully before you decide to participate in this study. This research has been approved by the Carson Newman University Institutional Review and Mr. (Director of Schools), Director of (School District).

Purpose of the research study:
The purpose of this study determine how improvement science is used a state education agency's framework of local school district support.

What you will be asked to do in the study:
You will be asked take part in an interview and focus group interview. Your answers will be recorded and transcribed.

Risk:
We anticipate no risk to you by participating in this study.

Confidentiality:
Your identity will be kept confidential to the extent provided by the extent provided by law. Your information will be assigned a code number or pseudonym. When the study is completed and the data has been analyzed, all information will be destroyed. Your name will not be used in any report.

Voluntary participation:
Your participation in this study is voluntary. There is no penalty for not participating.

Right to withdraw from the study:
You have the right to withdraw from the study at anytime without consequences.

Person to contact if you have questions about the study:
Name Tara Harrell and email address Tara.Harrell@tn.gov or the chair of this study may also be contacted: Dr. Tammy Barnes, Associate Professor of Education, Carson-Newman University, tbarnes@cn.edu.

Agreement:
I have read the procedure described above. I voluntary agree to participate in the study and have received a copy of this informed consent.

Participant's Signature _____ Date _____

Investigator's Signature _____ Date _____

Appendix D

School Leader Consent Form

School Leader - Informed Consent Form

Title of Study: Improvement Science as a State Education Agency's Framework of Local School District Support
Principal Investigator: Tara Harrell
Carson-Newman University
Email: ttharrell@cn.edu

You are being asked to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. Please read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information.

Information and Purpose: The study for which you are being asked to participate in is a part of dissertation research that is focused on improvement science as a state education agency's framework of local school district support. The purpose of this study is to gain a better understanding of how school leaders, including school principals and assistant principals, engage in improvement science work through a partnership with a state education agency.

Your Participation in Study Procedures: Your participation in this study will consist of a **interview, a focused group interview, and providing access to journal entries and artifacts collected by your school team**. Your participation is strictly voluntary. There is no penalty for discontinuing participation.

School-level participants will complete:
1. Two Interviews
2. One Focus group interview

The duration of the study will be completed over a two-month period. Audio taping will be used throughout the research. These recording will be kept confidential. Each participant will be given a pseudonym for the duration of the research. All recorded material will be kept secure and private.

Benefits and Risks: There will be no direct benefit to you for your participation in this study. However, the benefit for (School) will access to all findings of the study. This may assist school-level planning and strategies for future improvement endeavors. There are no foreseen risks associated with participating in the study.

Confidentiality: Your responses on the questionnaires, surveys, and interviews will be anonymous. Every effort will be made by the researcher to preserve your confidentiality including the following:

Assigning code names/pseudonyms for participants that will be used on all research notes and documents.

Keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.

Participant data will be kept confidential except in cases where the researcher is legally obligated to report specific incidents. The researcher will not share your individual responses with anyone other than the research supervisor.

If you have any questions or concerns, please contact Tara Harrell at Tara.Harrell@tn.gov , or her supervisor, Dr. Barnes at tbarnes@cn.edu.

Subject's Understanding

- I agree to participate in this study that I understand will be submitted in partial fulfillment of the requirements for the EdD degree in Curriculum and Instruction at Carson-Newman University.
- I understand that my participation is voluntary.
- I understand that all data collected will be limited to this use or other research-related usage as authorized by the Carson-Newman University.
- I understand that I will not be identified by name in the final product.
- I am aware that all records will be kept confidential in the secure possession of the researcher.
- I acknowledge that the contact information of the researcher and her advisor have been made available to me along with a duplicate copy of this consent form.
- I understand that the data I will provide are not be used to evaluate my performance in my classes.
- I understand that I may withdraw from the study at any time with no adverse repercussions.

By signing below, I acknowledge that I have read and understand the above information. I am aware that I can discontinue my participation in the study at any time.

Signature_____

Date_____

Appendix E

Teacher Consent Form

Teachers - Informed Consent Form

Title of Study: Improvement Science as a State Education Agency's Framework of Local School District Support

Principal Investigator Tara Harrell

Purpose of Study

You are being asked to participate in a research study. Before consent to participate in this study, it is important that you understand why and how the research is being collected. Please read the following information and ask the researcher if you have any questions or concerns before proceeding.

Study Procedures

The following study is being conducted to gather information from teachers at (Elementary School) in (City), TN.

Survey

The survey consists of 10 open-ended questions asking about your perceptions on improvement science as a state education agency's framework of local school district support. All questions are voluntary response as you may provide as much or as little information as you feel comfortable.

Interview

A sample of teachers will be asked to also participate in one-on-one interviews for more in-depth questions that are generated from the information provided in the surveys. The researcher will ask more open-ended questions asking more about teachers' personal experiences as a result of the improvement science work in conjunction with (School District) school district and the (Region) Regional CORE office. The interviews will be audio taped for the proper transcription of the interview.

Member Checking

Following data collection, the researcher will perform member checks by asking study participants to review transcripts of their survey or interview. This process is to ensure validity and allow the participant to make any necessary changes so the researcher will be provided with the most accurate data.

Risks

There are nominal risks in the study. You will be asked many variations of questions involving classroom practices based on improvement science research and the CORE Framework for school district support. Questions will strictly be asked about the topic seeking information that they, the participant, deem relevant. There are no anticipated physical, psychological, social, legal, or economic risks. However, they may decline to answer any or all questions and you may terminate your involvement and redact comments made in the study at any time.

Benefits

You will receive no direct benefit from their participation in this study, but your participation will provide further data for continued research. The researcher will collect data on perceptions improvement science as a state education agency's framework of local school district support with the intent to provide continued research on the topic.

Confidentiality

For the purpose of this study, your comments will not be anonymous. However, every effort will be made to preserve your confidentiality including:

1. Assigning numbers to each participant that will be used in all research notes and documents
2. All notes, transcripts, and other identifying information will be kept in a locked file in the researcher's computer and any papers will be kept in a file cabinet locked at all times.
3. All information will be kept for at least three years following the completion of the research.

Compensation

No participant will be compensated to participate in the study.

Contact Information

In you have questions about the study, of if you experience any adverse effects as a result of participating in this study, you may contact the Dissertation Chair Dr. Tammy Barnes at tbarnes@cn.edu. If you have any questions regarding your rights as a research participant, or if problems arise which you do not feel you can discuss with the primary investigator, please contact Carson-Newman University's Institutional Review Board to speak with Chairman Dr. Casalenuovo who can be reached at gcasalenuovo@cn.edu.

Voluntary Participation

Your participation in this study is voluntary. It is your decision whether or not to participate in the study. If decided to participate, you will be asked to sign the consent form below. After you sign the consent form, you are still free to withdraw at any time and do not have to provide

reasoning. Withdrawing from the study will not affect the relationship you have with the researcher. If you withdraw from the study before data collection is completed, the data will be returned to you or destroyed.

Consent

Contact information

If you have any questions or concerns about this study or if any problems arise, please contact Tara Harrell at Tara.Harrell@tn.gov or Dr. Tammy Barnes at tbarnes@cn.edu.

Consent

I have read this permission form and have been given the opportunity to ask questions. I give my permission to participate in this study.

Participant's signature_____ Date: _____

Investigator's signature_____ Date: _____

A copy of this permission form should be given to you.

Appendix F

Focus Group Meeting 1 Script

Focus Group Interview Script:

Today you will take part in a focus group interview. Focus group interviews bring together a group of individuals representative of the population whose ideas are of interest. During the interview, questions will be tossed out for the group to discuss. Participants are encouraged to respond to each other's points, agreeing, disagreeing, or modifying in any way you choose.

Research Questions:

1. How does a school district engage with a state education agency to do improvement science work?

2. How does a state academic consultant support a school district in improvement science work?

Introductory Comments:

1. Begin with one facilitator providing introductory comments:
a. Welcome and thank everyone for volunteering to participate.
b. Introduce yourself.
c. Hand out the consent form.

Consent Forms:
2. Ask participants to review, ask any questions, and then sign the consent form. Offer a copy of the consent form (unsigned) to each person. Some will want a copy, others will not, but always offer.

Goal of Project:
3. Brief overview of the of project and goals "I am talking to you today to find out about the infusion of improvement science of state support of your district and to gather your perception of how this work has looked and felt for all levels of stakeholders from your district. As a result, the goal of my study is to produce a case study to detail your district's improvement journey."

Logistics:
4. Give participants information about the process, times, notetaking/recording, etc.

Focus Group Guidelines:
5. Provide basic guidelines for the focus group or community meeting, review them with participants, and consider posting them for everyone to see.
a. Being here is voluntary.
b. One person talks at a time. However, participants are encouraged to bounce off of one another's comments/ideas to expand upon, add to, challenge, summarize, clarify, etc.
c. It's okay to take a break if needed. If you need to step out, that is OK.
d. Everybody has the right to pass on a question.

Focus Group 1 Questions:

Q1: Before we get started, please state your name, role, position.

Q2: Tell me a little about how the STATE support has felt the same/different from the STATE support you have received in the past.

Q3: Tell me a little about how the CORE consultant support has felt the same/different from the support you have received in the past.

Q4: Tell me a little about your improvement science lens and how it has affected your work.

Q5: What are some of the impacts improvement science work has had for your varying roles?

Q6: What would you want someone to know about improvement science? What advice would you give them?
What are some lessons learned?
What would you do the same?
What would you do differently?
What were some challenges?
What were the biggest impacts?

Q7: How do you see this effecting your work moving forward?

Q8: What would you want someone to know about your journey?

Let people know when you are going to ask the last question. This cues participants to share relevant information that may not have come up in answer to your key questions. For example, "If there anything else you want to share that we haven't talked about yet?"

Q9: Is there anything else you want to share that we have not talked about? Anything we've missed?

Thank you for participating

Appendix G

Focus Group Meeting 2 Questions

FOCUS GROUP MEETING 2 – GUIDING QUESTIONS (semi-structured)

1. Tell me about how this school first got started with improvement science.

2. From your perspective, tell me what the improvement science experience has been like.

3. Can you provide a specific example of a learning cycle your team participated in?

4. What have been some your lesson learned?

5. Are there any samples, journal entries, or artifacts you would like to share?

6. Are there any particular moments during your work with improvement science that stand out in your mind that has impacted/influenced a change in your teacher practice?

7. Could you explain what support from your state academic consultant has looked like? What did this entail? Has it impacted your work? If so, how?

8. Has there been any spread or scale as a result of your work in improvement science? If so, explain.

9. How have learning walks been a part of your engagement with the state education agency/ CORE and/or the state academic consultant? Can you detail what a learning walk is/looks like?

10. How has engagement in learning walks impacted/not impacted your work in improvement science? What are some outcomes of your engagement in improvement science work?

11. Is there anything that we have missed that you would like to share?

12. If you were reading this case study report, what is the biggest thing you would want another teacher to know about improvement science work?

Thank you for participating

Appendix H

Focus Group Meeting 3 Questions

FOCUS GROUP MEETING 3 – GUIDING QUESTIONS (semi-structured)

1. Tell me about your work/partnership with the CORE office/state academic consultant over the past two year.
   - What has that looked like for the last two years?
   - How did it start?
   - What did that journey look like over the first year?
   - What does it look like this year?
   - What happened as a result of your engagement with a state academic consultant?

3. Tell me a little bit about your perspective, as classroom-level teachers, of what math learning walks looked like? Felt like?

4. Tell me a little bit about your professional learning experience with the state academic consultant.

5. Looking at the CORE Framework model of support
   - What are the necessary pieces/needed ingredients?
   - What pieces/ingredients have felt the most/least important?
   - Are there any ingredients that was missing?
   - Is there any part of the process that could have been made more clear from the onset to make this process more beneficial?

6. Describe any outcomes from your engagement in this partnership.

7. What stakeholders took part in this process? What was each person's role?

8. How is this work the same/different than state support you have received in the past?

9. Has this work impacted your practice? Explain.

Thank you for participating

Appendix I

Interview Guiding Questions

INTERVIEW GUIDING QUESTIONS

1. State name/position/role.

2. Describe your district/school demographics. (use this question to gather numerics/ characteristics of interest.

3. What is CORE? What is a state academic consultant?

4. How did you first interact with the state academic mathematics consultant? Describe what this process entailed.

5. What services did the state academic consultant provide to district leaders? principals? teachers?

6. Describe the steps of a math learning walk/math learning walk cycle of improvement.

7. From you role/lens, what did a typical math learning walk day look like (before/during/after)?

8. What happened as a result of your engagement in math learning walks/training sessions provided by the state academic consultant?

9. How would you compare the math learning walk experience to previous state trainings? How is this experience the same/different?

Appendix J

Survey Questions

CORE Feedback Survey

Session: _____ Facilitator(s) _____
Date: _____ Location _____

Strategic Priority: __Assessment ___Accountability ___Early Foundations & Literacy ___High School & BTPS
___All Means All __Educator Support __District Empowerment

Rate your level of knowledge and understanding of this topic prior to this session.

1	2	3	4	5
None	Limited	Some	A lot	Expert

Rate your level of knowledge and understanding of this topic after this session.

1	2	3	4	5
None	Limited	Some	A lot	Expert

Please give feedback on this session by rating each of the following statements where 1 indicates strong disagreement and 5 indicates strong agreement.

I learned something that I plan to apply in my role in my school/system.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

The facilitator(s) had in-depth knowledge and experience in the content.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

The facilitator(s) was effective and engaging in delivering the content.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

If given the opportunity, I would attend similar sessions in the future and/or recommend that other staff in my school or district attend.

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Comments: Please elaborate on any of your responses above or leave additional comments.

_____

_____

_____

_____