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URBAN SCHOOL PRINCIPALS' DISTRIBUTED LEADERSHIP FOR ADAPTIVE CHANGE THROUGH THE LENS OF COMPLEXITY THEORY

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Abstract

Urban school districts' educational leaders face what seem to be an endless number of challenges, such as closing the achievement gap, enhancing student performance, building teacher capacity, creating leadership opportunities, and adapting to a student population that is changing rapidly and increasingly made up of students from low socioeconomic status backgrounds who are limited English speakers and/or English language learners. Through the lens of complexity theory, this three-year instrumental case study examined the leadership practices of two Lynch Leadership Academy Principal Fellows in relation to their leadership growth project that they determined would benefit from improvement and, as a result, would be implemented in their urban schools.

Using principal and teachers' interviews and observation fieldnotes of the professional learning communities meetings at the schools, this study chronicled the actions and behaviors of the principals and teachers through their interdependent and mutual relationships as they developed a theory of action and conducted their Leadership Growth Project, taking into account the concepts of complexity theory and the influence on the school community.

The findings demonstrate that principals, through their leadership and relationships with their teachers and their engagement in professional learning community activities, complicated and disrupted the complacency, compliance, and comfort of the teachers. The formation of a theory of action, however, which was a way for the teachers and the principals to satisfy the needs of their urban school community in response to the challenges they faced, was sparked by

such disruptions. Additionally, teachers had to reconsider how they interacted with their students as a result of their capacity for self-organization at the edge of chaos. A conclusion of this research is that in order to achieve successful professional learning outcomes and emergence through adapted change that incorporate the principal's leadership, teachers must be willing to communicate practice-related issues and to offer and accept constructive criticism in an environment of disequilibrium.

DEDICATION

This study is dedicated to my parents who have passed away, John and Maysie Spencer. My parents raised me, protected me, guided me, uplifted me, encouraged me, comforted me, chastised me, and counseled me. They meant the world to me. I am who I am because of them. They supported me in my endeavors and took pride in my accomplishments. I owe this accomplishment to them. They would be so proud. I am so grateful that God blessed me with awesome and loving parents. I wouldn't be here without them. I owe everything that I am and have to them. I am the Late John and Maysie Spencer. This doctorate belongs to them!

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INTRODUCTION

Challenges of the Urban School Principal

Urban school districts' educational leaders face seemingly innumerable challenges, which include bridging the achievement gap, improving student performance, increasing teacher capacity, developing leadership opportunities, and responding to an increasingly changing student demographic composed of students from low socioeconomic status backgrounds, limited English proficiency and/or English Language Learners. Urban schools are plagued by a variety of societal and economic conditions, according to Kimball and Sirotnick (2000, p. 536). They go on to say:

> In addition to the sheer difficulty of the principal's job in any school setting, a long list of societal and economic conditions plaguing urban centers and schools can turn this job, if taken seriously, into a nightmare. The general list includes high numbers of families that are homeless or living in poverty, many new immigrants, the effects of child abuse, English not the language of the home, a concentration of joblessness and marginalized groups, single-parent households, and more. All of these affect the schools, which often have aging facilities, high rates of teacher turnover, an overwhelming need for teacher retraining, and a familiar array of problems plaguing students and their families: drug use, gang affiliation, school failure (dropout, suspensions, lack of achievement, etc.), and a lack of adequate child care and parent support systems (p. 536).

According to M. Christine DeVita, President of The Wallace Foundation, principals are under a great deal of pressure to improve teaching and learning in today's climate of heightened

expectations whereas they must be visionaries, instructional and curricular leaders, assessment specialists, disciplinarians, community builders, public relations professionals, budget analysts, and facility managers; and while the job description sounds overwhelming, it shows that the field has begun to recognize the critical role and mounting demands of school principals and the importance of giving them the professional preparation they need to meet them (Davis et al., 2005). Almost all reformers agree that leadership at the school building level is in great need of attention (Carlin, 1992, p. 46). Former Boston Public Schools Superintendent Thomas Payzant spoke about his first year of transition in which he visited all 125 of the district's schools. Speaking with the schools' principals, Payzant learned that they viewed themselves as merely operational managers who were disconnected and disempowered from the work as school leaders (Payzant, 2011).

Principal leadership is a significant factor for school success and student achievement, according to Dolph (2017). He asserts that "with any school reform effort, there is a need to alter the status quo to foster improvement; this suggests principals must serve as organizational change agents to improve instruction and culture" (p. 376). For this study, I will examine the leadership practices of two urban high school principals who have committed their time to further develop their leadership practices at the Lynch Leadership Academy.

The Lynch Leadership Academy (LLA) at Boston College is a principal leadership development program which aims to improve and enrich the skills and knowledge of urban school principals who are just starting out in their career so that they can address these issues and support greater educational equity in urban school districts by collaborating with their school communities so they may enact these practices in ways that enrich the education their students receive. It recognizes that twentieth century leadership will not suffice for twenty-first century schooling. Goldstein et al. (2012) argue that the turbulent environment of this 21st century calls

for a leadership style that will create innovation ecologies through interactions and relationships in which leadership is demonstrated by both supervisors and employees, rather than the traditional top-down leadership approach. They add,

> A complexity science based view sees leadership as an influence process that arises through interactions across the organization: leadership happens in "the space between" people as they interact. Through influential interactions, which are happening all the time in every corner of the organization, novelty emerges and is enacted in unique and surprising ways. This means that the true catalysts of innovation are the web of relationships—in the nexus of interactions—that connect members to each other and to others in the environment (p. 2).

Distributed Leadership for Adaptive Change

Stories about the "heroics of leadership" are problematic in that they incorrectly attribute school leadership to a single leader when in reality principals cannot achieve school success on their own (Spillane, 2005) and yet, the school leadership dogma that promotes the 'cult of the individual' still persists (Harris, 2003). From a distributed perspective, leadership is a system of practice composed of a collection of interacting elements, and because the system is greater than the sum of its parts, these interdependent pieces must be comprehended as a whole (Spillane, 2005). This collective form of leadership within an organization is dispersed among some, many, or all of the members and does not favor particular individuals or categories of people, nor does it presume which individual's behavior carries greater weight with colleagues (Gronn, 2002). Maximizing the capacity of individuals within an organization is central to distributing leadership (Harris, 2004). Given the demands and challenges of schooling, distributing leadership is not a matter of relinquishing control, but acknowledging that there are

competent and capable individuals who are willing to share the responsibility of enacting and leading the initiatives of schooling as a collective and interactive process.

"The old fashioned ' lead from-the top' figures of authority who led by virtue of power of their position are no longer tenable" (Harris, 2003, p. 8). A top-down model is not only insufficient but also misleading in the assumption that schools' effectiveness is based on the problem-solving abilities of a sole school leader. Homer-Dixon (2000b, p. 15) describes various demands or constraints in which leaders are expected to uphold:

> We demand that [leaders] solve, or at least manage, a multitude of interconnected problems that can develop into crises without warning; we require them to navigate an increasingly turbulent reality that is, in key aspects, literally incomprehensible to the human mind; we buffet them on every side with bolder, more powerful special interests that challenge every innovative policy idea; we submerge them in often unhelpful and distracting information; and we force them to decide and act at an ever faster pace.

A leader's ability to release control and galvanize the intellectual capacity of individuals within its organization is a powerful step towards growing and developing leadership for change at the ground level, thus allowing individuals to harness the creativity and diversity within the organization's internal structure to generate the capacity to mobilize as a collective for effecting change. Therefore, we can study leadership as an "activity to mobilize adaptation" for values in which the organization is willing to take risks. (Heifetz, 1994, p. 27).

There are problems in which people have the know-how and expertise to solve, otherwise known as technical problems, and there are problems that cannot be solved by consulting established authorities, following established protocols, or seeking a divine solution from on high, as they are adaptive challenges which are in need of experimentation, new discoveries, and

modifications from numerous members within the organization: “Without learning new ways-changing attitudes, values, and behaviors—people cannot make the adaptive leap necessary to thrive in the new environment” (Heifetz & Linsky, 2002, p. 13). In schools, technical problems typically center around issues of scheduling, attendance, equipment, classroom assignments, and curriculum, for example. However, teaching practices for improving students’ performance and academic achievement is an adaptive challenge which requires teachers to change their practices, strategies, processes, values, and/or beliefs. This aspect is highlighted by Payzant’s (2011) position that “It is tempting to do what we have always done because we are comfortable with the routine and we think it works; change is viewed as a threat to the status quo and to our status as professional leaders, but this can lead to stagnation” (pp. 115-116).

Stagnation signals that everything is working fine; thus, some members in the school community do not necessarily see the need to change. “People do not resist change, per se. People resist lost” (Heifetz & Linsky, 2002, p. 11). The identity of individuals is often tied to their habits, values, and attitudes including those which are perceived as dysfunctional. As a leader, “you appear dangerous to people when you question their values, beliefs, or habits of a lifetime. You place yourself on the line when you tell people what they need to hear rather than what they want to hear” (Heifetz & Linsky, 2002, p. 12). To change how they act and behave is to challenge their identity, which often involves roles or priorities that others may perceive as self-destructive or obstacles to growth: “Habits are hard to give up because they give stability. They are predictable. In going through the pains of adaptive change, there is no guarantee that the result will be an improvement” (Heifetz & Linsky, 2002, p. 27). Leading schools through an adaptive change process for transformation is difficult given the misleading yet attractive narrative of “heroic leadership,” which exacerbates the challenges of leadership. Instead, Spillane cautions principals against the trappings of stories of the “heroics of leadership,” as the

central authority, and urges them to examine the activity of leadership as a manifestation through the interactions of people. “To cope with the unprecedented rate of change in education requires not only challenging the current orthodoxy of school leadership and relinquishing models suited to a previous age, but also establishing new models of leadership that locate power with the many rather than the few” (Harris, 2003, p. 8). When practices, processes, and planning within a school are open, inviting, and experimental rather than rigid, stable, and conservative, new strategies and ways of engaging students are likely to emerge. Leadership and control is best executed when distributed. In their article entitled, “Take this job and ____!”, Kimball and Sirotnik (2000) tell us that the phrase should end with “share it!” not “shove it!”

Purpose of the Study

The purpose of this study is to examine the leadership practices of two Lynch Leadership Academy (LLA) Principal Fellows through the lens of complexity theory in accordance to an initiative they have identified as an area for growth in which they committed to implement in their schools. The initiative is framed as their Theory of Action which is the guiding principle of their LLA Leadership Growth Project. This study will examine the leadership practices taken by the two urban principals in accordance to their Leadership Growth Project. Based on their Leadership Growth Project, I will study the actions and behaviors of the principals and teachers through their interdependent and mutual interactions through the implementation of their Leadership Growth project with an eye of the tenets of complexity theory and the impact within the school community.

Through the lens of complexity theory, I will study the respective schools as complex adaptive systems. “Complex adaptive systems comprise many *interacting* elements which must

be understood together—holistically; these elements, because of their interactions, cause new elements to form and new phenomena, new structures and new rules of behavior to occur" (Morrison, 2002, p. 12). The same concept applies to schools, as well. As complex adaptive systems, schools possess the ability to learn, adapt, and evolve (Brooke-Smith, 2003). "Individuals are . . . diverse in form, in capability; and in the information they hold and use. Moreover, each adapts more or less effectively by gathering information, learning from others, and changing their own rules or metal models when possible" (Goldstein et al., 2010, p. 6). Through their interactions, agents create their environment in such a way that power and control are dispersed and decentralized throughout the system and the quality of the interactions are dependent on information being fed back into the system (Brooke-Smith, 2003) resulting in observed phenomena that did not exist at the level of the individual agent but rather developed out of the dynamics of the agents' interactions (Zellermayer & Margolin, 2005).

The aim of this study is to examine distributed leadership practice of teacher content teams through the lens of complexity theory to ascertain the degree of authority, control, and adaptive change through interactions in which new outcomes emerge as a result of the collective interactions. The study will show the challenges and growth mindset of the teacher content teams in which they work to balance the disequilibrium within their settings to create and/or modify practices for improving students' mathematical proficiency and yet fall short in their ability to sustain adaptative change for emergence of new ways of being.

The promise of this study suggests that schools may be viewed as social systems in which emergence of a school is dependent on the non-linear aspects of interactions, self-organization, and feedback. Zimmerman (1999) expounds on the relationships imbedded in a community and its ability to self-organize for emergence, which are actions that cannot be planned or directed. He states:

> [W]hen a natural disaster strikes a community, we have seen spontaneous organization where there is no obvious leader, controller or designer. In these contexts, we find groups of people create outcomes and have impacts which are far greater than would have been predicted by summing up the resources and skills available within the group. In these cases, there is self-organization in which outcomes emerge which are highly dependent on the relationships and context rather than merely the parts. (p. 356)

Leadership Through the Lens of Complexity Theory

Given the many challenges from the external and internal environment, urban schools are under constant scrutiny and accountability to narrow the achievement gap. The external mandates impact their day-to-day routines, instructional practices, school structures and governance. "In an environment that seems to be changing, organizations want to be more adaptable and better able to learn from experience in order to reconfigure themselves in the face of new demands" (Cohen, 1999 p. 373). However, this is not always the case in the many urban school bureaucracies. Many principals are realizing that their "long-established business models" are no longer sufficient. Whereas they ". . . once operated with a mode of their world as a machine, which was predicated on linear thinking, control and predictability, they now find themselves struggling with something more organic and nonlinear, where limited control and restricted ability to predict are the norm" (Lewin & Regine, 1999, p. 197).

Change is a leader's friend, but it's nonlinear messiness can be problematic: "But the experience of this messiness is necessary in order to discover the hidden benefits—creative ideas and novel solutions are often generated when the status quo is disrupted" (Fullan, 2001, p. 107). Rather than perceive the disruption of the status quo as an imperfection or blemish, leaders can embrace complexity theory as rationale and framework to embrace disturbances that interrupt the

complacency, conformity, and comfort of stability as a gateway to the creation of something new and novel in order to meet the demands of their school community in response to the challenges they face.

According to Lewin and Regine (1999), the authority of complexity-guided leaders rests in their ability to see the wholeness of the organization, its connections and disconnections, and the potential of their people at the macro, micro, personal, and organizational levels. They further state,

> At the macro level, that translates into seeing the wholeness of the organisation - recognising patterns, anticipating the larger picture, being aware of external influences affecting the system, envisioning what the new possibilities are, what new story they can create from their organisation. . . . At the micro level, it's seeing the connections and disconnections within the system. At a personal level for the leader this means seeing oneself as in relationship to people, and cultivating strong relationships and connections with the system and outside it. . . . At the organizational level of seeing connections, the leader's role then becomes one of identifying where the blindness, denials, disconnections and constrictions are in the organisation, and cultivating connections for a more robust system" (p. 290).

Principals must begin to see the wholeness of their schools at the macro, micro, personal, and organizational level as they are all intertwined by way of learning and influencing one another throughout the webs of relationships.

Understanding complexity theory can provide insights into how a school community and its members interacts with the learning environment. "Complexity theory casts the learning that takes place in the community as a process in which the community, as well as significant insights of individuals in the community, self-organize through a series of critical events that shake the

community and place it at the edge of chaos" (Zellermayer & Margolin, 2005, p. 1279). It is at the edge of chaos when there is a great deal of positive tension going on so ideas can flow freely and surprising breakthroughs can be made, thus allowing the system to reinvent itself into a new, more complex form that is better equipped to grapple with its problems and challenges (Pascale et al., 2000). Additionally, given a common vision committed to shared beliefs, values, policies, and practices, schools can flourish as rich adaptive systems where power and authority are distributed and thrive when the school is on the edge of chaos (McQuillan, 2016). A common vision can act as a strange attractor (e.g., the mission statement or a strong leader) as it will inspire an organization to mobilize behind a cause or mission.

Leadership through the lens of complexity theory departs from the linear approach in which goals, action plans, and next steps are strategically crafted in a manner that is predictable, such that A begets B. Rather than expecting such predictable and linear interactions between discrete parts in an educational system, complexity theory emphasizes developing interrelationships between system elements at different levels of the system: "It offers a means to analyze emerging patterns and trends to illuminate how the disparate system parts are, or are not, working together" (McQuillan, 2008, p. 1794). According to McQuillan (2016), "In theory, schools embody what should be almost unlimited potential: empowering for students, enriching for faculty, satisfying for administrators, reassuring for parents, welcoming to visitors, and a benefit to society overall" (p. 2). He further elaborates on the status quo of schooling and the means by which to disrupt it by creating conditions for emergence.

> [S]chools cannot continue doing what they have always done simply because that is what they have always done. That said, one cannot forget: the status quo is typically a comfortable and safe context. . . . To disrupt such trends schools need to constantly evolve, to become rich adaptive systems in which power and authority are decentralized,

> system elements maintain a productive balance on the *edge of chaos,* and all involved—students, teachers, administrators, and parents—embrace a common vision committed to shared beliefs, values, policies, and practices. As I maintain throughout, schools need to embrace the tenets of complexity theory as embodied in the CAS metaphor. . . . The goal therefore becomes *creating the conditions that will create the conditions* (p. 3).

The "systems transformation heuristic" (STH), created by McQuillan (2016), is a useful tool that can assist leaders in utilizing the insights of complexity theory in a user-friendly manner to analyze the state of their schools to determine whether they have created or how they might create the conditions that will enable their schools to collectively adapt their ways of doing and/or being in order to evolve in response to the challenges of the 21st century. McQuillan (2016) describes the STH as a "streamlined application of the CAS metaphor, derived from five qualitative features of the CAS metaphor that can be quantified by applying a four-point scale and series of essential questions to each metaphorical dimension, such as: disequilibrium, distributing control and authority, generating a shared school culture, balancing on the "edge of chaos," and synergy of adaptive emergence. McQuillan (2016) acknowledges the existence of additional features to the complex adaptive system metaphor that may be considered and encourages others who might utilize the STH tool to draw from existing research to modify the model as they see fit. Listed are a few essential questions from the STH in which to draw from each feature (McQuillan, 2016, pp. 5-13):

> **Disequilibrium** - The following questions exemplify ways to conceptualize any source disequilibrium and how that may influence systems change:
>
> - Is there a commitment among faculty and administration to ensure all students succeed, universal student achievement?

- Are there mechanisms at your school that promote ongoing learning and growth for faculty and administration that help them learn how to best support all students?
- Are teachers constantly working to improve their teaching?

Distributing Control and Authority – Questions such as the following offer a way to conceptualize whether and to what degree control and authority might be effectively distributed throughout a school system:

- Are power and authority shared in ways that lead to the emergence of new connections and networks intended to enrich teachers' practice?
- Are power and authority shared in ways that allow teachers to enrich their professional skills and thereby enrich student achievement?
- Are new school leaders coming to the forefront?

Generating a Common School Culture – Questions such as the following offer a means to assess the role played by cultural values in shaping what occurs in a school context:

- Does your school promote a shared commitment to universal student achievement?
- Is there a shared vision underlying what happens in your school?
- Are people explicit about the beliefs and values that undergird important decisions?

Balancing on the 'Edge of Chaos' – Clearly, issues of balance permeate CAS dynamics. This understanding in mind, the transformation heuristic aims to explicate the nature of emergent tensions and their consequent resolution, or not, by attending to questions such as the following:

- Dissonance & Order: Does disequilibrium create a sense of urgency toward change without overwhelming people with perhaps unrealistic expectations and tension?
- Challenge & Support: Are people challenged to innovate but adequately supported to do so?
- Authority & Autonomy: Is some power centralized and some power shared more broadly?

The Synergy of Adaptive Emergence – The following are some of the essential questions that offer a way to conceptualize the workings of a CAS and assess whether synergistic relations may be manifest or novel outcomes might emerge over time:

- When one system element does what it is supposed to do, does it enhance what other system elements do, perhaps in unanticipated ways?
- Has the sum of the whole ever been somehow greater than the sum of the individual parts?
- Do the practices and policies being implemented target the sources of disequilibrium that were initially targets of concern?

McQuillan (2016, p. 13) states, "With notions of disequilibrium in mind, schools and educators need to ceaselessly embrace a commitment to student achievement; it is a never-ending opportunity tension that can drive ongoing systems change." He further elaborates:

> Teachers can always teach better; students can always learn more. If we prioritize student success, we can accordingly distribute leadership and authority, promote shared values, maintain balance in the system, and identify mutually reinforcing elements in system interactions aimed at achieving this end. Otherwise, we are unlikely to be creating the conditions that will create the conditions (p. 13).

Goldstein et al. (2012) assert, organizations that are unable to adapt to their constantly changing environment will "go the way of dinosaurs" and, therefore contend that in order to stay competitive in the turbulent environment of this twenty-first century, principals must demonstrate a higher level of innovation and adaptability through powerful internal interactions. By embracing the tenets of complexity theory as embodied in the CAS metaphor, leaders can examine their practices in accordance to the STH to evaluate the condition of their school relative to dimensions in which they improve and others in which they could adopt, then leaders will find themselves in the position in which they can begin to create conditions to create conditions to adapt and evolve to higher levels of complexity as a collective body.

Research Questions

Being responsive to rising demands, expectations, and responsibilities in schools is becoming increasingly more imperative for urban principals. Decentralized networks of agents acting as a collective body for self-organization, adaptation and emergence for novelty innovation through experimentation of new ideas, strategies, and practices is how leadership can be distributed throughout the school community (Stacey, 1996). By constantly engaging in meaningful interactions, principals and teachers can join together, in the spirit of collaboration, to provide engaging and meaningful learning experiences for their students by pushing their school systems to change and adapt.

The following research questions for this study served as a guide for choosing the research location, recruiting participants, and gathering and analyzing the data. While the questions defined the original investigation, other questions might emerge during the gathering and analysis of the data.

1. What approach did the principals take for implementing their Leadership Growth

Project?

2. What elements of complexity theory were manifested through teacher and principal interactions?
3. What hindered or promoted teachers' ability to self-organize for emergence as a complex adaptive system.

Importance of the Study

According to a survey of the literature, organizational science (which includes computer science or computational thinking), physics, biology, and management or administration science have all significantly contributed to the development of complexity theory (Lewin, 1999; Coffey, 1998; Keene, 2000; Mazzocchi, 2008). For instance, several of the presentations during the 1996 Organization Research Winter Conference focused on using complexity theory in organizational science (Lewin, 1999). A year later, Keene produced a well-constructed paper, making the case that complexity theory's construct complex adaptive systems may be used to examine business organizations and their leaders as living systems and organisms because of the dynamic interactions within their environment.

This study is important in that it provides a different perspective about distributed leadership for adaptive change through the lens of complexity theory of two urban principals. Using the "systems transformation heuristic" (STH), created by McQuillan (2016), I plan to focus on the leadership practices of two urban principals by assessing the interactions of two math teams to identify the condition of their structures and/or processes to determine whether the conditions for creating conditions for adaptive change are present, and if not identify the dimensions in which they may create conditions. I hope to add to the body of research, relevant

analysis and/or implications that may impact literature relative to complexity theory for educational change.

The scope and purpose of this instrumental case study are to use complexity theory to examine the leadership practices of two urban principal Fellows of the Lynch Leadership Academy at Boston College through the lens of complexity theory, which serves as a useful framework for this study and the overall project. Additionally, this study will describe actions taken by the urban principals to put into practice the principles espoused by Boston College Lynch Leadership Academy through their capstone Leadership Growth Project.

This instrumental case study strengthens the argument that, using the framework of complexity theory, where the emphasis is on a complex adaptive system, educational leaders (schools administrators and teachers) can offer crucial sources of information to help leaders with the necessary elements to change school practices, resulting in school improvement. Accordingly, this study will highlight the visions, values, and guiding principles that emerge from the interactions between teachers and principals through the lens of complexity theory.

Context of the Study: The Lynch Leadership Academy (LLA)

For principals and prospective principals, the Lynch Leadership Academy (LLA) is a coaching and professional development program with the aims to "empower school leaders to transform their schools." By strengthening the leadership capacity of urban school principals as a means to develop highly effective leaders in the urban K-12 Catholic, Charter and District schools. Their mission is to reduce inequity in urban schools and increase opportunities and outcomes in the lives of all children and families. LLA was established in 2010 thanks to a generous gift from the Lynch Foundation. Housed in the Lynch School of Education and Human

Development at Boston College, it is a cutting-edge organization for developing successful educational leaders within the context of challenges that concerns all urban school leaders and includes Catholic, District and Charter school principals.

K-12 principals and heads of schools (referred to as "Fellows") from district, charter, and parochial schools are brought together by the Lynch Leadership Academy to engage in cohort building, shared action research, and networking within and across sectors. Cognizant of the continuous conflicts among the three-sectors, an Executive Board member observed, "[T]he children are the focus. A quality education, no matter which sector it is delivered in, is the goal. Principals are documented to have a material impact on school performance; therefore, educating principals across sectors makes complete sense to the Foundation."

The program aims to develop Fellows' knowledge and skills in the area of culture-building, instructional leadership, cultural competency, distributive leadership, and building teams, relationships, and trust. Those are important features of complexity theory. The program includes retreats, visits to exemplary schools, a two-week summer institute, school-based coaching, critical friends' groups, and a Leadership Growth Project as its culminating plan of action for principals. It is carried out through a series of events and ongoing practices throughout the year. I will examine their leadership practice through the lens of complexity by combining these components because many of the elements of LLA are characteristics of complexity theory. Because complexity theory offers a means to understand how systems interact with each other, these are all pieces of related systems.

Theoretical Framework

Complexity theory emerged from the disciplines of physics, biology, chemistry and theories of evolution and chaos (Wheatley, 2006). The collective attitudes and behavior of a

complex adaptive system in response to an increasing state of disequilibrium can be understood using complexity theory, which may lead to unpredictable and nonlinear adaptive change (Meadows, 2008). In response to changing conditions within the environment, the system may self-organize for emergence or transformation as a result of the interaction between its members and the environment (Cilliers, 1998).

Diverse agents make up complex adaptive systems, which interact with each other and have mutually beneficial effects on one another to generate novel, emergent behavior for the systems as a whole (Lewin, 1999). The system is constantly adapting in response to its changing environment (Pascale et al, 2000; Lewin & Regine, 1999) through acquiring information, learning from one another, and deviating from the ways things are normally done (Goldstein et al, 2012). The complex adaptive system must continually generate information if it is to remain adaptable and endure (Wheatley, 2006). The edge of chaos (Stacey, 1996) is the "sweet spot" for productive change (Ehin, 1997), which is a special kind of balance between order and chaos (Waldrop, 1992), and a precondition for transformation (Pascale et al, 2000). Complexity theory essentially proposes an orientation in which relationships are valued and rich interactions are required to enable innovation leading to adaptive change through self-organization for emergence or transformation (Lewin & Regine, 1999).

Disequilibrium as Tension from an Opportunity or Crisis

Operating in a state of disequilibrium that can be brought on by an opportunity or crisis is necessary for pursuing adaptive transformation. Tension from an opportunity creates internal pressure to take advantage of an opportunity (Goldstein et al, 2000) while tensions from forces or threats from the environment will exert an external pressure to find a response (Pascale et al., 2000). Individuals or groups may interact in an effort to solve a common problem to a shared issue or take advantage of a specific opportunity (Ehin, 2009).

Disequilibrium resulting from tension as a result of an opportunity or crisis is an optimal condition for adaptive change. When systems are grappling with change, the discomfort of disequilibrium will lead to attempts to restore the imbalance and unpredictability of a situation to a state of stability and predictability, though often dysfunctional. Pascale et al. (2000) characterizes equilibrium as a "precursor to death" because it can lull a system into a state of complacency, leaving it less responsive to its changing environment and placing it at risk for extinction. "[I]t is not easy to recognize it as a threat because it often wears the disguise of an advantage. It is concealed inside strong values, or a coherent and close-knit social system, or a well-synchronized operating model" (p. 22). Therefore, living systems should not pursue equilibrium as their goal. While equilibrium may be a desirable state, it should not last forever because it can give the system a sense of security and productivity, which "to stay viable, systems must maintain a state of non-equilibrium, keeping themselves *off balance* so that the system can change and grow" as needed (Wheatley, 2006, p. 78).

Unpredictability and Non-linearity of Complex Systems

The collective attitudes and behavior of a system in response to an increasing state of disequilibrium can/may yield adaptive change that is both unpredictable and nonlinear (Meadows, 2008). Chaos, also referred to as turbulence, develops in non-linear and interdependent systems. "It expresses a disproportion between cause and effect; small causes may lead to large effects and large causes may have small effects" (Merry, 1995, p. 29).

Goldstein, et al. (2010) argue that "complex adaptive systems are NOT easily predictable, since what emerges from their interactions is something more than a simple aggregation of their properties" (p. 5). Most interactions among groups or individuals involve nonlinear feedback, in which the action of one person may cause a re-action of another person (Stacey, 1992). The

effect of the interactions ". . . can feedback on itself, sometimes directly, sometimes after a number of intervening stages. This feedback can be positive (enhancing stimulation) or negative (detracting, inhibiting) . . . Both kinds are necessary" (Cilliers, 1998, p. 4). They are " . . . radically unpredictable in detail but they exhibit clear overall patterns of behaviour . . . . It is hard to influence and intend specific changes in detail. They must be able to learn, and this involves being responsive and creative . . . ." (Morrison, 2003, p. 28).

Feedback on the Edge of Chaos

"The balance point—often called the edge of chaos—is where the components of a system never quite lock into place, and yet never quite dissolve into turbulence, either" (Waldrop, 1992, p. 12) and " . . . where the formal and the informal elements of an organization overlap and . . . . voluntarily form new (emergent) groups to solve problems" (Ehin, 2009, p. 6). "In the face of threat, or when galvanized by a compelling opportunity, living organisms move toward the edge of chaos, This condition evokes higher levels of mutation and experimentation and fresh new solutions are more likely to be found" (Pascale et al., 2000, p. 6)

Complex change typically conjures up negative connotations associated with disorder, disarray, and lawlessness which may induce stress, anxiety over loss of control, and fear of the unknown. Yet there is a positive side to chaos when it comes to complexity. Thus, complex emergence or change can be inclusive of a variety and diversity of elements and consequent evolutions (Merry, 1995). In order for the system to be stable, it needs turbulence to shock or jolt it out of its predictable state so that change might emerge at the point where stability and instability balance one another. Waldrop (1992) describes the dynamism of the system at the edge of chaos, stating,

> The edge of chaos is where life has enough stability to sustain itself and enough creativity to deserve the name of life. The edge of chaos is where new ideas and innovative genotypes are forever nibbling away at the edges of the status quo, and where even the most entrenched old guard will eventually be overthrown (p. 12).

Fundamental to systems operating at the "edge of chaos" is feedback—the manner in which the system talks to itself: "Amplifying and damping feedback serves like a throttle of a propulsion system; it causes a process of change either to accelerate or to slow down" (Pascale et al., 2000, p. 69). Self-amplifying (positive) feedback "occurs when a system uses the cycles of discovery, choice and action in a manner that amplifies changes and destabilizes the system." Self-regulating (negative) feedback "occurs when a system has some prior or external or systemic intention, plan or requirement," and therefore, dampen down deviations in pursuit of stability and predictability (Brooke-Smith, 2003, p. 101).

Evolution of Systems Through Self-Organization for Emergence

According to Pascale et al. (2000), emergence and self-organization are two sides of the same coin; emergence is the result of the new state or condition, whereas self-organization allows a system to transition to a new state that generates improbable combinations. A system can develop, reconstruct and change its internal structure through self-organization in order to respond to and influence its environment (Morrison, 2002). In an organization, a single person cannot self-organize for emergence. For experimentation to yield innovative ideas, there must be the connectedness and collective interactions among the organization members. Furthermore, according to Goldstein et al. (2010) self-organization requires both a bottom-up and top-down leadership approach. "Emergence is a central process within the nexus of leadership, precisely because it occurs through an integration of 'bottom-up' organizing and the 'top down' influences

of . . . leadership" (Goldstein et al, 2010, p. 75). The source of emergence in the system is the interactions among agents and how they mutually affect one other, which highlights the often-overlooked need to pay attention to relationships that reinforce one another (Lewin and Regine, 1999). These interactions are not planned or identified through analysis of prior interactions but may mutually impact one another: "Many variables might impact a particular event and particular events may have a rippling effect through the system that in turn involves many changes in neighboring variables. In this way interactions are dynamic" (Radford, 2008, p. 144).

Definition of Terms

There are several terms used throughout this study that merit a brief explanation about their meaning rather than a solitary definition or description. For the purposes and subsequent analysis, the following terms in this section include a constructed compositional meaning for clarification points.

Agent is an element in a model, e.g., an individual, an organization, an animal, etc.

Complex adaptive systems comprise many elements that interact in mutual and interdependent ways that are nonlinear enabling them to learn and evolve in adaptive ways.

Complexity Theory is a theory of how complex adaptive systems comprising multiple interactions behave and change.

Edge of Chaos is a condition (not a location) in which systems are poised between stability and instability, equilibrium and disequilibrium, or order and disorder enabling innovation to thrive and breakthroughs to emerge.

Emergence is unpredictable change or adaptation which results in properties or patterns never seen before emerging.

Feedback refers to the process where outputs of information feed back into inputs and either amplify the effect of that input moving the agent further toward the state of disequilibrium poised for emergence (positive feedback) or dampens the effect in which the agent is moved closer to the state of equilibrium (negative feedback).

Self-Organization is the process of collective interactions according to their own set of social norms without any overall plan telling them what to do and how to do it.

Non-linear growth or behavior can generate various outcomes that are non-proportional such that the whole is greater than the sum of the parts.

Overview of the Chapters

This study is presented in five chapters. Chapter One introduces the background to provide context to the problem and it provides the purpose, research questions, and importance of this study that describe the actions taken by the urban principals through their practices, which are inclusive of the principles advocated by Boston College Lynch Leadership Academy. It includes a discussion of complexity theory, the theoretical framework and its underlying assumptions and characteristics and provides a discussion of specific terms used in this study.

Chapter Two, the Literature Review, provides a general overview of relevant conceptual, theoretical, and empirical work that informed the problem of the study discussed in Chapter One. Chapter Three describes the methodology for this qualitative study, which draws on case study research as outlined by Stake (1995). It also describes the setting for the study and its participants.

The study's findings are presented in Chapters Four. Chapter Four presents the findings relevant to the participants' practices and the school context. The final chapter, Chapter Five,

offers a summary of the study, a discussion of how the findings answer the research questions in Chapter One, and implications for further research.

CHAPTER 2
LITERATURE REVIEW

Introduction

This chapter reviews and analyzes existing literature pertaining to complexity theory, with a special emphasis on educational leadership. It begins with a brief explanation of a growing body of research supporting the position that notions of complexity theory, such as complex adaptive systems, are pertinent to the study of organizations and educational learning environments. While investigations into organizational sciences and educational endeavors remain important, findings from this body of literature underscore the urgent need for researchers to find and disseminate insights into actions and practices used by urban principals.

The literature reviewed in this chapter is presented in four sections. The first section begins with a discussion of conceptual and empirical research completed in organizational science and business. Studies on educational leadership are briefly covered in the second section. The studies discussed in the first two sections are included due to the dearth of studies that employ complexity theory as a framework to investigate complex adaptive systems, such as actions and practices by the urban principal. The third section emphasizes the importance of relational trust, informational flow, and diversity as beneficial components of complex adaptive systems. The chapter's main points are briefly summarized in Section four to connect the major highlights mentioned across the first three sections.

Essential Components of Complex Adaptive Systems

Complex Adaptive Systems

"Change is everywhere; the future is unpredictable. Turbulence rather than stability characterizes the environment in which schools operate and school leaders lead" (Morrison,

2002, p. 1). “Complexity is on the cutting edge of science” (Merry, 1995, p. 58.) Scientists from a variety of disciplines wonder whether machine imagery can effectively explain how the world functions since this imagery leads to the misconception that analyzing the parts is key to comprehending the whole: “One of the first differences between new science and Newtonianism is a focus on holism rather than parts. Systems are understood as whole systems, and attention is given to *relationships within those networks*” (Wheatley, 2006, p. 10).

Complexity is the essence of individuals, or more broadly agents, interacting with one another in a way that has a mutually influencing effect: “In this mode, complexity arises when even two agents interact, since their unique information and perspective generates *difference,* and difference leads to unanticipated and novel outcomes” (Goldstein et al., 2010, p. 5). Leadership that embodies the principles of complex adaptive systems take on a human-oriented approach within the organization in which relationships are foundational to the creativity, culture, and productivity that emerges through interactions (Lewin & Regine, 1999). The excitement regarding this new science of complexity provides an explanation, for the first time, as to why some organizations are able to adapt, change, and thrive and why others fail (Merry, 1995).

Complex systems have an ‘adaptive’ nature and capabilities which, unlike passive mechanical linear ones, adapt to and interact with their surroundings and environment to effect positive change: “The key mechanism for this adaptive and interactive process is ‘feedback’” (Brooke-Smith, 2003, p. 24). In their adaptive capacity, these complex systems are also regarded as complex adaptive systems.

Complex adaptive systems consist of a diversity of agents that interact with one another, mutually affect one another, and generate novel and emergent behaviors for the system as a whole as it continuously adapts to the conditions of its environment and evolves over time. (Lewin & Regine, 1999). A complex adaptive system simply self-organizes without regard to

whether the process is long term or short term: “It engages in multiple activities of different types. The message here for organizations is not to take too rigid a stance in approaches to innovation but to respond flexibly as internal and external environments demand” (Carlisle and McMillan, 2006, p. 8). “At the edge of chaos –a good analogy to the current period of social transformation—innovation and dramatic shifts in activity patterns can occur, and systems can move to higher levels of performance” (Innes & Booher, 1999, p. 417).

Complex adaptive systems—at the micro level of an organization—are the first line of defense for responding to perturbations or exploiting opportunities from within or outside of the organization. The goal is adaptive change. The beauty of engaging in a complex adaptive system is that it seeks the participation of its members. Given the freedom and opportunity to identify challenges within the context of a threat to the organization, identifying problems offers an opportunity for growth and adaptation, and engaging with the excitement and anticipation of the sharing of ideas and opinions while seeking to disrupt the status quo makes for novel opportunities to seek and even drive change at a very upfront and personal level—a level within local interactions of peers and colleagues.

Connectivity

The ability of an individual, group, or team to readily access information through interactions in a variety of networks speaks to the viability of the school community. The dynamics of a complex adaptive system is keenly sensitive to the degree of connectivity among agents within a network (Stacey 1996). We are all greatly influenced by information flow and webs of relationships within a network that are not necessarily depicted on any formal chart, but are intricately linked to an organization's performance, the manner in which it develops and executes strategy, and its capacity to innovate (Cross and Parker, 2004). According to Davis,

Sumara, and D'Amour (2012), there are three types of network structures—centralized, decentralized (scale-free), and distributed—of which the decentralized network is the most important for learning and therefore referred to as the 'fingerprint' of a complex unity because it manifests in all complex learning systems (see Fig. 2.1).

Davis and Sumara (2006) assert, agents (i.e., nodes) act as subnetworks that link to one another to form hubs, such that the interactions are with its closest neighbors demonstrating that most information in a complex system is local. Davis and Sumara (2006, p. 52) further describe the two main advantages of the scale-free network relative to the information it carries and the strength of its ties.

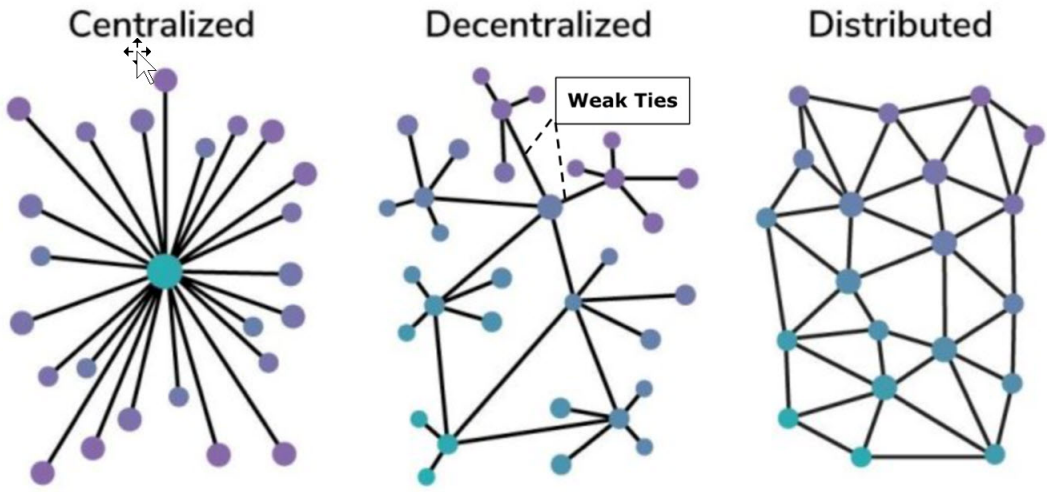
> First, [scale-free networks] are able to move information efficiently because nodes are never too distant from one another. Second, they are usually able to withstand shocks to the system because there are no nodes that are too critical to the global functioning (although failure or destruction of certain nodes can lead to a fragmentation of the network) (p. 52).

Stacey (1996) explains the importance of networks in which connections can be too many or too few: "Limited connections lead to stability, while many connections lead to instability; however, there are critical points between these two extremes where connections are rich enough but not too rich, resulting in endless behavioral variability" (p. 180). This is one of those cases where less is more. Keeping the connectivity of the hubs to a small number ensures a strong and stable network that can withstand the loss of agents without faltering. Unfortunately, the centralized and distributed networks (See Fig. 2.1), are compromised and vulnerable to failures as a result of poor connectivity in comparison to the decentralized (scale-free) network. The loss of the central node in the centralized network can cause a collapse of the network. However, in its full form, it is still inefficient as one agent being the central person who disperses information

to the entire network. Davis and Sumara (2006, p. 53) describe the strengths and flaws of each network:

> A centralized system can have highly efficient information flow because nodes can, in principle, be separated by at most one intermediary. The downside of this efficient connectivity is that such systems are vulnerable to massive failures. If the central hub fails to function, the entire system will go down. In contrast, a distributed, mesh-like system can be extremely robust. Many, many nodes could be removed before the system would begin to fail. However, such robustness comes at the expense of efficient movement of information and resources. The number of "jumps" required to move between nodes at the extremes of such networks can be prohibitively large. The decentralized or scale-free network balances efficient communications with robustness.

Figure 2.1. Three types of network structures



In addition to the various structures of three networks, there are *weak links* that will add to the robustness of the networks: "The addition of a few links among nodes can greatly reduce a network's dependence on its hubs, and hence decrease vulnerability. The addition of weak links can also improve the flow of information" (Davis & Sumara, 2006, p. 52). It appears that

solving to come from a variety of nodes that link to other nodes, which are linked to more nodes. These interactions provide the nutrients, building materials, wastes, and information that are exchanged from system to system in a vital exchange (Goldstein, et al., 2010).

Information Flow

Information is king (Brooke-Smith, 2003). It is the "lifeblood" that flows through the organization carrying meaning that emerges from the differences in members' backgrounds, skills, opinions, and perspectives; these differences help propel innovation (Goldstein et. al., 2010). An enriched environment holds an extensive body of information that is relevant for creative problem solving which may take the form of physical objects or flow directly from other people in the problem solver's environment (Guastello, 2002). We don't have to look any further than our computer screens to see how open information improves our personal effectiveness and knowledge, asserts Wheatley (2006), as she further expounds on "information-rich" environments:

> Innovation is fostered by information gathered from new connections; from insights gained by journeys into other disciplines or places: from active, collegial networks and fluid, open boundaries. Knowledge grows inside relationships, from ongoing circles of exchange where information is not just accumulated by individuals, but is willingly shared. Information-rich, ambiguous environments are the source of surprising new births (p. 104).

In complex adaptive systems, the richer the information flow, the more connections people create and observe and subsequently the larger the potential is for adaptability, claim Lewin and Regine (1999). Thus, according to these authors information restrictions will restrict the system. They contrast the use and misuse of information, declaring,

> When information rests in a few hands, those who have it feel a need to hold onto it for personal power, and use it to dictate their own agendas. It limits what is possible; it shuts others out. In contrast, cultivators treat information 'not as gold bars you put in the vault of a bank, but as a world of information'. . . . Protecting information slows things down and, in fast-changing times, hinders adaptability. Cultivators believe in throwing information into the common pot of knowledge, knowing that they can also take things out. They watch the flow of information in their area of jurisdiction, synthesizing disparate pieces of information, watching for new patterns in situations, recognizing patterns that apply to new situations, and informing the internal organization of external realities (pp. 314 -315)

Guastello (2002) suggests that whenever an individual "plugs into" an information flow, the flow is felt in two dimensions. Guastello distinguishes between the various forms of contributions within the two categories as universal participation or particularly creative in which a category or dimension provide unique content to an organization. He asserts,

> One dimension is the content-specific information and the organization of that information. In creative problem-solving groups, contributions of this type became known as *general participation*. The other dimension is akin to the *especially creative contribution* in groups; here it is the particular operation of starting a new line of thinking, elaborating a line of thought, or rectifying some apparent conflict. . . . A new nugget of information can be associated with existing information and stored with it. The new nugget of information can also act as a retrieval cue for items of stored information, ("That gives me an idea!") (p. 171).

Goldstein et al. (2010) assert the quality of information can be amplified through interaction resonance in which the networks of interaction exchanges "…would expand capacity

and encourage ideas to 'vibrate' within a work group, to strike enough chords that what may have started out as only a tiny seed of innovation is allowed to evolve and grow and perhaps even be implemented" (p. 39).

As complex adaptive systems, school communities depend on information to foster learning and knowledge creation, which maintains the community alive and response to the changing environment. The flow of information can make or break a school community. There is no life without information flow, just as there is blood pumping through one's arteries. Information flow is a "force for change," because it "carries meaning" through the system. If placed in the hands of *especially creative* networks of interaction exchanges, even a nugget of information can "strike a chord" and spread throughout the school community, promoting adaptations, innovation, and experimentation that leads to the emergence of something that exceeds expectations.

Diversity

The defining characteristic of a complex adaptive system is the vast diversity of its agents, components, and parts interacting with one another in a variety of ways. "These differences create novelty since the interaction of two identical things cannot generate something new" (Goldstein et al., 2010, p. 10). Diversity must be valued and actively incorporated in opportunities where differences can interact with one another in order to provide a richness of perspectives that will result in a wide expansion of new ideas, methods, and approaches (Lewin & Regine, 1999). For example, one reaction might be a DNA sequence that is not expressed when a pandemic affects humanity, giving certain people immunity. A network of researchers in several fields, such as virology, immunology, sociology, entomology, and meteorology, from which to investigate, might, however, produce a different response (Davis and Sumara, 2006).

Diversity is what makes complex adaptive systems thrive. "[M]eaning emerges through the differences in members' backgrounds, skills, opinions, and perspectives… [T]his micro-level diversity, when it is noticed, amplified, and disseminated…can emerge as novel patterns, practices, and strategies that can improve and transform organizations" (Goldstein et al., 2010, p.11). The *miracle* of self-*organization* and *emergence* occurs as a result of a diverse group of agents interacting in a diverse number of ways bringing a diverse set of skills and experiences to the 'phase transition' zone, also known as the edge of chaos (Brooke-Smith, 2003).

A school community is well positioned to add a richness of race, gender, age, experiences, perspectives, ideas, approaches, strategies, processes, and opinions, to name a few, given the right balance of diversity. It is the complex adaptive system's ability to engage differences through social interactions that propels it to its most creative place, the edge of chaos.

Relational Trust

According to Tschannen-Moran (2014, p. 18), "Trust has, paradoxically, been likened to both a glue and lubricant" wherein the "glue" binds an organization together and the "lubricant" promotes communication and increases productivity. She further expounds:

> As "glue," trust binds organizational participants to one another. Without it, things fall apart. To be productive and to accomplish organizational goals, schools need cohesive and cooperative relationships . . . Trust binds leaders to followers. Without that bond, a manager can enforce minimum compliance with contract specifications and job descriptions, but that will not lead a team of teachers to greatness. As a "lubricant," trust greases the machinery of an organization. Trust facilitates communication and contributes to greater productivity when people have confidence in the integrity of other

> people's words and deeds. Without trust, friction and "heat" are generated that bog down the work of the school (p. 18).

In schools, trust is "a core resource for improvement" (Bryk, & Schneider, 2002). "[A] group within which there is extensive trustworthiness and extensive trust is able to accomplish much more than a comparable group without trustworthiness" (Coleman, 1988, p. 101).

Tschannen-Moran (2014) asserts, trust and legitimacy in the school system are in limited supply in today's society. Trustworthy school leaders need to learn how to cultivate opportunities in which trust can thrive within the school and the its community. She further states,

> School leaders who. . . earn the trust of the members of their school community are in a better position to accomplish the complex task of educating a diverse group of students in a changing world. Principals and teachers who trust each other can better work together in the service of solving the challenging problems of schooling. These leaders create a bond that helps inspire teachers to move to higher levels of effort and achievement. These leaders also create the conditions, through structures and norms to guide behavior, that foster trust between teachers, and they assist teachers in resolving the inevitable conflicts that arise. Even more important, these leader cultivate a culture of high trust between students and teacher through their attitudes, example, and policies. . . . Trust can no longer be taken for granted in schools. It must be conscientiously cultivated and sustained—and school leaders bear the largest responsibility for setting the tone of trust" (p. 13).

A commitment to trust is generally seen as a vital precondition when members of a schools community seek to develop their schools as professional learning communities (Cranston, 2011).

Bryk and Schneider (2002), have determined that a particular system of social interactions, which they refer to as relational trust, is essential for improving urban public

schools as it describes specific role relationships between teachers, students, parents, and the school principal. They state,

> Relational trust views the social exchanges of schooling as organized around a distinct set of role relationships: teachers with students, teachers with other teachers, teachers with parents and with their school principal. Each party in a role relationship maintains an understanding of his or her role obligations and holds some expectations about the role obligations of the other. Maintenance (and growth) of relational trust in any given role requires synchrony in these mutual expectations and obligations. For example, parents expect that teachers will take the necessary actions to help their child learn to read. Teachers feel obligated to work in a professionally appropriate manner and are willing to commit extra effort, if necessary, in seeking to respond to the parents' expectations. Parents in turn are obligated to make sure that students attend school regularly and, more generally, to support the teachers' efforts at home. (pp. 20-21)

Bryk and Schneider (2003, pp. 41-42), assert that individuals are constantly discerning the intentions in the actions of others through their social interactions in the areas of respect, personal regard, competence in core role responsibilities, and personal integrity, which are described as follows:

- Respect – Relational trust is ground in the social respect that comes from the kinds of social discourse that take place across the school community. Respectful exchanges are marked by genuinely listening to what each person has to say and by taking these views into account in subsequent actions. Even when people disagree, individuals can still feel valued if others respect their opinions. Without interpersonal respect, social exchanges may cease. People typically avoid demeaning situations if they can. When they don't have this option, sustained conflict may erupt.

- Personal Regard – Such regard springs from a willingness of participants to extend themselves beyond the formal requirements of a job definition or a union contract.
- Competence in Core Responsibilities – School community members also want their interactions with others to produce desired outcomes. This attainment depends, in large measure, on others' role competence.
- Personal integrity – Perceptions about personal integrity also shape individuals' discernment that trust exists. The first questions that we ask is whether we can trust others to keep their word. Integrity also demands that a more-ethical perspective guides one's work. Although conflicts arise among competing individual interests within a school community, a commitment to the education and welfare of children must remain the primary concern.

Relational trust is rightly seen as an organizational property because its parts are socially defined by the way people interact with each other in a school community, and its presence (or lack) has important effects on how the school works and its ability to bring about fundamental change (Bryk and Schneider., 2002). Schools with high levels of relational trust find it easier to engage in collective decision-making as it reduces risk associated with change and provides a moral imperative to undertake the difficult work of experimenting with new practices, deal with conflict, and engage with colleagues (Bryk and Schneider, 2003).

In summary, "[T]he complex adaptive system is one of becoming. It is in the continuous flow of creativity, of changing and becoming. The connection of the elements, as well as their diversity, is a critical parameter of a complex adaptive system" (Keene, 2000, p. 16). "Complexity theory describes how networks of interaction enhance the potency of resource exchanges beyond their individual or summed values to the network, and how the interaction of

resources add strength and vibrancy to the system as a whole . . . .” (Marion and Uhl-Bien, 2001, p. 408).

Schools are complex adaptive systems in which trust is foundational to building relationships as it is the glue that binds communities together. A willingness to be vulnerable and take risks are attributes that result from trust in relationships. Vital to improving relationships and schools, however, is relational trust, which is a distinct system of social interactions. Relational trust within a school community is one of respect, personal regard, competence in responsibility, and personal integrity. Where there is relational trust, you will find interaction resonance coursing through the networks of complex adaptive systems with flows of information and interaction exchanges resulting in knowledge creation which builds capacity in a school community. The consistent interactions within the networks create rich connectivity which lends itself to innovation, creativity, and newfound possibilities to reinvent itself beyond expectation and even recognition.

Relational trust frees the mind to open itself to the diversity of people, places, skills, knowledge, and ideas. Possibilities are endless when diversity is perceived to be an advantage resulting in variety of combinations. A community in which relational trust exist will be a community that engages in rich interactions and high productivity resulting from information flow, connectivity, and diversity such that adaptations, innovations, and experimentation exists and emergence abounds. If schools are ever going to position themselves at a critical stage for transformation where true collaboration, interconnectedness, interdependence, and interaction resonance flourish then relational trust, connectivity, information flow, and diversity must be present.

CHAPTER 3
METHODOLOGY

The purpose of this qualitative instrumental case study is to use complexity theory to examine the leadership practices of two urban principal Fellows of the Lynch Leadership Academy at Boston College through the lens of complexity theory. Additionally, this study will describe actions taken by the urban principals to put into practice the concepts espoused by Boston College Lynch Leadership Academy through their capstone Leadership Growth Project.

This chapter introduces the research methods, including the participants, access and entry factors, data sources, data analysis, and the limitations of this study. In particular, various sections provide rationales for using qualitative research methods to answer following research questions.

1. What approach did the principals take for implementing their Leadership Growth Project?
2. What elements of complexity theory were manifested through teacher and principal interactions?
3. What hindered or promoted teachers' ability to self-organize for emergence as a complex adaptive system?

Research Design

To address the purpose of this study and answer the research questions, a qualitative method is employed through an instrumental case study. This qualitative study looked at few individuals and numerous factors, in contrast to typical quantitative studies that concentrate on many participants and few variables (Creswell, 2013). The research's design adhered to a key element of qualitative methodology: using the researcher as the main research tool (Bogdan &

Biklen, 1992). The study was conducted in a living environment (an urban high school), to build a sophisticated, holistic picture while analyzing language and practices and to report participants' perspectives. According to Denzin and Lincoln (2000), investigations through qualitative research are both typical procedures and important instances and influential to individual lives.

A three-year longitudinal instrumental case study (Stake, 1995) was conducted within the schools of two urban principals who participated in Boston College's Lynch Leadership Academy (LLA) which is a coaching and professional development program for principals and aspiring principal leaders. The instrumental case study examines a case, such as an individual or an organization, to provide understanding of a specific problem (Stake, 1995). Therefore, employing an instrumental case study will assist in addressing the purpose of each case, which is to study the leadership practices of the urban principal Fellows relative to the implementation of their Leadership Growth Project with hopes of acquiring an understanding of their influence on teachers and students in their school communities.

Access and Entry

This research is part of a larger research study of the Lynch Leadership Academy (LLA). Dr. Patrick McQuillan, the lead researcher, has conducted numerous studies based on the Lynch Leadership Academy in a variety of urban schools. As a research assistant, I have been afforded the opportunity to conduct research about the Lynch Leadership Academy experience of six LLA Fellow alumni through the lens of complexity theory which led to this current research study, approximately two years later, of two LLA principal fellows and their school leadership in which I focus on the mathematics' teams in both schools to assess how both principal fellows distribute leadership among the teachers, as a collective, to meet the goals and objectives of their

respective principal's leadership growth project.

Setting and Participants

This section describes the environment, which gives some background on the research participants. The study's setting or living environments are located at two research sites in a significant urban school district. The profiles of the participants will be presented after the two schools have been introduced.

Research Site: College Preparatory High School

College Preparatory High School (CPHS) is a college preparatory high school located in an urban district in Massachusetts. Its mission and vision is to prepare students for advanced studies and careers in the field of health and science and provide multiple opportunities for students to participate in internships, job shadowing, and hands-on experiences in the fields of health and science. The predominant demographic group that make up the majority of the student body population are African American (66.8%) compared to the school district (33.7%) and the state (8.3). The next major group is Hispanic (27.1%), which is about forty percent less than the district (43.0) and about 59% more than the state (16.1%). A summary of the school enrollment data for 2012-2013 is presented in Table 3.1.

Table 3.1. CPHS Enrollment Data (2012 - 2013)

Enrollment by Race/Ethnicity (2011-12)			
Race	**% of School**	**% of District**	**% of State**
African American	66.8	33.7	8.3
Asian	1.6	8.3	5.7
Hispanic	27.1	43.0	16.1
Native American	0.0	0.3	0.2
White	2.4	12.6	67.0
Native Hawaiian, Pacific Islander	0.0	0.1	0.1
Multi-Race, Non-Hispanic	2.1	1.9	2.5

Selected data for student body population for the academic year 2012-2013 indicates that College Preparatory High School is identified as a school that serves students with a variety of needs. The student body comprises 91.8% of students with high needs 83.4% of students are low-income, 42.6% are students with disabilities, 39.3% are students whose first language is not English and 23% are English language learners. Table 3.2 provides a summary, which also includes school, district and state comparison data.

Table 3.2. CPHS Selected Population Data (2012 - 2013)

Title	% of School	% of District	% of State
First Language not English	39.3	48.1	23.9
English Language Learner	23.0	30.4	11.0
Low-income	83.4	71.2	43.8
Students With Disabilities	42.6	21.9	18.9
High Needs	91.8	81.5	55.6

Research Site: Community Charter School

Community Charter School is a college preparatory school located in an urban district in Massachusetts. The mission and vision of the school is to prepare students for success in college and beyond by providing an outstanding and transformative education that speaks to the whole child: mind, body, and character. Community Charter School is an Expeditionary Learning school which sees the world as its classroom and engages its students through academics and daily experiences of discovery. The arts and social justice are the cornerstone of its curriculum. The school is committed to educating its diverse student-body with broad curricular opportunities. It is a four-year high school of more than 96% of students reflecting the diversity of the district. The school's record showed that the student body consisted of 2% white students, 84.5% African American students, 11.4% Hispanic students and 1.3% Asian students. Since the school functions separately from the district, its district data is the same, but vary in comparison to the state data in which white students make up 67% of the student enrollment, African American, 8.3%, and Hispanic, 16.1%. %). Table 3.3 presents a summary of the school enrollment data for 2012-2013.

Table 3.3. Community Charter School Selected Population Data (2012 - 2013)

Enrollment by Race/Ethnicity (2011-12)			
Race	**% of School**	**% of District**	**% of State**
African American	84.6	84.6	8.3
Asian	1.3	1.3	5.7
Hispanic	11.4	11.4	16.1
Native American	0.7	0.7	0.2
White	2.0	2.0	67.0
Native Hawaiian, Pacific Islander	0.0	0.0	0.1
Multi-Race, Non-Hispanic	0.0	0.0	2.5

A little more than two third of the students, 69.1.%, come from low income backgrounds in which 51.7% receive free lunch and 17.4% receive reduced lunch. Additionally, 22.8% of the data comprise students with disabilities and 22.1% show that English is not their first language. Table 3.4 provides a summary of the selected population data, which also includes school, district and state comparison data for the academic year 2013-2014.

Table 3.4. Community Charter School Selected Population Data (2013 – 2014)

Title	% of School	% of District	% of State
First Language not English	22.1	22.1	16.7
English Language Learner	2.0	2.0	7.3
Low-income	69.1	69.1	35.2
Students With Disabilities	22.8	22.8	17.0
Free Lunch	51.7	51.7	30.4
Reduced Lunch	17.4	17.4	4.8
High Needs	-	-	-

Note. High needs data for the school was not available.

Research Sites' Participants

Felicia Thompson is the principal of College Preparatory High School. She is a Black female who has served for four years as a principal. Her LLA Leadership Growth Project (LGP), Ms. Thompson chose to focus on consistency in consistent classroom observations, timely feedback, teachers meeting or exceeding Common Writing Assignment (CWA) targets, conducting teacher-led 'Looking at Student Work" sessions and sharing best practices. Ms. Thompson's LGP is as follows:

> The focus of my LGP was to conduct consistent classroom observations using the state evaluation rubric and to provide targeted feedback in a timely fashion. I chose this as my focus because in order to meet and exceed the school-wide learning goal, I needed to be

in the classrooms observing instruction and providing feedback. The school-wide learning goal that Ms. Thompson wrote in her LGP is as follows:

> Students who attend school 85% of the time or more will meet or exceed the following targets on Common Writing Assignments (CWA) in math (2.1), English (2.3) science (1.3), and social studies (2.3 same as ELA) by the second week in May. These scores include a 50% increase from the Spring 2012 open response MCAS data.

Teachers knew they were being evaluated with a new rubric and that they needed to be proficient in Standards I and II in order to receive an overall rating of proficient. In addition, my professional practice goal was:

> In order to provide targeted and constructive feedback to all staff that I evaluate, I will ensure that all evaluators observe classes on a consistent basis, at least 6 visits per week, and provide feedback within 3 days. I will also use professional development and PLC [Professional Learning Community] time to conduct teacher-facilitated "Looking At Student Work" (LASW) sessions, develop CWAs, share best practices, review focal student project, meet with families, and to review common core standards. I will measure my progress towards these goals by the number of observation forms returned to staff and uploaded as artifacts on the evaluation system, professional development (PD), and Professional Learning Communities (PLC) agendas, and PD feedback forms.

Ms. Thompson's hypothesis declared the following:

> If our students are consistently exposed to rigorous, literacy-rich instruction and curriculum that require a wide range of higher order performance tasks, then they will:

- perform at the proficient and advanced levels on MCAS
- obtain scores of 3 or higher on AP exams
- obtain combined SAT scores of at least 1650
- be college and career ready

Her plan and strategies for promoting a "rigorous, literacy-rich instruction and curriculum" included the following components:

- Use of the state curriculum frameworks to plan and develop lessons.
- Expose students to informational texts in all content areas, as well as, require student to write using tier 2 and 3 vocabulary in all content areas.
- Use AVID strategies, specifically Cornell Notes and Costa's Levels of thinking and questioning.
- Use Claim-Evidence-Reasoning as a framework for student writing, thinking, and discussions.
- Use of the cycle of inquiry model to test the hypothesis using formative and summative assessment data from Galileo.
- Use grade level meetings and professional development sessions to look at student work.
- Participate in district Professional Development (PD).

Bomani Taylor is the second participant in the study. He is the principal of Community Charter High School. He is a Black male who has been a principal for five years. Mr. Taylor decided to concentrate on changing assessment procedures at the school level for his LGP project so that students' grades reflected their knowledge and abilities. His Leadership Growth Project is as follows:

My Leadership Growth Project is focused on changing assessment practices school-wide so that a) grades more closely mirror what students know are able to do, b) prevalent conception of the school, from a student's perspective, shifts from "unnecessarily difficult" to "difficult but doable" and c) a higher number of students reach proficient on Learning Targets (LTs) and courses. During the summer of 2011, we began the process of switching from "traditional" grading to standards based grading. Our audacious school year goal for 2011-2012 is to get every student, in every course, to demonstrate proficiency on course Learning Targets, in turn earning a promotion to the next grade or graduating. Given our relatively high rates of attrition, this is disrupting business as usual. This change in assessment practice will have a positive effect on teaching, grading, culture, promotion/graduation rates.

Theory of Action language

If we implement standards based grading appropriately (name standards, accurately assess what student know/able to do based on standards, and re-teach to improve ability), then teachers will intervene more effectively when students need additional support to reach proficiency, and students will learn more. (measured as quality of content understanding, not just number of concepts exposed to). Overall levels of proficiency will increase and more students will earn credit/be promoted/graduate

Data Sources and Collection Procedures

The data for this study were collected during a period of three academic years, September 2013 through June 2016. The data sources for this longitudinal study consisted of interviews and observations. The sources and collection procedures are described in the following section.

Interview data

The interviews provide researchers a means to make sense of the thoughts, feelings and practices that were unique to the participants to whom they happened, which help with developing an in-depth understanding of the case (Creswell, 2013). In addition, in-depth interviews are conducted to explore detailed information and experiences about the participants through the lens of complexity theory. The interviews were semi-structured, lasting for 40 minutes to 90 minutes, depending on the attention and interest of the participants.

Observation Fieldnotes

According to Creswell (2013), for qualitative research, observation is an essential tool for collecting data. This perspective is also highlighted by Angrosino (2007), who argues that observation as a qualitative tool provides the researcher, i.e., the observer, a way of noting how the phenomenon in the field or environment acts. For this study, applying complex adaptive systems, the living environments are two urban high schools and their mathematics department meetings. Five observations were conducted during the second year and three in the third year of the study. Specifically, for the second and third year, observations were conducted for the mathematics teams in each school to examine their collaborative efforts for implementing the school-wide leadership goals as specified in their principals' Leadership Growth Projects.

Data Analysis

The goal of the analysis is to understand the leadership practices of the urban principal Fellows relative to the implementation of their Leadership Growth Project with anticipations of developing an understanding of their influence on teachers and students in their school communities. The analysis targeted interview transcripts and observational fieldnotes. Saldana (2021) recommends applying In Vivo Coding for analysis of interview transcripts as an approach

of attuning yourself to participants' perspectives and actions. In this the participants are principals at two urban high schools. The initial codes will be based on key components of complex adaptive systems: *disequilibrium, self-organization, feedback, edge of chaos, emergence, trust*, *informational flow, connectivity,* and *diversity*. The next level of analysis will be thematic to provide interpretation of the data to construct meaning of the urban principals' understanding of their practices and actions happening in their school environment.

The Role of the Researcher

I played two roles as the researcher for the study: an insider and outsider. As an insider, I was responsible for the implementation of a problem solving strategy process for creating a theory of action as well as the facilitating of the cycles of inquiry for all math teachers at College Preparatory High School, which were conducted during the math meetings. As an outsider, I conducted interviews and observed teachers' during their math team meeting for each school.

CHAPTER 4
CASE STUDY FINDINGS

The purpose of this chapter is to present the findings that are pertinent to the participants' activities and the environment of the school. The review of literature which placed emphasis on the complex nature of leadership indicates that urban principals must progressively be sensitive to the expanding demands, expectations, and duties in schools. Leadership may be disseminated across the school community via decentralized networks of agents working as a collective body for self-organization, adaptation, and emergence for novelty innovation through the development of fresh ideas, methods, and practices. The findings presented in this chapter focus on each principal role of influence to answer the following research questions.

1. What approach did the principals take for implementing their Leadership Growth Project?
2. What elements of complexity theory were manifested through teacher and principal interactions?
3. What hindered or promoted teachers' ability to self-organize for emergence as a complex adaptive system?

This chapter presents the findings in three major sections. The results of the College Preparatory High School teachers' development and use of a theory of action to address subpar achievement test performance are presented in the section of this chapter. It also contains assumptions about the role played by district and school coaches in facilitating the circle of inquiry. Additionally, the principal offers both successful and unsuccessful narratives about structure, accountability, and restrictions. These perspectives are investigated in relation to the principal's viewpoints on the success and failure of the action—or lack thereof—taken by the teachers. In this section, essential findings are presented about College Preparatory High School

and it also focuses on Community Charter School's principal and teachers, considering their vision for their school.

College Preparatory High School (CPHS)

This section's goal is to highlight important research about the inquiry cycle at College Preparatory High School, including details about the principal's contribution to creating a culture of teachers through ongoing interactions with them. The principal shares observations on both constructive and counterproductive teacher action in terms of structure, accountability, and limitations. It also includes information on test performance by students.

The mathematics team consists of six teachers and one teacher intern. They are diverse in their race consisting of African American/Caribbean, Portuguese, Cape Verdean, and White persons, and they are diverse in the years of teaching ranging from 0 – 23 years. However, the number of years teaching at CPHS range from 1 - 9 years. Each individual brings a host of knowledge and information to their work.

The Cycle of Inquiry: Developing a Culture of Teachers Interacting with Teachers

In March 2013, when Ms. Thompson, the principal, and I began our research at CPHS, we had the chance to watch several content meetings and interview several teachers. I've known Ms. Thompson and have done my work under her direction. She was the assistant principal while I taught math. She was aware of my work and background as a math teacher in the district and graciously invited me to visit her school as a researcher to examine her leadership in light of her position as a Boston College Lynch Leadership Academy (LLA) Fellow. I told her I was searching a consulting position or something part-time around the start of the new school year in May 2013, about two months into my study and a month before the summer vacation, and I inquired if she had anything or knew about a position at another school. She then expressed an

interest in having me assist her mathematics team in their PLCs. Because I have prior experience leading work with grade-level and topic teams, I eagerly accepted her offer.

"If our students are routinely exposed to challenging, literacy-rich instruction and curricula that require a wide range of higher order performance tasks, then they will score at the proficient and advanced levels on MCAS," Ms. Thompson's hypothesis in the Leadership Growth Project (LGP). She used the following *strategies and plans* to introduce "literacy-rich instruction" in her school:

- Use Claim – Evidence – Reasoning as a framework for student writing, thinking, and discussions
- Use the cycle of inquiry model to test the hypothesis stated above using formative and summative assessment data from Galileo, a database that house students assessment record
- Use grade level meetings and professional development sessions to look at student work

The findings presented in the following sections will focus on the mathematics team and the implementation of *the Cycle of Inquiry*. Teachers would be encouraged to collaborate with one another as they concentrated on student learning by looking at a student work approach in which to apply literacy-based content that would require students to engage in higher-order thinking through the tiered questioning levels of MCAS Open Response items.

Developing a Theory of Action

Looking at Data. In an effort to use the data to create a theory of action, the researcher gave a presentation of the mathematics MCAS data with the mathematics PLC in September 2013. Analysis of the facts, identification of the issue, and determination of its underlying causes were necessary before we could create a theory of action. For MCAS data from the years 2009–2013, a 5-year frame of reference was given to offer historical context (Massachusetts Department of Elementary and Secondary Education).

The percentage of students who were rated as proficient or higher, advanced, proficient, needs improvement, and warning/failure, as well as the Composite Performance Index (CPI) and the Student Growth Percentile (SGP) for the entire school, were all displayed in a summary of the data from 2009 to 2013. The CPI gauges students' proficiency levels, with 100 being considered proficient. The median student, or SGP, in the school or district—which is often between 40 and 60 for most schools—shows the growth of the middle student, or the measure of growth, on a scale from 1 to 99. However, students outside of the 40–60 range in Massachusetts schools can grow more or less than the average. The CPI and SGP levels of student performance from 2009 to 2013 are shown in the historical overview of the MCAS data for CHPS (See Figure 4.1.)

Table 4.1 CPHS MCAS Historical Data (2009 – 2013)

	Proficient or Higher	Advanced	Proficient	Needs Improvement	Warning/ Failure	CPI	SGP
2013	45	10	35	39	16	70.9	23
2012	43	9	34	50	7	74.1	43
2011	52	18	34	37	11	79.2	67.5
2010	52	25	27	32	16	78.4	71
2009	29	10	19	38	33	62	51

The mathematics PLC examined the data and found that the CPI began to decline in 2011 and the SGP began to decline in 2010, respectively.

The MCAS Point System, which some teachers were familiar with and others were not, was evaluated in order to look into the data change in more detail. The MCAS consists of 32 multiple-choice (MC) questions, each worth one point, six open-response (OR) questions, each worth four points, and four short-answer (SA) questions, each worth one point. The MC receives a total of 32 points, the OR receives 24 points, and the SA receives 4 points, for a total of 60 points. Refer to Table 4.2. A student must get at least 29 out of a possible 60 points to receive at least a competent rating, as illustrated in Table 4.3. As a result, when examining the point system to determine how students can advance from Needs Improvement to Proficient presented in Table 4.4, we could see how the six open-response questions' unanswered responses (BL for "blank") and low-scoring responses negatively impacted student scores, which could have produced proficient or even advanced results.

Table 4.2 MCAS Points for Types of Questions

Type	Number of Questions	Points per Question	Total Points
Multiple Choice	32	1	32
Open Response	6	4	24
Short Answer	4	1	4
Total Number of Points			60

Table 4.3 MCAS Points for Levels of Performance

Raw Score	Scaled Score	Level
19	220	NI
20	222	NI
21	224	NI
22	226	NI
23	228	NI
24	230	NI
25	232	NI
26	234	NI
27	236	NI
28	238	NI
29	240	Proficient

Table 4.4. Student Performance Point System

Student #	MC	OR1	OR2	OR3	OR4	OR5	OR6	SA	Raw Score	Scaled Score	Level
Student #1	27	2	3	BL	BL	2	2	3	40	258	Prof.
Student #2	19	3	4	3	1	4	2	3	40	258	Prof.
Student #3	18	2	0	1	2	2	1	1	27	236	NI
Student #4	16	2	1	0	1	3	0	1	24	230	NI
			+1	**+2**	**+1**		**+1**				
			↓	↓	↓		↓		↓	↓	↓
Student #4	**16**	**2**	**2**	**2**	**2**	**3**	**1**	**1**	**29**	**240**	**Prof.**
		Total OR points = 12									

Note. MC = 16 and OR = 12, then proficient

Students will therefore pass the MCAS at a proficient level, scoring 29 out of 60 points, if they are able to earn at least 12 points for OR responses (i.e., 2 points for each question), and 16 points for MC responses.

Problem of Practice/Root Causes. The Mathematics PLC noticed from looking at the itemized student data, which is not available online, that of the 57% of students at the "Needs improvement" level, less than 15 points were earned on the multiple-choice items, and less than 2 points were earned on the open-response items by 36% of the students. Based on the problem-solving approach to designing and implementing a strategy to improve performance (Childress & Marietta, 2010), the Math PLC used this data to identify their problem of practice, create a theory of action, define the three symptoms preventing students from gaining proficiency, and write their own root causes for each symptom based on the difficulties they believed were preventing students from performing well in their class. These results are presented in Table 4.5.

Table 4.5. Root Causes

Problem: Over the past 5 years, student performance at the Warning/Failing level has continued to decrease as student performance at the Needs Improvement level has increased, failing to make a significant shift to the Advanced/Proficient level.		
Symptom 1: The majority of Open Response points from students at the Needs Improvement level fall within 0–1 point.	Symptom 2: On the multiple choice items, fifty-seven (57%) percent of students at the Needs Improvement level are scoring less than 15 out of 32 points.	Symptom 3: On the short answer items, students at the Needs Improvement level, on average, are scoring 1.5 out of 4 points.
Why? I am not using enough Open Response type questions for students to experience the challenge of them and the success of scoring a 3 to 4 rather than a 1 to 2.	**Why?** I need to be more strategic with assisting students in becoming stronger in the specific areas they are struggling with and drill down more into the data and teach the students based on what I learn from their data.	**Why?** I need to be more strategic with teaching the concepts to my students that they are struggling with and use the Galileo data to assist me in being more strategic
Why? I need to incorporate fresh approaches that have students reach answers using higher order skills. I will use Galileo assessments as well as other technology as a part of this.	**Why?** I need to be more strategic in having students eliminate/narrow choices to increase possible responses.	**Why?** I need to incorporate into my teaching the value of marking up the text and have students find key words/phrases in the text that will help them get a response.
Why? I need to teach problem solving strategies for open response questions with my students and colleagues so that all students can increase their scores on the open response section. I will use MCAS data to determine areas of weakness. I will also use my own and district assessments (Galileo) to find out what standards/areas my students are having difficulties with, develop lessons to address these areas and communicate with my colleagues so that we can address these areas.	**Why?** I need to help my students increase their content knowledge. I will share MCAS data with my students and help them develop a plan to address areas of weakness. This plan will involve the student, the teacher, and the parents. I will communicate with my colleagues about the skills that my students are having difficulties with and develop a plan to help them improve or master these skills.	**Why?** I need to help my students increase their content knowledge. I will utilize Study Island to help my students become independent learners so that they can address areas of weakness.
Why? I need to incorporate more open response questions into the daily practice of the class. In addition, I need to determine if the reason for the decline is either language or skills based. If the cause is language based, I need to research additional methods of enriching the language needs of my students. Use of MCAS data, Galileo and other resources will help me determine a cause, which I will then use to create lesson plans to prepare the students.	**Why?** I will begin incorporating more multiple choice questions into my weekly quizzes and bi-monthly tests. While instructing and preparing my students, I will show them how to eliminate weak answers on multiple choice exams.	**Why?** I will need to obtain a class set of dictionaries. Then begin using more of the expected vocabulary in class. In class instruction on responding to short answer questions, I would begin by teaching the students to place the answer of an equation into a phrase, then complete sentences, and eventually into four to five line paragraphs.

Theory of Action. The Mathematics PLC developed their theory of action, which served as the foundation for their cycle of inquiry, after finishing the examination of the data. Following is the theory of action that was presented during their PLC meeting:

> All students should be able to perform at proficiency or higher on the MCAS if they are adequately prepared and supported by all teachers. We acknowledge that our students in the "Needs Improvement" category faced several challenges that impeded their efforts to successfully attack the 2013 MCAS, in which, on average, they scored less than 2 points on the Open-ended Responses and less than 15 of 32 points on multiple-choice items. We are committed to improving student performance and endeavor to aggressively pursue a more rigorous agenda for meeting the needs of our students.

Following agreement on their theory of action, the teachers agreed to the following tenets:

1. Provide frequent opportunities for students to experience the challenge of Open Response items,
2. Develop innovative approaches for students to access higher order thinking in problem solving,
3. Provide appropriate models to help students deconstruct the language of Open Response items,
4. Utilize data from Galileo predictive and formative assessments in identifying and monitoring areas for development,
5. Increase the instruction for test-taking strategies on multiple choice items, and
6. Adopt a common practice across the grade levels requiring students to show all work for short answer problems.

The mathematics PLC anticipated that, over time, they would not only improve student performance but also significantly affect their school's support of underrepresented and

historically marginalized students. Regarding instructor intentions in relation to students' learning experiences, Ms. Thompson was a little unsure. Because students don't feel like they are in a safe learning environment in that classroom, she added, "teachers are not even aware that students have emotional filters." Thus, as Ms. Thompson attended the PLC meeting and heard the teachers pledge to raise MCAS test scores, the tenets gave her some comfort about the teachers' intentions.

The team found it unsettling to see and acknowledge the 2013 MCAS data in plain sight, as well as the data's consistent decline from year to year. This realization made everyone in the room aware of the necessity of making an adaptive change in their instructional practices in order to improve student performance. The data dive, which lasted roughly three months during the mathematics PLC, was also attended by all of the mathematics teachers, the assistant principal, and the principal, Ms. Thompson.

The clearest explanation of the significance of change in relation to the PLC's work came from a teacher:

> We are all creatures of habit. Ms. Thompson is aware of that from year to year. We talked last year about this. Ms. Thompson asked us to try something different to keep us fresh. It's understood that people are going to have to have new routines, but that's dictated by the fact that our students still struggle academically, and if we keep doing the same thing, nothing's going to change.

In the mathematics PLC, which aimed to better prepare students for MCAS Open Response items, another teacher discussed the effects of looking at student work (LASW). She remarked, "A lot of our students weren't skipping open response items or not getting graded well on our MCAS. We had a lot of practice with that to ensure students left no blanks on the ORs." She proceeded when the researcher inquired about the outcome,

> We'll know when the test results come back. I felt good, even with the student who was absent 10 times over the term. Almost all of my tests this year were open responses, and they all attacked it in some way. We made it difficult for them to leave things blank.

Coach Facilitated Cycle of Inquiry

The objective of guiding the CPHS mathematics PLC team through an inquiry process is to engage them in a collaborative process of reviewing their colleagues' student work examples and giving insightful feedback in response to a specific question posed by the presenter of the student work. The ability of teachers to self-organize at the edge of chaos may cause the development of something new to resonate through their interactions. Teachers' openness to sharing their practice-related issues and to giving and receiving constructive feedback in an environment of disequilibrium is essential to the success of this approach. Ms. Thompson states, "I want them to become content specialists. So, the least of our worries is whether or not you know how to get students to figure out one plus one. It is…the collaborating with your colleagues, so that when you are stuck, they can help you out using the resources around you." She continues to speak on the need and consistency of feedback:

> They need…consistent feedback on their practice. . . . It's not about what you did or did not do; it is about what ***we*** did or did not do (emphasis from Ms. Thompson.) So, it's being resourceful but understanding that the work is hard, but if you want to change the picture, you have to do something different."

Looking at Student Work. The presenters are expected to pose a question to their colleagues in reference to the three pieces of student work submitted in relation to the Open Response item that was recently given in their classes, loosely matched to the Constructivist Tuning Protocol (National School Reform Faculty, 2014). Approximately five minutes are

allotted for the mathematics team to assess the student work, ask clarification questions, and then record warm and cool feedback on their sticky notes. When ready, the team gives the presenter warm comments first, followed by cool feedback. The presenter receives the stickers and then answers to the suggestions made by the team.

Example 1. CPHS Mathematics PLC January 2014. One of the first presentations given at LASW was this one. The speaker explains an open-response task in which he wants students to be able to perform simple mathematics in the form of answers to questions and effectively explain their solutions. He asks his colleagues to assess whether students are clearly elaborating on their responses. A member of the mathematics team frequently facilitates the conversations. A second team member would take the initiative and present the students' work. The dialogue is as follows:

Facilitator: Do you want to explain what this is?

Presenter: This was a question from eighth grade 2011 MCAS question that was given to the students. It wasn't entirely something that we had covered in class, but rather just expectations that they were able to complete it and make some calculations to form responses to the question. We had talked about, in the last time, about annotating and marking up the text. What I had emphasized here was to stress that they're explaining their answers clearly. So, that even though they're making those calculations, are they clear about it by stating what it is that they arrived at?

Facilitator: Okay. So, we'll have five minutes. We're going to *do warm feedback*, e.g., positive comments. (This type of feedback is illustrated by the comments made by the team):

T2: I feel like it is evident that you're working on writing out the answers and showing your work because all the students, at least, in the answers that they felt confident in, they all wrote out the answer. So that's evident that you're doing that.

T3: I think it was a good problem. And, it looks like they're having some training on how to label the answers and they're able to get the first questions right. It looks like they're putting forth great effort to solve problems.

After listening to these observations, the facilitator made the decision to further include the teachers by inviting them to express their opinions. T4 was given the opportunity to speak to start this discussion.

T4: I like the fact that every student has made an attempt to answer the questions. Some have gone as far as putting the answer in the form of a sentence. And all the work here, every student has started the question and gone through the steps to explain and show that they actually understand.

Facilitator: I agree. I like that they all show their work. Also, I like there's a real world problem and order of the problem.

T5: I like the fact that even though a lot of them weren't complete sentence answers, there are signs of annotation and writing the facts that they got from the problem given the information.

T6: Steps by students – you see it. It's a good typical MCAS question. Real world someone said. It was a good amount of work. Students understand how to calculate "Total Earned." So, I definitely saw some deeper understanding.

The facilitator was crucial in this session in getting the conversation to go in the right path. The facilitator requested input from the teachers regarding the assessment tasks. Then a debate known as "Cool Feedback," such as constructive criticism, was added. The facilitator prompted the team to respond once more.

Facilitator: So, we're going to go back around and do *cool feedback*.

T2: I will pass.

Facilitator: Mr. T3?

T3: I have a question. Can they use proportion to solve percent problems?

T4: There was one student here, who had an understanding–well, had a concept of percent, but I think it was reversed just based on her answers. How would you deal, or speak with her about that?

T5: I would basically agree with T4 where I'm in this class too. So, I did see a lot of the students do the same thing.

Facilitator: My question is, do students understand what it means to give a final answer without cross outs and marking up and stuff like that? And do students know what "show or explain" mean? So, when they showed a lot of work, do they feel like that is my "showing" and I fulfill that requirement of showing?

Presenter: I know proportions were covered, setting proportions up and solving for a variable. I know that every time, we're always asking for evidence. It's just from day one, that just giving an answer without some type of evidence is just not acceptable. So, I know that

that's pretty clear. So, I feel as though the students should be doing that, and they are expected to do that. Lastly, rationalizing that problem, or are they trying to put themselves in the place of it. They're struggling with that, and I'm not sure if it's a language problem or if they're unfamiliar with the situation of having a job. I'm not sure.

According to the presenter's response, it was critical to provide clarification, particularly explaining why having students provide evidence is critical to the mathematical task process. This pushed T3 to make the following request:

T3: May I comment on that?

Facilitator: Yes.

T3: I think sometimes we're having a lot of "language issues." There's a language barrier. But I think this problem, even though it's a good problem for us because we experienced these things, is a bad problem for these kids, who have not experienced these things. How many hours a week do you work? What is the length of a day? Unless you've experienced it, it's not something he's going to pick up. I know we have to introduce it to them, but this stuff is not that real to them.

Presenter (Final Response): I agree with you. I think some of the trivial conversations I might have with the students are about chores. Some of them have chores, and they get paid for that. Some of them find a balance. So, we have, again, one-on-one conversations about the allowance, the weekly rates, and doing a good job shoveling snow. For some of them, how much money do they get from shoveling snow? I agree with you. I think that it is about the students just trying to enter into situations where they've been experiencing rates or things

like, "If this, then that." So again, it is that exposure that they need to have. But at the same time, they've been working through these problems. I also like to think that those middle school and elementary school teachers are talking about those concepts and that this is what their world is about. As artificial as that may be, I know that again, in middle school there are activities that are done that reinforce the rates—doing scientific projects, those kinds of things.

T3: Okay.

This debate over the student work focused on whether language or experience was the cause of the performance issue. How can students excel at things that they do not even truly understand but have not yet encountered in the actual world? Is the apparent question posed by the team, based on their questions and remarks. The presenter acknowledges this concern in his concluding remarks, but he disregards T3's conclusion that perhaps there are linguistic concerns that need to be addressed. As a result, what is demonstrated here is how the mathematics team's use of warm and cool comments disrupts the complacency, conformity, and comfort of stability as a springboard for the development of something new and novel in order to meet the demands of their school community in response to the challenges they face. Lewin and Regine (1999) assert that this factor is essential for complexity-guided leaders, as a means to promote information flow and shared understandings (Meadows,2009).

Example 2. CPHS Mathematics PLC April 2014. One month before the MCAS, Example 2 of looking at student work was one of the few remaining LASW presentations for the learning community before students took the MCAS examination. During this session an open-ended response exercise is presented. The presenter assesses how well students comprehend, organize,

and represent the data to show how they responded to the mathematical tasks. This session began with the facilitator prompting the presenter to prepare for the discussion.

Facilitator: Let's start with [the presenter].

Presenter: This is an open-ended question that I gave my class last week. I was looking for their ability to answer the questions correctly, how well they read and processed the information, and how well they presented the information when they were asked to explain the process. But I was also testing for how much prior knowledge they had related to the topic. We talked a lot about equations and so forth. But there was also a question about percentages that we hadn't discussed, and I was curious to see how they would respond to that question and their answer.

Facilitator: Great. At this point, we will start and offer warm feedback to [the presenter]. Specifically, we will focus on these two questions. What were the two questions you wanted us to consider?

Presenter: Sentence structure – how they presented the material? Overall, how do they (students) answer the questions? If they answer questions correctly and how do they present the material? I've been encouraging them to use proper symbols. Like, for example the use of the money sign, using sentence structure, and whether or not they even knew enough to understand the question.

The facilitator stated that it was time for the team to provide the presenter feedback after the presenter had shared his questions with the team, asking, "Okay. I appreciate it. Do we have any willing volunteers who would like to provide warm comments? As shown below, several teachers volunteered to remark on the presentation.

T2: I'll start. I think, looking through the ones that I saw, they were, at least, all able to answer Question A. So, all the students were able to answer Question A.

T3: I'll follow that too. You did a good job with Question A. And I like how they're labeling their answers so that people can find them. And, they're putting forth a lot of effort to actually answer the question.

T4: I'm kind of catching myself here. I thought there were elements to the question that were connected to the students, but then again, this was an eighth- or ninth-grade question. So, I don't know how many of them actually have a job. So, I think talking about money might have been engaging to them and had a goal. I know one question, Part C, asked about trying to save money for something. Maybe it wasn't as clear, but there were elements to the question that I thought were engaging.

T5: For me, a good question is a scaffolded question. I liked how it progressed, and if others have said they did a good job answering Question A and labeling their answers, I agree. And the student work I looked at definitely showed an effort to answer all three questions.

T6: I liked how Part A of the question was separated from Parts B and C. With the introduction of new information to the problem, students can focus on the information for Part A. Then they realize that things are being switched up and we're looking at new information. Once again, I thought there was a good progression to the question types and how they became increasingly difficult for the actual student work. Again, Part A was fine. My student put down, for example, the symbol for money and got the correct answer designated as his amount per week. For Parts B and C, the student also wrote—not complete sentences but key information. For example, in Part C, the student wrote on the back that he wants to buy a car. But then he didn't show how much that car costs. So, leaving that out and then jumping directly into the work, unfortunately, led to the wrong answer.

The questions and various components of the response item were each highlighted by the teachers in their remarks. Since many of the students may lack work experience, most teachers

placed strong emphasis on how they felt about the questions and how engaging the task might be for students. The teachers also focused on how students labeled their solutions, e.g., using the dollar sign symbol ($). T6 made a perceptive comment on the mathematical assignment, focusing on the student's strategy and the sources of information he or she used to respond to each part of the test item. It appears that it was simple to just make general statements like, "I like the question" or other superficial remarks. As a result, T6 comments may be more helpful for the presenter to think about regarding how to use the activity to increase student learning.

After T6 detailed comments, the facilitator prompted the group to shift their remarks to offering *"cool feedback"* to the presenter.

Facilitator: Okay. So, we'll go around now and share cool feedback.

T2: Maybe in order to help them structure their work better—sometimes with the freshmen last year—I had them actually answer the question using claim, evidence, and reasoning. They could not make a claim. They could only respond to the question by not assigning me any work. And then, for evidence, show only the work to support your claim. Reasoning then asks, "Why did you do what you did?" So, to actually have them write it out, like, "Claim: Evidence: Here's all my work," Reasoning being what it is, this is why I got my answer. Sometimes, that helps them rearrange it. They did all the work correctly, but this person didn't. There was no money sign, and there was no context for why they got their answer.

T3: I think one of the things you focused on was having the dollar sign and answering the question in complete sentences, right?

Presenter Yes.

T3: I wonder if that's the best way to spend your time, or should you focus on the content? Say, if they're missing the dollar sign but they have the right work, they're going to get credit for

it. If the thing is not in complete sentences but the work is done correctly, they're going to get credit for it.

Presenter: I'm just thinking about text-based strategies: marking up the text and emphasizing key parts of the question. What are we doing to try to help the students focus on what they are trying to answer? I have a response here. For Part B, they took Part A and just extrapolated that for one day. Then they repeated it seven times in a row for seven days. So, they got a number that was just too high. Not everybody did that. But I saw elements to that where they weren't just going back to the question and making sure they were recognizing what was asked and making sure that their answer was reasonable.

T5: Okay. My cool feedback contradicts T3, and it might just be a difference of opinion. His students gave answers. But for me—maybe this is me, as a teacher—I would want more of an explanation, more of a complete sentence as to what the answer means in the context of the question. So that might be your own style. Maybe we need to do more research into what the MCAS graders look for. I don't know, but I know that for me personally, I want more of a full sentence and explanation and things like that. And I applaud you for getting to a more detailed explanation of what 213 and 300 mean. What does "blah, blah, blah" mean? Also, if I can provide feedback on your notes, maybe you can provide some written notes too. I know you said you're going to have a very thorough conversation with the students, but maybe you can give some written notes back so you're verbalizing for them some feedback as well, or maybe that's going to come. I don't know. So, it gets away from the 1 over 4 for the score. But I think overall, it's really good. Thank you.

T6: Yeah, I totally agree. More writing should be included. And that goes along with the show and explains Part A. I would say for something like Part B, you ask the question, "What percent of Leo's weekly earnings is taken out for taxes?" Perhaps you could add to that so

that students can still earn points even if they can't do the math, but you'd have to explain what we mean by "percentage." Like, if we're figuring out the percent of his earnings once taxes are taken out, what does that mean? I've seen students divide their earnings, their total earnings, by what was taken out rather than the other way around because I've dealt with this debt issue before. So, there's confusion about what it means—the word "percent," I think—and how that applies to the process.

Presenter: So, thank you, I appreciate that.

The main points of contention at this stage in the conversation included the volume and caliber of writing that students were expected to demonstrate while responding to the question, as well as whether a greater focus should be placed on mathematical content. Some of the teachers thought that too much time was spent on sentence structure, for example, writing complete sentences. Others, however, insisted that it would be preferable to concentrate on the content, particularly if pupils were getting the right answers. The presenter agreed, after hearing the feedback, that "additional writing is needed," in which the students would provide detailed information about their reasoning and understanding.

The facilitator asked the presenter if he had any clarifying questions he wanted to ask the team or if he needed to respond to the teachers' comments although he had just finished speaking and acknowledged his colleagues' feedback. The presenter did provide a commentary to elaborate on the scoring criteria and the need for complete sentences. The principal, Mrs. Thompson, had been sitting quietly during the discussion and paying close attention to the teachers' observations, particularly the presenter's description of how the mathematics task was scored. As a result, the following conversation was had.

Facilitator: Do you have some clarifying questions that might be asked? Do you want to give some feedback right now?

Presenter: Well, actually, when I was grading this and looking it over, I was actually looking at the MCAS scoring rubric, and I was looking at it and saying to myself, "Okay, many of my students did get the right answer." But the rubric also asked that the information be presented in a way that's understandable in terms of what was being asked and how it was presented within a certain context. You need dollar signs, complete sentence structure, and things like that. So, I was also looking at sentence structure as well as complete answers. And yes, I know that they will get credit for getting the right answer, but they'll also get more credit, or at least give a greater understanding to whoever's reading it, by presenting the answer in a format where it's understood that they know how to read, understand, and format where it's understood that they know how to read, understand, and give back information as it's presented. And seeing that I work with students who struggle with English, that's also one of the things I'm going to be focusing on as well.

Facilitator: Great. We do have someone who wants to ask some clarifying questions and stuff. So go ahead, Ms. Thompson.

Ms. Thompson (Principal): Are these papers ready to be returned to students as they are now?

Presenter: No, I was going to talk with them about it and ask their thoughts about it. Then I will take it back and regrade it again before I give it to them again. I didn't feel comfortable giving it to them the way I just gave them the score. I have to talk to them about it. Because—to be honest—I just put the score down. It could really lower many of their GPAs. So, I want to present it to them, and we will talk about it. Then I could give him something very similar back, and that would be great.

Ms. Thompson: Do they have a copy of the rubric?

Presenter: No. They don’t.

Ms. Thompson: So, if we’re trying to build skills in which students are going to be graded against a rubric, I think it's important for students to have the rubric ahead of time and for them to have exemplars so that they know what is included in levels 1, 0, 1, 2, 3, and 4. I think that's important even before you even begin to engage in giving out open response questions. I think that's part of the introduction to it. And in terms of the feedback, I think that it is important for students to get specific feedback here. This is just two over four. I don't know what that means. I don't know what I did right. I don't know what I did wrong. I think that our feedback—the feedback that we give to students on their work—has to be feedback that will expand their thinking. And without that, it's just a number on the page, and it doesn't give them the guidance they need to get to the next level.

T5: I agree.

Ms. Thompson: And I hear you saying that you're not done with this. So, that's just my opinion.

Presenter: Thank you.

Facilitator: Okay, everybody. We're actually at the end of time, so thank you.

Analysis of observation data shows that, while acutely aware of Ms. Thompson's presence during this session, the PLC participants were slightly surprised when she raised a question. According to complexity theory, community learning is a process in which the community, together with important insights from its members, self-organizes through a sequence of crucial events that shake the community and bring it uncomfortably close to chaos (Zellermayer & Margolin, 2005). T5 and the presenter both gave their approval to Mrs. Thompson's comments and queries. Additionally, it was clear that some of the teachers were apprehensive, particularly the facilitator who abruptly ended the session due to time constraints

without addressing the principal or her comments. Consequently, argues Pascale et al. (2000), the system, in this situation, the learning community, reinvented itself into a new, more complex form that was better equipped to handle the problems and challenges that emerged when there was a lot of positive tension present at the edge of chaos. Thus, it had hit a state of disequilibrium since "healthy systems do not operate at equilibrium. Rather, they are in constant disequilibrium. They must continuously respond to a diversity of circumstances that do not allow it to exist in a steady state" (Davis & Sumara, 2001, p. 92).

Prior to Ms. Thompson's questions, perspectives flowed freely and unexpected breakthroughs were made, which gave the presenter much to consider as he continues to make the mathematical task more accessible for the students. Breakthroughs similar to ones cited by Ms. Thompson show that "creativity in adaptive systems occurs in a special zone between the unstable disorder of chaos and stability of no change at the edge of chaos. . . . This essential creative state must be sustained long enough to overcome the tendency to revert to the sage, stable patterns of the past" (Zellerymayer& Margolin, 2005**,** p. 1279).

District Facilitated Cycle of Inquiry*:* Change in Structure

Ms. Thompson had submitted an application for the District's Cycle of Inquiry prior to the coach-facilitated cycle of inquiry. Ms. Thompson was unable to obtain coaching from the district for the 2013–2014 academic year due to demand. However, the following academic year, 2014–2015, they were able to accept the application. The researcher did not guide the mathematics PLC through the inquiry process as a result. Leading the inquiry process at CPHS was the district's inquiry team. The method of "Looking at Student Work" changed thanks to the district coaches' facilitation. The mathematics PLC's inquiry focus shifted to professional development, which covered a range of subjects like lesson planning, rigor, higher-order

questioning, and teaching techniques. The district coach, not the teachers, was in charge of the facilitation**.** The district coach facilitation sessions were attended by the PLC teachers, the principal, and teacher interns from a local university who were completing their full practicum.

District Coach Led PLC Facilitation

For this observation, which took place in December 2014, teachers examined one of their colleagues' lesson plans to identify higher-order questions. The district facilitator suggested to the teachers that they use a particular format when making remarks, then have each participant provide a key insight and a challenging question. An example of the teacher's interactions is in the dialogue that follows.

District Facilitator: Here's my proposal. I have a template that would allow for feedback. I want everyone to share one big takeaway and then ask one big critical question to up the rigor.

T1: My takeaway is that excellent work is now on the agenda. All these questions are good. Students might finish this in two minutes with nothing else to do. How about adding a higher-order question?

District Facilitator: It should be a question to which they all have access. Anyone else want to share?

T2: The question of whether I leveled up or we leveled up is delineated by defining inequality, linearity, and absolute value. "What is the difference between linear, inequality, and absolute value?" we wondered?

District Facilitator: The pizza questions made me think of area and sector questions. If they conclude that the 16-inch pizza had a larger area, then does that make it a larger sector?

Intern 1: Or, pretend you have a pizza with a specific diameter and create a problem to find a wedge. Which piece would you pick? They could make an argument out of it.

T1: I like the different sizes of the pizza.

District Facilitator: We're in our last couple of minutes. Who else wants to share a take away and level up?

Instead of focusing on the earlier remarks made during the sharing of information regarding the lesson plan, the facilitator decides to end the session by spending the final few minutes with the teachers providing new information. She goes on as though the remarks were irrelevant. Complexity theory emphasizes the growth of connections between elements at multiple organizational levels. The district facilitator and the teachers do not really engage with each other very much. The district facilitator does not make use of the teachers' feedback that they have provided. She does not bring them up in conversation. Additionally, the facilitator does not provide any context to connect the replies from the teachers and interns.

Intern 1: I like your questions. I'm just wondering what that's going to look like as you execute them. Are you going to build from level one to three, or are you going to mix it? How are you going to execute it?

Intern 2: I'm looking at a question dealing with tire pressure and the pressure that it should be, and it gives an interval for that. Now, how is it used in society? There's a problem about medication. Taking pills—that works for 3 to 6 hours; that's an interval. So, this builds into the kinds of questions that I'm supposed to ask.

Presenter: Did I do okay guessing what the levels might be?

District Facilitator: We had a discussion about level 2's, and they seemed to be more recall questions. When you see the resources that I have for you today, you'll see them.

T3: I'd like to hear more critical feedback than "good job."

T1: Are we focusing on the content or the language? And is this what we are going to do, or are we focused on the work the students are going to do?

District Facilitator: We are focusing on the questions in the lesson. It's important that the scaffolding match the task. But the primary lens is in the mini-lesson and conversations with students. And I think this is good in terms of where these questions come in. It will come up when we meet next week.

Again, the district facilitator does not connect this statement toT1's questions, which clearly indicate that the teachers would like to concentrate on content and language that would be a continuation of their work on student learning addressed during the previous year.

Limited Teacher Interactions with Each Other. The district coach led a whole-group discussion about what teachers are presenting in their classrooms during this observation, which took place in March 2015. After that, the reading task was introduced. Teachers, Ms. Thompson, and the assistant principal are all present during this meeting. Teachers are speaking, but it is difficult to hear them. After the group sharing period has finished, the facilitator then moves on to the next item on the agenda, which is a text rendering protocol from an article teachers were expected to have read in preparation for the meeting.

Teachers are reading the piece when Ms. Thompson pulls the meeting facilitator aside to express her dissatisfaction with the meeting. She expressed that she wasn't happy with the teacher engagement after overhearing some of the talk. She also voiced her disappointment in the facilitator for failing to encourage the teachers to discuss what they had shared. She believed that their actions and conversations had no bearing on how they conducted their practice. Ms. Thompson departs from the room highly upset.

Together, leaders and teachers can better address the intricate problems of education. As the head of the school, Ms. Thompson has cultivated a relationship with her faculty over time

that motivates them to work more and accomplish more. This doesn't seem to be the case between Ms. Thompson and the district facilitator. By setting expectations and norms for behavior that serve as a guide, she hopes to assist the teachers in resolving their inevitable differences and foster trust among them (Bryk et al. 2002). Furthermore, claim Bryk et al., improving urban public schools requires a certain set of social interactions defined as "relational trust." More crucially, in order to provide greater learning opportunities for their students, effective leaders need to create an environment of high trust among those who are guiding them. There seemed to be a breach in confidence when Ms. Thompson asked to speak privately with the district facilitator. Her reply to the researcher during the meeting, in which she indicated her skepticism about whether she should continue with the program, served as further evidence of this. As the head of the school, she was aware that the sessions accelerated by the district facilitator were not advantageous to the teachers. According the Lichtenstein and Plowman (2009), a specific high level of interactional quality known as "relational space" reflects a shared environment of respect, trust, and psychological safety in the relationship. These aspects seem to be missing at this point of the implementation phase of the project.

The teachers were asked to discuss their impressions on the reading when the district facilitator returned to the meeting. She carried on with the discussion as though the brief exchange with Ms. Thompson had not occurred.

District Facilitator: Lets go around and share what resonated with us about this piece.

Intern 1: I liked how one of the students came up with the idea of dividing the brownie into eight pieces. It wasn’t teacher-generated.

T1: I agree with that as well. Students were able to interact with one another and defend their position. It builds an academic repertoire among themselves.

T2: It reminds me of accountable talk that we used to do. We want to try to force these conversations so that kids are accountable for their actions and explain their thinking.

District Facilitator: I like how it highlights both teachers' classrooms as a place where they're both engaged. But it shows the difference between them. What did Ms. Carter do that was so different to get them to that next level? (Ms. Carter is the teacher showcased in the reading.)

Intern 1: I remember Ms. Carter, but it didn't resonate because I didn't have enough time to read it.

Intern 2: She expounded on what the students said, building on their answers.

District Facilitator: Let's go back into the piece and really try to pull out what Ms. Carter did on page 55 that was so different from page 56. (At this time, there are side conversations the researcher hears from teachers at the other end of the table.)

T3: She pulled at understanding. It wasn't, "You got the right answer, fine."

District Facilitator: She forced students to explain what they meant. Did you notice anything else? I know you did because there was a lot of conversation.

Intern 2: Well, the student from Ms. Carter drew a visual and Ms. Anderson drew a picture. (Interestingly, the most dialogue is coming from the interns.)

T1: It reminds me of the Socratic method of learning, in which a student learns by asking a series of questions and then guiding themselves to the correct answer. Ms. Carter is Socrates, and the student is Lacone.

T2: We did something with AVID around that, and it was familiar.

District Facilitator: This was in front of the whole class. So, I think they had been in groups where they were sharing their strategies.

Intern 2: Well, I find myself asking questions when I should be asking the students what their questions are. Being more specific about your questions will help them.

T3: We talked about how she didn't just accept the right answer but wanted to make sure that everybody in the class understood; however, it should be understood.

T4: This student was allowed to show their thinking, and the teacher checked for understanding. But other students may have different understandings. I thought the other method was more efficient, but the teacher just accepted the answer.

District Facilitator: So, you're saying Ms. Carter was interested in efficiency.

Intern 2: If I were in Ms. Andrews' class, I believe she would feel pressure to finish the lesson in time for those crucial discussions. (Mr. Andrew is another teacher mentioned in the reading that is under discussion.)

District Facilitator: Thanks to everyone for all of those comments. We're wrapping up at this point, and you're still on track for your action plan. We're in the middle of your action plan to get students to explain their reasoning.

T3: I like what Ms. L is doing because in her class she pushes for understanding, causing them to think about why their answer makes sense.

District Facilitator: So, as a team, what about committing to at least one piece of evidence that you can share when you push for that understanding? Document when you have a student present their strategy and have that be the centerpiece of the conversation. Bring the evidence to the next meeting. Can we push for capturing students' explanations of their thinking and making that the centerpiece of your conversation?

As this session came to an end, the teachers were responding to inquiries and making remarks about the reading but did not relate the reading to their own practice. The principal

raised serious issues with this element. However, it did not appear like the district facilitator made an effort to address this when she discussed the reading with the teachers.

MCAS Results

MCAS scores are shown in this section, demonstrating students' growth over the previous few years. Ms. Thompson chooses a focus area and then gives examples of how the external and district facilitators collaborated with teachers to accomplish her expectations.

Ms. Thompson's LGP

To meet her professional and student learning goals, Ms. Thompson made the decision to concentrate on improving the writing of 70% of students who attended school 85% of the time in all subject areas. Additionally, she used observations to provide teachers with pertinent and helpful feedback. Ms. Thompson recommended that the MCAS open response rubric be used by the teachers to evaluate students' writing. Based on the average of the 2012 MCAS, Ms. Thompson set particular target scores for the students to achieve.

External Coach Facilitator

The researcher chose to implement a weekly cycle of inquiry in which teachers would concentrate on reviewing student work based on MCAS open responses and receiving feedback from their peers based on a question of their choosing in order to help build students' MCAS open responses and best support Ms. Thompson's efforts to provide more consistent and timely feedback for teachers in order to help them reach their target goals in order to improve student open responses in the 2014 MCAS. As a result, students received the highest scores on the 2014 Mathematics MCAS exam since the MCAS data was first recorded in 2006. The 2014 MCAS Composite Performance Index (CPI) was 79.9. The Student Growth Percentile was 71.5. (See Table 4.6.)

Table 4.6. CPHS 2014 MCAS Mathematics Data Results

	Proficient or Higher	Advanced	Proficient	Needs Improvement	Warning/ Failure	CPI	SGP
2014	60	21	39	35	6	79.9	71.5

District Coach Facilitator

The district coach facilitator concentrated on lesson design, more difficult questions, teacher strategies, and classroom observations to support the mathematics PLC by assisting students in developing their mathematical literacy and demonstrating their understanding of mathematics. The mathematics PLC was better set up to examine how teachers interact with students, teach, plan, observe, and respond to questions. Therefore, education was the primary focus. The Student Growth Percentile (SGP) for the 2015 MCAS was 59, while the Composite Performance Index (CPI) was 74.2. (See Table 4.7).

Table 4.7. CPHS 2015 MCAS Mathematics Data Results

	Proficient or Higher	Advanced	Proficient	Needs Improvement	Warning/ Failure	CPI	SGP
2015	50	15	35	24	26	74.2	59

Overall, student performance decreased somewhat during the year that the district coach worked as the facilitator. Although there may have been a variety of explanations for the decline, it appears to be related to a change of facilitators and a shift in the PLC's emphasis from student learning and assessment to instructional preparation. Although each of these components are crucial, a more thorough examination is required.

Community Charter School

Bomani Taylor, the principal of Community Charter High School, is a graduate of Lynch Leadership Academy's (LLA) first cohort (CCHS). Of 147 students, 82.3% are African American, 81.6% have high needs, and 74.1% have low income. Retention rates were 6.1% and

attrition rates were 10.8% for the 2012–2013 academic year. The mathematics CPI and SGP were, respectively, 88.2 and 74.0. The Leadership Growth Project (LGP) of Mr. Taylor focused on altering assessment procedures so that grades are closely related to what students know and are capable of doing, students' perception of schoolwork shifts from being "unnecessarily difficult" to "difficult but doable," and a higher number of students are able to demonstrate proficiency in their courses and on their Learning Targets (LTs). The categorization of Community Charter High School (CCHS) as an Expeditionary Learning (EL) school is distinctive to the CCHS culture. Mr. Taylor goes into more detail on what an EL school is. He asserts,

> An Expeditionary Learning school is committed to the idea of social justice, educational experiences that are connected to students' lives, and learning and reasoning through authentic experiences. We want to decouple learning from textbooks and rote learning. Expeditionary learning is depth over breath. It is linked to personal experiences. Instead of just studying physics in isolation, we'll go out and measure the speed of cars, traffic lights, and vectors.

The Standards-Based Grading (SBG) initiative was initiated by the Dean of Students and his 10th grade mathematics teachers. The Dean of Students explains how the SBG was initiated. He states, "I was deeply involved in the standards-based grading when we started to make it go." My colleagues on the 10th grade team and I, after reading a book by Ken O'Connor, had exposure from a former Expeditionary Learning school."

Lynch Leadership Academy (LLA) Leadership Growth Project: Standards Based Grading

The Community Charter High School's grading policy is the main topic of this section. The explanation of Mr. Taylor's theory of action, which focuses on standard-based grading, is

presented first. A discussion of some of the problems caused by the new grading system, such as how students are graded, is also included in this section.

Mr. Taylor's Leadership Growth Project focused on transitioning from a traditional grading format to a Standards Based Grading Format (SBG) in order to increase the promotion and graduation rates at his school. His leadership growth project reads in part,

> During the summer of 2011 we began the process of switching from "traditional" grading to standards based grading. Our audacious school year goal for 2011-2012 is to get every student, in every course, to demonstrate proficiency on course Learning Targets, in turn earning a promotion to the next grade or graduating. Given our relatively high rates of attrition, this is disrupting business as usual. This change in assessment practice will have a positive effect on teaching, grading, culture, and promotion/graduation rates.

Mr. Taylor is well aware of the seismic shift in moving from a traditional grading system to a standards based system as he refers to it as a "crazy" goal. He states, "[W]e want 100% proficiency, which in turn will mean that 100% of our students are being promoted at the end of this year. It is crazy if you look at our numbers over time, but that is what I am pushing. So, that is the big indicator."

Mr. Taylor speaks passionately about students having a clear understanding of what is expected of them in all areas of content and that the expectations are doable in order for them to be successful. The idea of students articulating feelings of being overwhelmed, disrespected, and beaten down is not an option, as far as he is concerned. Thus, redoing the system of assessment school wide, provides for a measurement of students' abilities. He articulates his concerns as it relates to the importance of his leadership project which is written as follows:

> So, my project basically concerns redoing our school assessment system school-wide and to do it in a way that is going to allow for more accurate measurement of what students

> know and are able to do and [produce] outcomes on the kids' side where they are sharing information with us that they are *not* feeling overwhelmed, disrespected, and beaten to a pulp in regards to what they need to do. So, it's thinking about how we need to use assessment and assessment practices to better know what kids know without doing the whole race to nowhere and destroying their sense of self. So, that is the big picture. Thinking through what it would take to do a Standards Based Grading approach school wide has a ton of implications about practices.

Ambitious in his project to redo the school assessment system, Mr. Taylor is actually creating conditions for adaptive change in his school. Such a shift can bring about a great disturbance within the whole school community in its efforts to get students to 100% proficiency in learning targets that don't yet exist. In essence, he wants to generate a state of disequilibrium schoolwide. In his model, adaptive leadership starts by Identifying an Adaptive Challenge, which can only be achieved through "… sustained periods of disequilibrium. … Without a general sense climate of urgency—the feeling that something must change—the society [i.e., System] may do nothing until it is too late. [The key question is] how to manage sustained periods of stress" (Heifetz, 1994, p. 35).

Mr. Taylor created a theory of action that centered on Standards-Based Grading (SBG) in his school as a result of students not graduating or not being promoted to the next grade level for his leadership growth project. Thus, students can be rated on what they know and are capable of doing by switching from a traditional approach to grading to standards-based grading. The following is Mr. Taylor's theory of action:

> My [leadership] growth project is focused on changing assessment practices school-wide so that a) grades more closely mirror what students know and are able to do, b) the prevalent conception of the school, from a student's perspective, shifts from

"unnecessarily difficult" to "difficult but doable," and c) a higher number of students reach proficiency on LTs and courses.

Through his Leadership Growth Project, Mr. Taylor is creating the condition for disequilibrium where change is “aimed at enhancing student achievement” (McQuillan, 2016), allows the school community to embrace the tension created by the internal pressure to seize the opportunity (Goldstein et. al, 2000) to create a system that is accessible and engaging for students. Disequilibrium, while uncomfortable, is a required condition for transforming systems. As a whole-school project, it is not uncommon that staff members feel disturbed when the status quo is disrupted.

Attributing his goal as a "crazy" one, Mr. Taylor states, "[W]e want 100% proficiency, which in turn will mean that 100% of our students are being promoted at the end of this year. It is crazy if you look at our numbers over time, but that is what I am pushing. " So, that is the big indicator." Mr. Taylor credits his teachers for the idea of standards-based grading. He identifies his area of growth as a leader who changed his perspective from a focus that was exclusively on teachers to one that centers on teacher practices as well as student outcomes. He states,

> When I was focused on teachers, my rationale was to find out what they were doing well, support them, and help them name the things they weren’t doing well and support them. So, it's goal naming time. What do you see as your goals? What goals do I see? Who’s doing what in the school, and how do we measure this over time? My growth has been not just looking at teacher moves but at students' outcomes.

Mr. Taylor's distributed leadership is demonstrated by letting teachers take on a project, possibly even accidentally. The proposal was in the best interest of students in an effort to fully assess their knowledge and understanding without the confluence of other factors that

inaccurately represent their performance, and it was clear that his teachers had a strong case for why they wanted to implement standards-based grading.

A Problematic Grading System – Disrupting the Status Quo

The endeavor to separate what is referred to as "habits of work" from academic material, the standards-based grading system, was created out of this need. "Habits of Work" at Community Charter High School refer to one's preparedness and readiness to engage in the scholarship of schooling. They are: *Preparation* (I can come to class ready to learn), *Deadlines* (I can meet deadlines), and *Engagement* (I can fully engage in the work of the class). Focusing on student outcomes, Mr. Taylor questioned the reliability of the measurement of student performance in which the "Habits of Work" were embedded. He declares,

> As a school as a whole, how can we measure what students know and be more responsive? [This is] why we put in the standards-based grading and why our conversations have shifted. It doesn't matter if the children did their homework, were friendly, or were well behaved. No! Can they demonstrate the knowledge?

According to the Dean of Students, the Habits of Work constituted half of the grade, when he was a teacher, due to his perception that students weren't trying hard enough. His justification on Habits of Work states,

> One way I used to grade students was the category Habits of Work, 50%, classwork, 10%, and tests, 30%. Then, it would tell me that this student was not doing well on tests—maybe they're not studying hard enough or maybe they have test anxiety. But often times, the problem is that they're not understanding the work.

The team leader for the 10th grade stated his disappointment with the Habits of Work component of their grading system and the detrimental effect it had on students' grades. He explains,

> Previously, when I was here three or four years ago, when I initially came in, I was highly concerned about the weighting of grades. We have this component called *Habits of Work*, which is basically student skills: coming to class on time, turning in the homework regardless of performance on the homework, and the last one that we have is engagement in the class. So, with the majority of grades coming in from those things—upwards of thirty or forty percent—and not necessarily the actual understanding of the content, I was concerned that students were being passed on without understanding the content. So, within that first year, I dramatically changed the grading from what the previous teacher had done.

The mathematics teacher in the ninth grade expressed her worry about traditional grading since it unjustly prevented students who understood the material from graduating. She states,

> The mathematics standards-based-grading is such a big step from where we were before. One of our major concerns was how we would maintain the importance of work habits—I'm not sure if we ever figured it out. But, in my first couple of years here, it was a concern to me that students who had to repeat a grade knew 80 to 90 percent of all the material that we had studied that year. So, how was that working for someone who knows what we need them to know by the end of the year, but then they have to repeat it? A lot of it obviously had to do with habits or work.

The Habits of Work grading scheme, according to the teachers and the principal, disadvantages students. It didn't benefit the individuals it was intended to help at all. They all have reservations about losing specific components of the existing system, despite their commitment to change the grading system.

Inherent in Mr. Taylor's leadership growth project is the need to change the language and expectations of the teachers that better support students. He recognizes the Habits of Work as a practice that blames and fails students rather than push and support students. Thus, as he perceives the problem with the Habits of Work, it is a teacher issue rather than a student issue. He retorts,

> [The leadership growth project] was standards-based grading and changing the conversation language for kids: getting more kids to earn credit, move forward, and naming it so that we are intentional for every student to move forward and earn the grade, which is a symbol of having the knowledge they need. I think that is still a disruptive behavior in that the expectation, I think, in most schools it is not that every student will master the knowledge and move on. That's actually not the expectation. It's a very different frame for how to think about schooling as we are responsible for getting every single student to master the knowledge and move on. And, when they don't it's not because of their failure it's because we have failed to be able to support them in doing that.

There appears to be conflicting views between a deficit mindset versus a growth mindset on display at Community Charter School. To disrupt the status quo, Mr. Taylor changed the culture by which the certain teachers perceive the shortcomings of their students as internal rather than external by adopting the standards-based grading, which places the development of students' knowledge and understanding at the forefront for teachers. Mr. Taylor, however, recognizes the systemic issues in which marginalized students must navigate. Thus, teachers who subscribed to the "sink or swim" mentality saw the standards-based grading, with a particular focus on Habits of Work, as a means of relieving students of their responsibility. As a result, they

were the teachers who inevitably left the school. Mr. Taylor continues to expound further on the matter of disrupting the status quo.

> Where the rubber meets the road that's still very difficult to do because there are some things that are systemic that are issues that kids are bringing and bring. There are some kids that struggle with the knowledge or struggle with the skill set [they need] that supports their growth in academics. And so, that's more status quo. I believe we have been pushing on that front. We've changed our culture, we've lost some staff members due to it, who had said prior, it's more of a "sink or swim" mentality which was what we used to have at this school. So, they saw our change in grading as a way to reduce responsibility in children, and therefore they left. Some of them left on those philosophical grounds.

The status quo in education consists of policies, practices, and power structures that influence the way we educate and impede students from acquiring meaningful and substantial knowledge, which is substantiated in the data that shows a vast percentage of white educators lack cultural knowledge in our classrooms (Wurdinger, 2018). Disrupting the status quo is, by definition, creating conditions for disequilibrium in which the tension is not a result of opportunity, but of crises, as it challenges people's belief systems. In this case, Mr. Taylor chooses

Proposed New Grading System, Teacher Buy-In, and Implementation

According to Mr. Taylor, the idea of standards-based grading was developed by a group of teachers under the direction of the Dean of Students. Through Ken O'Connor's 2012 book *School Leaders' Guide to Grading*, the dean of students learned about standards-based grading. He and the 10th grade team decided to test out standards-based grading over the course of the

following ten days in order to determine its efficacy. He expresses his enthusiasm for standards-based grading in contrast to their grading system. The Dean states,

> I'm a big fan of measuring accuracy in student understanding—sort of naming the skills and knowledge. One way I used to grade students was by category: Habits of Work (50%), classwork skills and knowledge. "Hey, let's get you more resources about your grammar and conventions, or work with you to find the main idea of a paragraph." Then, the conversations with parents and kids have more accuracy.

In this case, the Dean of Students recognized the need to shift the conversation from what students must do to what teachers can do to better support student learning.

The team leader for the tenth grade elaborates on his suggestion to the group to start a pilot SBG and the teamwork required to pilot the SBG. In contrast to Habits of Work, which masked the difference and decreased the correlation, the findings of their examination of the data revealed a significant difference in the correlation between student performance and standardized assessment. He states,

> Within the second and third years, I proposed to my grade team that we adopt this philosophy, and the Dean and I actually approached the meeting saying that we were concerned that Habits of Work were not properly representing our students' understanding. So, we took that year as sort of a pilot/experimental year to go ahead and pitch this idea, where we clearly separated the two parts of the grading system (habits of work and content) into two categories. Then we had the student's grades be weighted by just their understanding of the content via formative and summative assessments. We did a very rough analysis during that process, primarily because the 10th grade cohort size was so small with about thirty-three, so the statistical rules and validity definitely apply there. We noticed that there was a very big difference in the correlation between student

understanding and performance on the MCAS state standardized test. The "Habits of Work" tended to dilute that correlation and that was, once again, correlation with one assessment.

Accepting disequilibrium as an opportunity tension, the 10th grade team and the Dean, began to self-organize around systems, strategies, and approaches to identify the problem and pilot the initiative. For experimentation to result in novel ideas, there must be interconnectedness and collaborative interactions among the people in the school community (Meadows, 2009). Through the self-organization of the 10th grade team and the Dean, they were able to pilot an experiment in which they examined student assessments based on their understanding of content and the Habits of Work. By analyzing the two together and then separately, it produced dramatic results. Through their collective effort and interactions, a new system of grading emerged that would place a greater weight on student performance rather than Habits of Work and focus on teacher practice in the content areas as the strategy for improving student performance.

The dean and team leader examined the results after completing an analysis on the data from the small pilot study that lasted approximately a year. Despite the short sample size, the findings were encouraging. The dean and the team leader made the decision to inform the teachers of the findings. The objective was to persuade them to try standard-based grading. The events that transpired when the principal and dean delivered their findings from the research to the teachers are briefly described here.

The tenth grade team's pilot/experiment with standards-based grading was effective, and as a result, the team leader was so confident in the pilot's results that he suggested they share them with the entire school. "We determined that [the results] were going to be in the right direction, and we decided that was evidence enough to basically go ahead and expand it to the rest of the school," he said. Mr. Taylor was shown the statistics and after hearing about their

research, he decided that the standards-based grading initiative should be presented to the entire school. Mr. Taylor elaborates,

> The data was so compelling about the alignment between the scores students were getting during their class period and then the outside proficiency exams—the MCAS—and the shift in conversation and output that kids were having.

Making an appeal to his colleagues, the 10th grade team leader focused on student knowledge and understanding in opposition to students simply turning in work, which lends itself to the wrong type of messaging for students. He shares the conversation he had with his colleagues,

> Let's work on your understanding of content because ultimately, we want kids to understand the content, and if you want them to be able to reproduce in a certain way, then maybe that should be a learning target or objective of your course. So we are trying to emphasize with the students that the importance is in the content and understanding of what we are asking you to do, not in being able to necessarily produce a test, a piece of homework, or a project. Those are definitely very important, but there are ways of assessing your student that are not necessarily focused on the content.

According to Mr. Taylor, the data presentation by the 10th grade team leader resonated with the whole school community. He states, "It was so compelling that the staff then voted to go ahead and do the system across the entire school." The Dean of Students and the 10th grade team, with the approval of the principal, forged ahead to invite the whole staff community to adopt the standards-based grade for the entire school.

Mr. Taylor responded, "It's a place that is teacher-driven, where excellent practices arise from teacher groups," when questioned about the school's culture. By allowing teachers to pilot

their project and share their findings with the entire school community served as a way to have their project adopted across all subject areas, Mr. Taylor exemplifies distributed leadership.

The dean and the tenth grade team serve as an illustration of a complex adaptive system. As a team, they were able to adapt to the conditions within their environment and change over time. They worked together to develop the Standards-Based Grading system, which was later adopted by the whole school community and changed the landscape of grading schoolwide. Complex adaptive systems are made up of a wide variety of agents that communicate with one another, have mutual effects on one another, and produce novel and emergent behaviors for the system as a whole (Lewin & Regine, 1999). Their diversity in years of experience, age, gender, and content knowledge is reflected in their influence on one another. Because they are never too far apart, given their small school setting, they can efficiently move information (Davis and Sumara, 2006), which is relevant for creative problem solving (Guastello, 2002). Relational trust is the cornerstone of the relationship, as it is the glue that bonds this community together and the lubricant that contributes to greater productivity through the flow of communication (Tschannen-Moran, 2014).

Implementation and Challenges

To persuade teachers that changing the current grading system is worthwhile, it can be helpful to provide evidence when commencing change. The tenth grade team leader presented the results, and the school's teachers were free to ask questions and voice their concerns after reviewing the information. The decision was made to proceed with standard-based grading at that point.

Once the whole school accepted the Standards Based Grading system as presented by the Dean of Students and the 10th Grade Team, they began the process of crafting their Learning

Targets and Supporting Learning Targets within their content team meetings, during the whole school professional development meetings and in their content team meetings. The process of crafting Learning Targets and Supporting Learning Targets within the content teams was an arduous process as teachers gathered to go through each common core standard and create supporting learning targets. At times, the different content teams would gather together to review the Learning Targets and on other occasions they would be in the same room in different areas crafting Learning Targets alone or with another member of the team. The process took approximately one year.

A student teacher interning under the tenth lead teacher, who also teaches mathematics, goes into considerable length about standards-based grading. He provides an overview of the curriculum for standards-based grading, which is distributed into Big Learning Targets and Supporting Learning Targets. Students are required to be able to complete these targets in order to receive a performance level of beginning, developing, accomplished, or exemplary. He describes Standards Based Grading as follows:

> We have three trimesters. As a result, everything taught at Community is based on learning objectives. So, we came up with big learning targets. For our course, we have seven of these big ideas of what we want students to be able to do. So, they're all phrased the same way: "I can do this...." So, within each big learning target, there are several supporting learning targets, as many as ten or as few as four. Usually, I try to balance them out a little bit, but supporting learning targets is more skill-based and more accessible.

At this moment, the intern took a moment to let his listeners reflect on his remarks. He proceeds with an example to further illustrate the ideas of standard-based grading. Stating,

> For example, supporting learning targets might be "I can identify a pair of triangles that are similar or congruent." Then assess the work they've done. They get graded on a scale of "beginning," "developing," "accomplished," or "exemplary." Basically, if they can do all of those skills that we're asking them to do, they are, according to the grading scale, "accomplished." In order to get exemplary credit, they need to be able to show some extra work where they're thinking about the material in a deeper way and organizing their knowledge in a deeper way, which we do through extra work. That gets them to think more deeply about things. So, they actually get a grade on each and every supporting learning target on the scale, and those things create a grade for the big learning target, which creates an overall grade for the course. if that makes sense.

The mathematics intern then goes into depth on how the supporting learning targets may be used to grade the students.

> The grade on the Supporting Learning Targets comes from a variety of things. It varies in classes—they could be projects, papers, or assessments. In math, we've been largely using assessments. So, that grade comes from assessments. Therefore, everything else is based on those assessments.

The way the content teams decide to organize teaching and learning within their classes will affect how grades are assigned for learning targets. In this instance, the mathematics team will base its grades on assessments of the supporting learning targets.

Mr. Taylor used one word to sum up his experience with the implementation of Standards-Based Grading across the entire school. He described the inability of some teachers to change their perspectives as "painful." In this instance, he discusses a conversation he had with a few of his teachers. He goes on to say,

> [Standards Based Grading] was a process. It was painful because of the shifting paradigms about what it means to teach and what learning means. And a lot of folks got really hung up on a couple pieces, like, "So, you're saying kids can just turn in other material later on to show that they know something, and they're not penalized for not turning stuff in early on?" And I'm like, "No, no, they're not." They're saying, "So, you're saying that they don't have to do every homework assignment?" "Yeah, that's actually what we're saying." You don't have to do every homework assignment. "But if you do enough so that you understand, that's what we want."

Mr. Taylor recounts a similar incident in which a teacher accused him of manipulating their decision-making process in order for them to reach the decision he wanted. He talks about the conversation,

> There was a time when a teacher, who ended up leaving, said, "If this is what you wanted to do, you should have done it rather than take us through this process." She spoke as if it was nefarious on my part, but I wanted the decision to be a team effort. I think we did it just right. We spent a lot of time going through the process, and at the end of each year we would tear it down and do it again. It feels right. Standards-Based grading is way messier than traditional grading. As new people come on, there's a process of realigning.

When it comes to developing systems, processes, and programs that have an influence on the school, teachers and administrators collaborate as a single, cohesive team. This is how Community Charter School operates. Individuals must engage when working in groups, teams, or committees, especially during trying and unpleasant conversations.

The Dean of Students spoke about his frustration with working with teams that slow down efforts to bring about change within the entire school community. He elaborates,

> We do a lot of committee work, cooperative problem solving, and cooperative decision-making. I often find it frustrating, but it's good for my development as a communicator. Sometimes, in our efforts to get everybody on board and unified, we might move away from things that work, or we might want to make a consensus decision that might have pretty good results, or we could make a non-consensus. Sometimes I believe our committee decisions set limits rather than achieving the ideal.

Despite his frustration, he appreciates the ability for people to differ and be straightforward with one another. It has been beneficial to consistently have uncomfortable and meaningful dialogues. According to him, community is about coming to decisions collectively. He states,

> One thing I appreciated about my relationship with my colleagues was how much we disagreed with each other and said no, and how direct we were with each other. So I try to be more direct. The repetition of having difficult and meaningful conversations has been helpful. One thing about our community here is that it's around decision-making.

Regarding the systems, institutions, and programs that have an impact on the school, teachers and administrators collaborated as a single, collective entity. The standards-based grading system's advantages were not without controversy. For some people, it was unpleasant, and for others, it was frustrating. However, change is a process, and change does not always happen without conflict.

This process can be seen as self-organization for the development of something new or novel at the edge of chaos through the lens of complexity theory. The content team meetings were rife with conversations of individuals working together, struggling together, laughing together, and occasionally working in silence during the Standards-Based Grading creation process. Information is fed continuously back into the system in a delicate balance of push and

pull. The balance point, also known as the edge of chaos (Goldstein, et al. 2010), is where the teachers, as complex adaptive systems, never quite lock into place but also never fully collapse into disorder (Waldrop, 1992). This state of being in constant tension stimulates greater transformation and experimentation, and it is more likely that novel solutions will be discovered (Pascale et al., 2000).

As the glue that holds communities together, trust is the cornerstone of relationship formation in schools since they are complex adaptive systems (Morrison, 2002; Brooke-Smith, 2003). Mr. Taylor and the tenth grade teacher leader have the ability to expose their concerns and take chances are qualities that come from relationships where there is trust. Relational trust, a unique system of social interactions, is crucial to enhancing both relationships and educational institutions. There is mature respect, among the dean, the tenth grade team leader and the principal and over time the tenth grade teachers who had buy in into the importance of change. The personal integrity of these individuals also had the ability to assume responsibility and to contribute to relationship trust within their school. Where there is relational trust, you will find interaction resonance flowing through the webs of complex adaptive systems, with flows of information and interaction exchanges leading to knowledge creation that strengthens a school community (Keene, 2000). Analysis of data suggest that this may be the case for Community Charter High School, during their initial inquiry and implementation phase.

Results

Mr. Taylor discussed the advancements achieved by his school since the implementation of Standards-Based Grading, which was developed over the course of two years and fully implemented the following year. He elaborates on the success of the school, students' knowledge of and comprehension of the learning targets, classrooms' posting of the year's learning targets on

the walls, teachers' use of performance-based grades rather than letter grades, and students' ability to check their progress toward their learning targets. When asked how things were going, he conveyed the following,

> Very well! We have an extremely effective, standards-based grading system in place. We're at the point of just talking to the 9th graders when they come in and say, "This is what we do." Everyone now understands and knows the system. When you walk into classrooms at Community Charter School, you will see on the walls the learning targets for the year. Every day, the targets for that day are listed, and students understand that they are responsible for knowing the information on those targets. The teachers aren't giving them grades like "check plus" or "A minus." They're asking them, "Are you proficient in this target or not?" And they know where to go to check and see how they're doing on their target development over time with the online target system, which is great. We've made a significant shift from conversations about just turning your work in so you can be promoted to conversations that are just about always, "I didn't understand this concept." "How do I understand this concept?" So that's been phenomenal.

Mr. Taylor and many of the teachers were quite concerned about the retention and graduation rates at the beginning of this project. The grading system was considered to be a likely contributing factor by the administration, the dean of students, and the mathematics coach for the 10th grade. As a result, the principal created a theory of action to modify how teachers assessed their students. After conducting a pilot study with a tenth grade team, led by the team leader, there was evidence that switching from the existing system to a standards-based approach would help improve the retention and graduation rate for the school. All members of the school community have to be committed to the standards-based grading system in order for it to be successful. Despite its difficulties and conflicts, the school community underwent

metamorphosis. As a result, of their retention rates decreased and their graduation rates increased over a three-year period are shown in Table 4.8.

Table 4.8. Community Charter School – MCAS Retention/Graduation Rates

Year	Retention Rate	Graduation Rate
2011	10.3	43.5
2012	3.4	62.5
2013*	6.1	70.4

*2013 represents exodus of 80% of Community Charter School's veteran teachers

The Community Charter School has proven that interactions among people inside a system are the source of new thinking, originality, and adaptability. Connectivity and collective interactions among members of an organization are essential for experimentation to generate innovative ideas (Morrison, 2002).

CHAPTER 5
SUMMARY, CONCLUSIONS AND IMPLICATIONS

Chapters Four contains the results of this instrumental case study. This chapter includes the following sections: a summary of the study, a discussion of the findings, conclusions and implications, limitations of the study, and suggestions for further research.

Summary of the Study

Although there are numerous research projects that might be conducted to address various issues related to how common principal leadership was, this research is constrained by the objectives and goals of this study. Its purpose was to examine and document the leadership practices of two Principal Fellows from the Lynch Leadership Academy (LLA) using complexity theory to examine an initiative that they had recognized as a growth area and had committed to implementing in their schools. With a focus on the tenets of complexity theory and the influence on the school community, one objective of the inquiry was to examine the actions and behaviors of the principals and teachers through their mutually dependent and interdependent interactions as they carried out their Leadership Growth Projects. Another goal was to use the complexity theory as a lens to look at each school as a complex adaptive system. Complex adaptive systems are made up of a variety of interconnected parts that must be understood holistically in order to promote the emergence of new elements, phenomena, structures, and behavioral laws (Morrison, 2002, p. 12). It was hoped that studying the principals and their teachers over time would shed light on a process for thinking about principal learning as well as teacher learning as they identify, improve, and fortify their school community to support student academic learning and growth.

An examination of the study's literature reveals that the bulk of educational inquiries into the related domains of teacher and school administrator professional development take place in school districts, with the latter taking place in separate silos. In this study, I argue that in addition to acting as vital information sources for teachers like district coaches, administrators have the ability to develop relational trust, which is the cornerstone of complex adaptive systems. Schools are complex adaptive systems that can learn, adapt, and change (Brooke-Smith, 2003). Using principal and teacher interviews and observation fieldnotes of professional learning communities meetings at the schools, this study documented the actions and behaviors of the principals and teachers as they developed a theory of action and carried out their Leadership Growth Project, taking into account the ideas of complexity theory and the influence on the school community.

Research Questions

The following research questions helped in choosing the study's setting, subjects, and methods for data collecting and analysis.

1 What approach did the principals take for implementing their Leadership Growth Project?

2 What elements of complexity theory were manifested through teacher and principal interactions?

3 What hindered or promoted teachers' ability to self-organize for emergence as a complex adaptive system?

Importance of the Study

This study is important because it provides two urban principals with a distinctive perspective on distributed leadership for adaptive change using the framework of complexity theory. This intentionally focused on the leadership practices of two urban

principals by analyzing the interactions of two mathematics teams to assess the state of their structures and/or processes in order to determine whether the conditions necessary to create conditions for adaptive change are present and, if not, to identify the areas in which they might do so. It did this by using the "systems transformation heuristic" (STH), developed by McQuillan in 2016. The scope and goal of this practical instrumental case study were to assess the leadership practices of two urban Lynch Leadership Academy Principal Fellows through the lens of complexity theory. The use of complexity theory as a framework is beneficial to both this study and the entire project. This report also describes the actions performed by the urban principals as part of their capstone Leadership Growth Project to actualize the ideals promoted by the Leadership Academy.

In the context of complexity theory, where the emphasis is on a complex adaptive system, this instrumental case study provides evidence to support the claim that educational leaders (teachers and school administrators) can provide key sources of data to assist leaders with the necessary elements to change school practices, leading to school improvement. This study will highlight the visions, ideas, and guiding principles that emerge as a result of the interactions between teachers and principals.

Discussion of Findings

This study provides information on the activities and demeanor of two principals who conducted Leadership Growth Projects in their urban high schools to strengthen and better the school community. College Preparatory High School and Community Charter High School underwent reorganizational adjustments from 2013 to 2015 under the direction and support of their principals. The adjustments to the way schools focused on student learning and assessment were like constant tremors left over after a large earthquake that fluctuated in strength over time,

functioning at the edge of chaos. When dealing with the emergence of new elements, events, structures, and behaviors, teachers and their principals occasionally had to renegotiate relationships since complex adaptive systems require a holistic understanding of all of its linked components. The major findings presented in this section are emphasized in three salient areas that highlights the principals' interactions with their teachers that led to the development of reasonable bottom-up and top-down human relationships in the school community.

Theory of Action

The mathematics professional learning community at College Preparatory High School created the theory of action, on which their cycle of inquiry was built. However, the theory of action at Community Charter High School was created by the school principal. The principals, through their leadership and relationships with their teachers and their engagement in professional learning community activities, complicated and disrupted the complacency, compliance, and comfort of the teachers. In response to the challenges and disruptions faced by the teachers and the principals, the formation of a theory of action, which was a strategy for meeting the needs of their urban school community was developed.

This finding is consistent with Fullan's (2001) assumption that disruption can be perceived as an imperfection or blemish that might help leaders view complexity theory as rationale and as a framework. The principals who were the main participants of this study embraced disturbances that interrupt the complacency, conformity, and comfort of stability of the teaching and learning process in their schools. Furthermore, the theory of action implemented can be viewed as a gateway to the creation of something new and novel in order to meet the demands of their school community in response to the challenges they faced.

Disequilibrium and Self-Organization for Emergence at the Edge of Chaos

Principals at College Preparatory High School and Community Charter High School mandated that mathematics teachers make enormous efforts to raise student performance. These efforts would unavoidably show up in data from their state's comprehensive assessment system showing increased student growth, graduation, and retention rates. The job needed communication between the members of the respective teams. Disequilibrium resulted, driving the teams to the edge of chaos because of mistrust, ulterior motives, and hidden agendas.

The significance of adaptive tension in promoting emergence and self-organization is a key component of complexity theory (Borzillo and Kaminska-Labbe, 2011). Tension presents itself as an opportunity for some and as a crisis for others. Tension, also known as disequilibrium, is essential to move members of a community to the edge of chaos. According to complexity theory, community learning is a process in which the community, together with major insights from its members, self-organizes through a sequence of crucial events that shake the community and push it to the edge of chaos (Zellermayer & Margolin, 2005).

Feedback is crucial when chaos threatens to take over. In order for the system to regenerate or stabilize, it will either push or pull. Teachers on both teams tried to strike a balance between their honesty, competency, personal regard, and respect—all elements of relational trust—and their willingness and refusal to be disturbed at the edge of chaos. On the verge of pandemonium, teachers discussed the assignments of their students and got suggestions on how to improve learning opportunities for their students. The problems were allowed to play out as both principals were actively involved in the process and were highly present and engaged the entire time. Through consistency in interactions, teachers became more willing to be disturbed in their acceptance of critical feedback. As a result, they developed relational trust for their colleagues, and their interaction resonance grew. The emergent behaviors in both schools

resulted in improved student performance that reflected student growth, decreased retention rates, and increased graduation rates in their state's comprehensive assessment system data.

Complex Adaptive Systems

Complexity [theory] highlights the significance of the dynamics of the interactions between agents and elements within the educational system and how novel phenomena and behaviors emerge from these interactions that may not have been "contained in the core of the constituent elements." (Mason, 2008, p. 35) Because the individual components of a complex adaptive system are constantly revising their rules of interaction, each component is immersed in a constantly changing environment (the changing behavior of the other parts). As a result, the system's overall behavior is usually far from optimal (Holland, 1992).

College Preparatory High School's mathematics PLC and Community Charter School's mathematics team, respectively, functioned as complex adaptive systems. They developed a pool of collective knowledge through the process of self-organization, which they used to support their students more effectively. The math teachers used the knowledge, information, insight, and ideas they had gained through the feedback of their colleagues to substantially increase student growth at College Preparatory High School and substantially reduced the retention rate while increasing the graduation rate at Community Charter School through the process of "Looking at Student Work" and developing Standards Based Grading.

Leadership that embodies the principles of complex adaptive systems adopts a human-centered approach within the organization, where relationships are the foundation for the creativity, culture, and productivity that emerge through interactions. (Lewin & Regine, 1999). Leadership from the principals of these schools was foundational to the transformational work of their mathematics teams. Providing space and autonomy to engage in the work as they saw fit,

the principals chose not to disrupt or interrupt the process but to get involved in it. Their interaction and participation in the process were beneficial.

Conclusions and Implications

This section presents the main conclusions and implications that transpired from the findings of this study. The implication for school leadership with be presented first, followed by the implications for teacher practices, with some information regarding assessment.

Implications for School Leadership

The implications for school leadership are centered on continuity, and how do leaders view complex adaptive systems in their school for progress; it also considers how the potential for external interruptions that could disrupt the continuing process of self-organization for emergence.

When district coaches arrived at College Preparatory High School as part of the district's commitment to the school, they completely disrupted the LASW process and chose to concentrate on teaching strategies, which were cut off from evidence of engagement through the application of teachers' work in the classroom. Additionally, after the first round of the whole school implementation, a major exodus of about 80% of veteran teachers left Community Charter School, which had a detrimental effect on retention and graduation rates.

A conclusion of this research is that in order to achieve successful professional learning outcomes and emergence through adapted change that incorporate the principal's leadership, teachers must be willing to communicate practice-related issues and to offer and accept constructive criticism in an environment of disequilibrium. Therefore, an implication for leadership effectiveness through the lens of complexity theory is that the school community

needs to develop trust in terms of relationships through respect, esteem, competence in their primary responsibilities, and personal integrity.

Implications for Teacher Practices

A conclusion for this study is that to achieve effective professional learning outcomes teachers must be capable of communicating teaching practice concerns, offer and accept constructive criticism in an environment of disequilibrium. McQuillan (2016) writes, “With notions of disequilibrium in mind, schools and educators need to ceaselessly embrace a commitment to student achievement; it is a never-ending opportunity tension that can drive ongoing systems change” (p. 13). He further elaborates:

> Teachers can always teach better; students can always learn more. If we prioritize student success, we can accordingly distribute leadership and authority, promote shared values, maintain balance in the system, and identify mutually reinforcing elements in system interactions aimed at achieving this end. Otherwise, we are unlikely to be creating the conditions that will create the conditions (p. 13).

Thus, to achieve successful professional learning outcomes and emergence through adapted change that incorporate the principal's leadership, teachers must be willing to communicate practice-related issues and to offer and accept constructive criticism in an environment of disequilibrium. As complex adaptive systems, school communities require information for learning and knowledge development in order to remain active and sensitive to their changing surroundings and evolving needs.

Limitations of the Study

Although this study has provided a number of implications, there are some limitations. First, data collection for this project was completed quite early on, before this study was

conducted. Although the researcher of this dissertation study had taken part in a previous study with LLA Fellow Alumni that examined their experiences at Lynch Leadership Academy through the lens of complexity theory, the researcher was still learning the complexities of the idea and was only just getting acquainted with complexity theory. Because of this, even if the data is somewhat outdated, it might be analyzed using the "systems transformation heuristic" (STH) proposed by McQuillan (2016) to determine whether urban schools have the necessary frameworks in place to "collectively adapt and change when complex issues occur" (p. 3).Using the STH will allow me to analyze the data in terms of whether conditions were created and if not, how conditions may be created. The researcher can examine the data using the STH to determine whether circumstances were generated and, if not, how conditions may have been produced. The study also makes the case that the results may have an impact on procedures and guidelines that affect how administrators and teachers carry out their responsibilities in urban school communities.

A second limitation to this instrumental case study was created to examine the leadership practices of the two Lynch Principal Fellows in relation to their leadership growth project. Therefore, the generalizability of this study may be a limit. However, a qualitative case study provided an analysis of a small group of participants from just two urban high schools using interview, observation, and fieldnote data. I was the only researcher to analyze the data and draw any conclusions. The interpretations made during this procedure may have been impacted by my own predisposition or educational background (Creswell & Creswell, 2017). The findings can be taken as a fresh look at how complexity theory may be used to examine how administrators' practices impact teachers and their students.

Recommendations for Future Research

With the help of complexity theory concepts that the two Lynch Leadership Academy Principal Fellows determined could use improvement and would, as a result, be implemented in their urban schools, this instrumental case study was created to examine the leadership practices of the two Lynch Principal Fellows in relation to their leadership growth project. There are two ways the research design might be enhanced.

First, I would include focus group interviews with the teachers if I were to do this research again. The learning they experienced while putting the primary participants' proposed theory of actions into practice will be the central focus of this study. Although I would particularly inquire as to what benefited and hampered the project's ramifications, my attention would be on how the modifications made to assess student learning affected their practices. I would like to learn more about the methods they employed during the project's implementation phase and how they handled interruptions that altered their interactions and lines of communication with the school's administrators.

In order to reach additional teachers, who work with Lynch Leadership Academy Principal Fellows, I would secondly utilize the findings to create a survey. Given that Catholic school leaders participated in the Leadership Academy outreach, this would also apply to the teachers at Catholic urban schools. The survey's main goal would be to learn more about the activities and conduct of those teachers, particularly how they handled difficulties and the effects they had on their learners. Further investigation into how the teachers' professed understandings of the theory of action influenced their conception of how relational trust promoted constructive interactions and relationship building in the context of significant change on the edge of chaos would also be intriguing.

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