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CAN SELF-ORGANIZING TEACHER GROUPS REDUCE TEACHER ISOLATION?

A DISSERTATION APPROVED FOR THE DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

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DEDICATION

I am so grateful for my wife Becky, who has been incredibly understanding while I poured so many hours into this project. And to my kids Knox, Cruz, and Beau, who might've thought I'd temporarily moved out—I'm still here, and hopefully sane.

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Abstract

This study investigates the conditions fostering self-organized teacher groups within schools and their relationship to reducing teacher isolation. Utilizing a mixed-methods approach involving 663 online surveys and 18 interviews, the research aimed to identify specific school conditions that encourage teachers to form self-organized groups and assess whether such participation experience decreased feelings of isolation. Findings indicate that self-organized groups, formed under interdependence, independence, and clear goal-setting conditions, are associated with reduced teacher isolation. These groups enable collaborative support without necessitating physical meetings, suggesting that connections within the educational organization can significantly mitigate feelings of isolation among teachers. Although the complexity theory framework does not allow for definitive cause-and-effect conclusions, the study highlights a strong link between supportive conditions for self-organization and lower levels of reported isolation. This research contributes to the educational field by offering insights into how school leaders can cultivate environments that promote teacher autonomy, collaboration, and self-organization, potentially reducing isolation and enhancing the educational setting. The implications extend a call to action for educational leaders and policymakers to foster school cultures that embrace self-organization principles, emphasizing the importance of independent and interdependent work aligned with shared objectives for natural teacher group emergence.

Chapter 1: Introduction

Schools can positively affect culture, the broader community, and other stakeholders (Deal & Peterson, 2016; Gruenert & Whitaker, 2015; Hargreaves, 2012; Sampson, 2019). Seen as a community center for many (Binger et al., 2003; DeCesare, 2020; Hanifan, 1916) and a safe place for some (Little, 2006), schools can be a source of enrichment for families in preparation for the future (Lovat, 2010). How a school looks, feels, and operates can positively affect students and staff (Binger et al., 2003). Positive effects include, but are not limited to, a positive school climate, good discipline, and productive learning (Deal & Peterson, 2016; Gruenert & Whitaker, 2015; Hamlin, 2021; Schneider, 2002). Community integration can increase morale and financial resources, social support, and educational experiences (Hands, 2010). Acting as a 'safe place' for stakeholders, schools can help decrease absenteeism for students and staff, deliver a positive environment, and increase student achievement and school improvement (Kim & Gentle-Genitty, 2020). In order to effectively address these challenges and maximize the positive influence schools can have on their communities, understanding the interplay between stakeholder relationships and internal dynamics is crucial.

Schools may overlook essential components that contribute to educational success. Traditionally, schools inherently bring stakeholders (e.g., students, teachers, administrators, and community members) together. For approximately 6-8 hours on a given weekday, staff and students are in close proximity and provide opportunities to learn and grow (Day et al., 2011; Miller et al., 2008; Sammons et al., 2011). Externally, schools are meant to be a hub for progress (Flinders, 1988), but internal experiences may be less collaborative and increasingly isolating.

Institutions facing increased isolation and limited collaboration must enable staff to connect, share knowledge, collaborate, and form enduring bonds. Leadership must, therefore,

create environments that mitigate isolation by fostering self-organizing groups within complex systems. Achieving this requires a deep understanding of isolation, collaboration, and complexity, which can guide the development of more cohesive and supportive organizational structures. The following subsections of the introduction will introduce the ideas of isolation, collaboration, self-organization, and complexity. These topics will be further developed within the literature review and the theoretical framework.

The study begins by acknowledging schools' profound influence on culture, community, and stakeholder relationships, emphasizing their role as community centers and sources of enrichment. While schools gather students, staff, and community members, internal dynamics and external pressures may reveal challenges of collaboration and isolation. These challenges necessitate leadership that fosters environmental conditions where self-organizing groups can emerge, guided by an understanding of isolation, collaboration, and complexity. The subsequent chapters of this study will delve into these themes: Chapter II will provide a detailed literature review, examining empirical research that underpins the study's hypotheses. Chapter III will explain the theoretical framework, exploring complexity theory, flocking theory, and their applications. Chapter IV will describe the methodology employed to study self-organization, and Chapter V will present the findings. The final chapter, Chapter VI, will integrate insights from the study, addressing implications, limitations, and recommendations for future research and practice.

Isolation

Isolation is present in two predominant modalities: workplace and psychological conditions (Flinders, 1988; Ostovar-Nameghi & Sheikhahmadi, 2016). Workplace isolation can be further separated into two subcomponents: structure and opportunity. Beginning with the one-

room schoolhouse, schools grew in size and complexity to accommodate an influx of students (Fong, 2006; Lortie, 1975). School expansion may resemble an additional set of classrooms or the construction of a new building. When districts make these changes, they typically resemble what is already present: modular classrooms connected through a web of hallways. Although individuals are not generally alone in a school, the structural formation of buildings may prevent easy access to educational resources such as peers, mentors, and academic materials.

Another component of workplace isolation is the lack of opportunities (Ostovar-Nameghi & Sheikhahmadi, 2016). A core cause of this type of isolation is scheduling. In addition, teachers and staff are reporting a lack of sufficient opportunities to interact due to the nature of class rotations, start and end times, and now COVID (Coyle, 1997; Lieberman & Miller, 1984; Ostovar-Nameghi & Sheikhahmadi, 2016; Parte & Herador-Alcaide, 2021). Collaboration may suffer, and individuals may struggle to act collegially with their peers (Ford, 2019; Musanti & Pence, 2010). Schools have used inventive methods to address scheduling concerns. Many districts have instituted collaboration or late-start days into their instructional calendar. Calendar changes represent a drastic approach to providing instructional collaboration opportunities (Leonard & Leonard, 2003).

Psychological isolation is another form of isolation, but instead of being caused by school structure, it places cause within an individual (Bruffee, 1999; Heider, 2005; Ostovar-Nameghi & Sheikhahmadi, 2016). Typically, this type of isolation is rooted in individuals' perceived interactions. Just because teachers interact does not mean the interaction is meaningful (Akin, 2001). Conversations are typically surface-level and may not lead to a discussion regarding work-related matters (e.g., student achievement, school improvement, community interaction). A contributing factor to psychological isolation is job isolation (Angel-Alvarado et al., 2021),

where teachers are grouped based on job-related characteristics. Job-related characteristics may prevent teacher-to-teacher interaction that is meaningful for student and teacher growth.

No matter the type, isolation can negatively affect student achievement and school improvement (Gaikwad & Brantley, 1992; Kraft et al., 2016; Seashore et al., 2010). Evidence has shown that isolation in the classroom or school can lead to higher rates of teacher burnout, helplessness, and loneliness (El et al., 2016; Gaikwad & Brantley, 1992; Stephenson & Bauer, 2010; Tatar & Horenczyk, 2003; Weiner, 1982). Researchers have stated that these outcomes can lead to decreased learning for students and increased teacher turnover (Ford & Forsyth, 2021; Hale et al., 2006; Tatar & Horenczyk, 2003). Teachers report feeling that no one cares about their daily activities—professional isolation—which can lead to psychological effects and mental distress (Eisner, 1992; Flinders, 1988; Lieberman & Miller, 1984), causing teacher turnover and lower engagement. Professional isolation is a significant contributor to altered experiences within the classroom environment. This is partly because only a few—or sometimes one—individual(s) teach a given subject within a school (Bull & Cummings, 2002). A common visual associated with this type of isolation is an ‘egg-crate. Put forth by Lortie (1975), this visual encapsulates the common sentiment of teachers regarding their classroom location throughout a school, not only their placement but how this placement affects their ability to socialize with other educators on curriculum and pedagogy.

Collaboration

School leaders have attempted to combat isolation by bringing teachers together. Teacher groupings revolve around collaboration, focusing on student achievement and school improvement (Hargreaves, 1994; Little, 1990; Datnow, 2011). Teacher collaboration has many forms: professional learning communities, teacher leadership teams, peer mentoring, and teacher

coaching (Hargreaves, 2019; Reeves et al., 2017). These collaboration methods focus on working together for a common goal, an interdependent process rooted in a task, goal, or outcome. While collaborative efforts can be teacher-led, they are typically hierarchical (Hargreaves, 1994; Lissack, 2002), primarily when sponsored by a school leader. School-sponsored groups revolve around a central point (leader) to drive participants toward a common goal. Even if participants agree that the goal is worthy and achievable, the core nature of the group and its central leadership can result in decreased professional autonomy (Anderson, 1987; Hargreaves, 1992; Lortie, 1975; Ostovar-Nameghi & Sheikhahmadi, 2016). According to Hargreaves (1994), this type of grouping may produce contrived collegiality rather than an authentic and collaborative culture. Focused more on managerialism (Fielding, 1999), contrived collaboration may be geared towards implementation rather than outcomes, and collaboration characterized by volunteerism and spontaneity is intermingled with mandates and enforcement. Contrived collaboration, or contrived collegiality, reconfigures teacher relations in the image of the administrator (Hargreaves, 1992). Rather than allowing collaborative opportunities for teachers to produce unpredictable outcomes, administrators seek to regulate and construct the lives of teachers for administrative plans and purposes (Ford & Youngs, 2018).

Self-organization

Teachers may resist contrived events and instead seek the collegiality of their peers by forming their own groups (Hargreaves & Dawe, 1990). The absolute removal of administrator-derived collaboration may be impossible. To circumvent the dark side of collegiality (Datnow, 2011), it is important to understand collaboration that spontaneously forms between teachers in the absence of central authority. To do this, leaders will need to understand the environmental conditions that need to be present for teachers to collaborate (Ford, 2019).

There is a need to better understand the conditions by which collaboration can exist. However, the results of empirical research usually illustrate the conditions within a collaborating culture rather than the conditions that spur collaboration. For example, Little (1982) speaks to the norms of collegiality, and Hargreaves (1994) discusses the five primary forms of collaboration. Datnow, Park, and Lewis (2013) discuss preparing teachers for data-driven collaboration and the type of leadership that must be installed before group formation. Finally, Musanti and Pence (2010) discuss the connections between two individuals and the construction of knowledge transfer as a means for different types of collaboration. Lengthy discussion lays the groundwork for their view of proper collaboration and continual growth. Each ideal attempts to explain the innerworkings of a group that collaborates, the structure of an 'egg-crate' is a collaborative group, or what components may be missing. Minimal discussion or research revolves around the conditions that must be present within an organizational environment that spurs collaboration, or as Hargreaves and Little put it, creates a collaborative culture.

The problem is that national surveys and empirical research show that teachers are experiencing higher rates of burnout and loneliness because of isolation (Diliberti et al., 2021; Oberle & Schonert-Reichl, 2016; Steiner & Woo, 2021). To combat the sense of isolation, school leaders create groups that are consistently considered contrived. Contrived groups may not decrease isolation (Ostovar-Nameghi & Sheikhahmadi, 2016; Shakenova, 2017), which marginally affects the isolation of teachers, staff, and students. More research needs to be focused on understanding the conditions that will create collaborative groups that do not need central leadership, are open, and evolve and form independently. This type of grouping is considered to be self-organized. Self-organized groups are adaptive and flexible (Fong, 2006). Flexibility allows for group restructuring, which can be limited in contrived groups. Self-

organized groups spontaneously form out of seemingly infinite complexity, input variables that are almost impossible to predict, and outcomes that are just as difficult to fathom (Fong, 2006; Liechtenstein, 2000). Self-organized groups form for as long as they need to exist, and due to the nature of their creation, they may not 'hang around' longer than their purpose requires (Liechtenstein, 2000). Theoretically, self-organized groups offer participants greater flexibility with their work, and the ability to come and go as they please, a characteristic that contrived groupings may be unable to offer. Compared to contrived groups, the formation and direction of groups serve the needs of the administrator's plans and purpose. However, for self-organized groups, once items are complete, the group may be repurposed or held together with little direction.

Empirical research shows that isolation negatively affects teachers, students, and the organization (de Lima, 2003; Kelchtermans, 2006; Sin & Lyubomirsky, 2009). Negative effects range from burnout, lower levels of student achievement, decrease in teacher satisfaction, and turnover (Carlson & Thomas, 2006; de Lima, 2003; Gaikwad & Brantley, 1992; Kelchtermans, 2006; Neveu, 2007; Sin & Lyubomirsky, 2009). Many studies look for ways to combat teacher isolation through special groups, teacher collaboration, and collegiality (Drossel et al., 2019; Goodenough et al., 2009; Hew & Hara, 2007; Vescio et al., 2008), but what has been consistently overlooked is the environmental conditions that should be in place to for long-term collaborative efforts. This dissertation will utilize complexity theory to view environmental conditions, teacher interactions, and leadership in pursuing self-organizing teacher teams. Complexity theory allows researchers and leadership to understand better a system's components and how components interact. Administration could forgo the need to devise a cause-and-effect relationship between a single change and outcome; complexity theory creates a lane to inspect

how many parts interact in pursuit of understanding the whole (Colijin, 2000). Most, if not all, empirical research describes the interactions within a collaborative event and how to arrange collaborative events but fails to consider how parts of a collaborative event work together. This paper aims better to understand the gap between self-organizing groups and school collaboration. More research is needed to understand the environmental conditions that should be in place to promote the development of self-organized teacher groups.

Complexity

Schools are complex environments. Many factors affect school climate, teacher satisfaction, student achievement, and collaboration. Because of this, it can be challenging to understand how any single input can lead to a particular output (Cillers, 2002; Gilstrap, 2013; McMurty, 2006). Complexity and the nature of being complex may call for an alternative approach to investigation. Within social sciences, it is common to attribute cause-and-effect and correlation to outputs. For example, school leaders may feel that a school's structure results in isolation, leading to helplessness. The cause-and-effect or correlational relationship propels leaders to create contrived collaborative groups. This type of reasoning does not consider the multitude of variables or emotions of individuals. For some, school structure allows for seclusion, not isolation (Ostovar-Nameghi & Sheikhahmadi, 2016). Forcing everyone into contrived collaboration may lead to further seclusion due to the nature of the group. Those who self-isolate may do more harm than good, and those who are isolated may feel stripped of their professional autonomy (Ostovar-Nameghi & Sheikhahmadi, 2016). What needs to be studied are groups that self-organize. Self-organized groups can spontaneously form within an environment with optimal conditions (Fong, 2006; Lewin & Regine, 2002; Stacey, 1992). With no need for central leadership, organizational members come together around a common goal, interacting

with one another for an undetermined amount of time, seemingly disappearing spontaneously just as they formed (Fong, 2006). Self-organized groups operate within a delicate structure (Gershenson & Heylighen, 2005), referred to as operating on the edge-of-chaos. This structure, no matter how delicate, should be better understood. Understanding this structure may help school leaders create the most optimal conditions for self-organized groups.

Science is about understanding the natural world and reducing its complexity to predictable regularities (Phelan, 2001). By describing complex environments, complexity theory offers a lens for understanding self-organized groups. As previously mentioned, self-organized groups form spontaneously from complex environments with no central leader. Complex environments contain many possible variables that may influence group formation and output. The complexity of self-organized group formation makes it difficult for traditional approaches (cause-effect) to understand their creation. By positing simple causes for complex effects (Phelan, 2001), a central theme for complexity theory is that the complex world exists from simple rules (generative) (Marshall, 1996; Morrison, 2002; Phelan, 2001; Plowman et al., 2007; Youngblood, 1997). Generative rules are not equated to laws but help individuals understand how to view complex system components over time, including the interactions between those in a system. One type of self-organized group that has empirically established a set of simple rules governing group member interactions and structural formation is flocking.

Flocks can be viewed as a self-organized group of individuals with emergent behavior (Rosen, 2007). These groups follow simple rules to form a coherent structure. Using the template introduced by Reynolds (1987), flocking theory now includes matters beyond biology and nature. Social science concepts regarding human interaction and group formation have conceptualized the self-organization of humans in the context of a few simple flocking rules to

understand the organization and movement of individuals with no central authority. By looking at interdependence (individuals working together), independence (people working alone), and goal-setting, the researcher will investigate the relationship of Reynolds' simple rules as a means to lower isolation. Suppose leaders can create a space conducive to self-organization by focusing on these 'generative' rules. In that case, experienced isolation may decrease for teachers, decreasing burnout, loneliness, and helplessness while increasing student achievement and school improvement.

Summary

Theoretical reasoning suggests that self-organized groups typically produce better outcomes than contrived groups. However, only some empirical studies have assessed the conditions in schools that promote the creation of self-organized teams of teachers. This is partially due to the difficulty attributed to studying self-organized groups. Self-organization and self-organized groups emerge from complex environments as members seek to form patterns resulting in organizational structures (Haken, 2006; Heylighen, 2008). These structures form from a few simple rules (conditions) (Phelan, 2001). Specific conditions can lead to emergent behaviors of self-organization. Traditional research has faced adversity in understanding environmental conditions that must be present for self-organized groups (or true collaboration) to form. This could result from empirical efforts to show cause-and-effect or correlation between inputs and outputs. A better understanding of optimal conditions for self-organized groups of teachers may be better served using a theoretical lens that helps researchers understand the complexity of an educational system. One such theoretical lens is complexity theory.

The Purpose of the Study

The purpose of this study is to investigate conditions for the self-organization of teachers and to determine if self-organized teacher groups experience lower levels of isolation. This study asks the following question: Is there a relationship between conditions for self-organized teacher groups and levels of isolation? To explore this question, the core components of complexity theory must be considered: nonlinearity and feedback, self-organization and emergence, edge of chaos, openness and nesting, and evolution and adaptation. Complexity theory allows observers to consider how system components interact with one another. Compared to Newtonian methodologies, complexity theory considers a complex system's nonlinear nature and attempts to understand how system pieces interact and create emergent results. Focusing through the lens of complexity will allow an observer to understand an environment that hosts self-organizing groups of teachers and the problems they pursue. Also, the lens will help leadership interpret forthcoming obstacles, how individuals and groups navigate through their environment, and the possible outcomes produced.

If school leaders know the optimal conditions for self-organization, they could form a space for self-organized groups. Complexity theory and its components allow us to understand the nuances of self-organized groups (Fong, 2006). Groups of teachers nested within various situations that spontaneously emerge out of seemingly unlimited complexity deserve a comprehensive understanding. Nonlinear structures that can live on the edge of chaos, holding a set of conditions and sustaining just enough disequilibrium, could produce valuable outcomes. As previously stated, flocking is a form of self-organization, and flocking theory develops a structure to understand the optimal conditions for self-organized teacher groups within an

educational organization. This study seeks to discover the structural conditions put forth by flocking theory to help school leaders develop a space for self-organized teacher groups to form.

The initial research question is looking for a correlation between proposed optimal conditions for the self-organization of teachers and their feelings of isolation. The research theorizes that formal collaborative events are contrived and need to go further to lower levels of teacher isolation. The researcher proposes a structure extrapolated from complexity and flocking theory, leading to self-organized groups (with no central leader), which lowers levels of teacher isolation. This relationship investigates through an online survey composed of Likert scale and open-ended response questions. Questions investigated the proposed conditions for self-organized groups, conditional components (collaboration, trust, autonomy, and efficacy), and levels of teacher isolation. Surveys were distributed statewide to teachers within districts of various socioeconomic statuses. The quantitative portion of this research will measured the presence and amount of proposed conditions for self-organized groups of teachers.

A significant component of complexity theory is nonlinearity (Morrison, 2002;). Nonlinearity states that an environment is too complex to show correlation or causality; in other words, it is impossible to predict outcomes based on inputs (Lewin & Regine, 2002; Youngblood, 1997). The nonlinearity component leads to the second portion of this study, a qualitative approach that investigates a teacher's understanding of the conditions of self-organized teacher groups. This study's quantitative analyses will generate correlational estimates that may shed light on the optimal conditions for self-organization across varying organizational contexts. The quantitative question posed earlier attempts to discover the conditions experienced by teachers participating in self-organized teacher groups.

This study also uses qualitative methods to understand the mechanisms underlying the statistical results. The qualitative question investigates how participating teachers describe the conditions by asking the following research question: How do teachers describe the conditions for self-organization in their schools? By performing 18 interviews, the researcher probes the statistical results of the quantitative study, investigated the conditions experienced by participating teachers, sheds light how these conditions can be conducive to their experience, and postulates that when leaders provide a space for the conditions to be present for teachers and self-organized groups, feelings of isolation may decrease. More details can be associated with empirical research around conditions and the conditional components for self-organized teacher groups by utilizing open-ended responses from the survey and teacher interviews.

Teacher isolation is a critical concern for school districts (Bull & Cummings, 2002; Flinders, 1988). Providing the least restrictive environment for teachers and staff must be a top priority for school leaders. Because teacher isolation can be produced by workplace or psychological conditions, many components of a school environment should be considered (e.g., school organization, time, and communication). Typically, contrived collaboration is implemented to decrease feelings of isolation and increase student achievement (Goddard & Goddard, 2007; Supovitz et al., 2010). By pushing teachers together, leaders mandate collaborative activities for the goal of student achievement and school improvement (Hargreaves, 1994). This approach can cause teachers to feel less professional autonomy, leading to greater isolation or withdrawal (Hargreaves, 1992). Teachers want to collaborate on their own terms (Ostovar-Nameghi & Sheikhahmadi, 2016) and meet with their peers over common issues and goals. One grouping type that may allow for autonomy and collaboration is self-organization, which is groups that spontaneously appear out of complex environments. Self-organized groups

have been shown to produce outcomes better suited to reducing isolation (Arrow et al., 1999; Power, 2013; So & Kim, 2013). Through teacher surveys and informative interviews, this study and the outcomes sheds light on the optimal conditions for self-organized teacher groups.

By asking these questions, this study may help researchers and practitioners better understand how complex individuals and their environment view conditions for self-organization. Viewed through a lens of complexity theory, the outcomes of this study should advance the literature on conditions for self-organized collaboration. I hope to provide leaders with the knowledge and guidance for creating an environmental (cultural) space with optimal conditions for creating self-organized teacher groups. In summary, the purpose of this qualitative study is two-fold: 1) to investigate conditions in schools that are associated with participation in self-organized teacher groups and 2) to test whether participation in self-organized groups is related to lower perceived isolation in teachers.

Dissertation Organization

Chapter 2: Literature Review

Study Purpose

The purpose of this study is to investigate conditions for self-organizing teacher groups and to determine if self-organized teacher groups experience lower levels of isolation. Due to the nonlinear nature of the chosen theoretical framework, the study will be broken into two parts: quantitative (determine if conditions are present) and qualitative (research how teachers understand the conditions). To determine if the conditions for self-organization are present, I will ask, “Do teachers experience the conditions for self-organization and isolation?”. A second question is posed to understand how teachers perceive the conditions for self-organized teacher groups. I will ask, “How do participants describe the conditions for self-organization?”. This study will use complexity theory as the lens by which to identify, observe, and evaluate the conditions of self-organizing teacher groups and levels of isolation.

Synonymous with complexity science (Strathen & McGlade, 2014; Turner & Baker, 2019), complexity theory literature has a rich history across many domains, attempting to understand system complexity as a whole rather than its individual parts (Clark et al., 2005; Weaver et al., 2011). Complexity science combines concepts, allowing researchers to understand the emergent phenomenon within a complex system. In chapter three, an explanation of complexity theory and concepts will be given, followed by an in-depth look at self-organization, and finally, a discussion of a structure developed through the understanding of flocks (a self-organizing group).

Literature Review

Educational organizations have established an area of community preparation. Since the beginning, local districts have assembled formal structures for the purpose of education, defining

a relationship between those with knowledge (teacher) and those without (student). Since the formation of the one-room schoolhouse, communities have experienced exponential growth and change. Once served by a single teacher or administrator, these supports can no longer sustain the community (e.g., individual teacher, administrator, or building) (Fowler & Walberg, 1991; Lee & Smith, 1997). This has led to expansive districts serving demographically diverse rural and urban communities (Lindsay, 1984), an evolution that may cause more harm than good. New facilities were required to accommodate an increasing population. By duplicating outdated layouts, schools have become large isolating environments (Fong, 2006; Lortie, 1975). School administrators have responded by bringing teachers together around a shared purpose. These collaborative events attempt to foster community and collegiality.

Collaboration is considered an essential component for the effective functioning of an organization (Hargreaves, 1994; Head, 2003; Kelchtermans, 2011; Liberman & Miller, 2011; Stoll, 2009). Researchers have highlighted numerous benefits of collaboration: teacher satisfaction, decreased burnout, student achievement, increased efficacy, etc. (Diliberti et al., 2021; Oberle & Schonert-Reichl, 2016; Steiner & Woo, 2021). Throughout the decades, many joint endeavors have been pursued. Teacher teams, better known as professional learning communities (PLC), have been a popular initiative pursued by districts and school administration. PLCs were not the only type of partnership pursued by schools; peer coaching, mentoring, and teacher leads are all meaningful and effective methods for training and support (Datnow, 2018; Stoll et al., 2006).

While collaboration can be a successful method for information exchange, the official act can leave much to be desired. Not all individuals prosper from participation in collaborative events. For some, collaboration can feel contrived, encroaching on or removing professional

autonomy (Hargreaves, 1990; Oberle & Schonert-Reichl, 2016), possibly decreasing their decision-making (Hargreaves, 1990; Hargreaves, 1994). Contrived collaboration is defined as a forced notion of community that has already been decided, structured, or planned out. Participants void of ownership may choose to self-isolate, refuse to engage in collaborative events fully, and focus inward rather than outward (Hargreaves, 2001).

Isolating environments can cause lasting effects on teachers and students (e.g., decreased student achievement, teacher satisfaction, student dropouts, and teacher burnout) (Diliberti et al., 2021; Oberle & Schonert-Reichl, 2016; Steiner & Woo, 2021). In order to address isolation, school leaders actively seek to bring teachers together, but in certain circumstances, teachers will autonomously seek out others with similar goals, self-organizing either for the benefit or detriment of the organization (Fong, 2006; Gunz et al., 2002; McCombs-Tolis, 2002; Plowman et al., 2007). These open groups evolve to meet demand while remaining flexible enough to respond to the environment. Understanding how and why groups self-organize is critical. Instead of structuring collaboration, school leaders may be better served by creating an optimal space for teachers to collaborate without the need for authority. In other words, leaders should create and support a culture (or environment) conducive to self-organized teacher groups.

For these reasons, a better understanding of self-organization is needed. The purpose of this study is to investigate conditions for self-organized teacher groups and determine if these groups experience lower levels of isolation. A qualitative methodology will be employed to examine the conditions and components of self-organization within the context of school teachers. To enhance our understanding of the presence of these conditions within the school environment, 18 teachers were interviewed for 45 minutes each.

The theoretical framework introduced complexity theory as the study lens and presented the theory of flocking as the mechanism for creating a structure for self-organizing teacher groups. Flocking theory states that groups may be explained by three simple rules: cohesion, separation, and alignment (Renolds, 1984). For this study, the theorized components relate directly to the theory of flocking: interdependence (cohesion), independence (separation), and goal-setting (alignment). Within two of these conditions lies a set of components: collaboration and trust (interdependence) and autonomy and efficacy (independence). The literature review will connect isolation to schools, detail different types of collaboration, explain the notion of contrived collaboration, and explore the theorized conditions and components of self-organized teacher groups put forth by the theoretical framework.

Isolation

Scholars tend to consider isolation as having two modalities: psychological and workplace (Ostovar-Nameghi & Sheikhahmadi, 2016). Teacher isolation is commonly called professional isolation (Johnson et al., 2018; Ostovar-Nameghi & Sheikhahmadi, 2016), and its presence has been studied for years. Researchers have attempted to understand how a teacher's environment and career affect student achievement and teacher satisfaction (Chidolue, 1996; Garcia-Arroyo et al., 2019; Ostovar-Nameghi & Sheikhahmadi, 2016; Sindberg, 2011).

An explanation of the various forms of isolation is required to understand the importance of conditions for self-organized teacher groups. Workplace and psychological conditions for isolation appear in many formations throughout an educational organization (e.g., school schedules, building structure, collaboration opportunities). An administrator's ability to create a collaborative event addressing each form of isolation may be improbable. By understanding

isolation and its many forms, school leaders may be better suited to create a space devoid of specific barriers known to isolation, allowing teachers to self-organize.

Workplace Isolation Among Teachers

Workplace isolation stems from the absence of support or recognition, a limited chance for informal interactions with peers, or not feeling a part of a group (Marshall et al., 2007). For educational staff, workplace isolation can be caused by structures (closed classrooms and expansive layouts) or restrictive bell schedules (limited time for communication) (Cookson, 2005; Flinder, 1998; Liberman, 1990). First described as "egg-crate" isolation (Lortie, 1975), this visual representation depicts the secluded nature of classrooms. Divided up by four walls and separated by a web of hallways, teachers may find it challenging to participate in informal communication (Lortie, 1975). An extensive tradition of teacher isolation embedded in school culture creates difficulties for collaborative efforts. When this tradition is disturbed, teachers feel exposed, vulnerable, and powerless (Musanti & Pence, 2010). In a longitudinal qualitative study, Musanti and Pence (2010) examined the complexity of collaboration by researching teacher resistance and how teachers co-constructed knowledge and developed their identities. What they found was interesting. The researchers were astonished to discover that their collaborative initiative did little to expand their feelings of collegiality. Instead of focusing on whether teacher collaboration can "fix" teachers, they shifted their analysis to understand how participants interpreted the crafted environment opened by the initiative. Instead of following specific guidelines dictated by the research initiative, participants constructed their own space for collaborative information exchange.

Even though the teaching profession is highly interpersonal, teachers are typically isolated from their peers most of the day (Davis, 1986). Liberman once said, "Teacher isolation

is fundamental. If people are isolated from others in the profession, they will not know what others are doing, there will not be much trust" (Lieberman, 1990). Fimian (1982) said that isolation is a significant contributor to stress. "...usually, teachers are left alone in a classroom with students for most of the day, with little opportunity to interact with their peers or to support one another." Survey results from the National Education Association show that teachers find value from time spent with their peers (Drury & Baer, 2011). Understanding that a communal spirit does not happen in isolation, groups are working diligently to provide meaningful opportunities for information exchange (Darling-Hammond & Bransford, 2005; Musanti & Pence, 2010).

Workplace isolation is critical to understand and study because it can impede reform initiatives and professional growth. In a qualitative study of six educators, Flinders (1987) found little professional interaction between observed teachers and their peers or administrators. In fact, in the spare time afforded to collegial exchange, Flinders observed teachers intentionally avoiding interactions, and when interaction did occur, little or no information exchange concerned the education profession. Another qualitative study looked to increase teacher performance outcomes by enacting thinking exercises within a professional development community (Hadar & Brody, 2010). The researchers did not expect to hear much regarding isolation as a driver for joining the group. What was uncovered was a recurring theme of isolation intertwined within various organization groupings. From department groups to other collaborative meetings, novice and inexperienced teachers felt highly isolated from their peers. A significant revelation of this study was that for any collaborative event to be successful, it must first 'break isolation' (Hadar & Brody, 2010), and forming a collegial environment may be the first step (Shah, 2012).

Psychological Isolation

Rather than a workplace condition, psychological isolation is the perceived state of isolation from the individual's perspective. Based on how information is filtered and processed (Flinder, 1988), this type of teacher isolation is founded more on expectations and experiences rather than interaction (Hedberg, 1981). Lortie defines psychological isolation as the response to the quality of relations (Lortie, 1975). Workplace isolation can lead to psychological isolation (Sarason, 1996). The overwhelming amount of interaction with students and sparse interaction with adults can leave teachers experiencing a sense of loneliness. Coupled with the demands of their work (Hargreaves, 1994), academic freedom, and non-interference (Sindberg & Lipscomb, 2005), restrictive and invasive efforts of administrators to reverse isolation may accelerate these psychological feelings (Stephenson & Bauer, 2010). Psychological isolation is a problematic component of teacher collaboration. First, it may be a reason for self-isolating individuals to remain in their classrooms, avoiding collaborative events and information exchange. Second, it may result from current collaboration initiatives (Stephenson & Bauer, 2010). Defining the source or cause of psychological isolation may be difficult for school administration. Instead, it may be necessary for school leaders to create an optimal environment for collaboration to exist.

Schools have recognized the importance of quality interaction. By focusing on collegial relationships, they take the necessary steps for worthy collaboration (Heider, 2005). As mentioned, forming a collegial environment may be the first phase of creating a collaborative event. It is not the number of collaborative opportunities being considered but the quality of exchange between participants. Collaboration and collegiality were generally interchangeable within empirical research, but researchers have begun separating the two terms in the past decade. Collaboration is the act of information exchange, and collegiality is the relationship or

attitudes between collaboration participants (Fielding, 1999). Since psychological isolation refers to the perception of quality interaction, research has focused on collegiality to improve collaboration and lower teacher isolation levels. Little (1990) adds that any interaction that breaks teacher isolation can lead to knowledge and skill attainment, enhanced judgment, and an improved collective capacity of teacher groups.

In a case study analysis of novice and experienced teachers, Harris and Anthony (2001) observed both teacher groups participating in professional development. The researchers stated that collegiality played a significant role in teacher participation; this pushes against a common sentiment that experienced and novice teachers fail to participate in collaborative events. Interviews suggest their participation was career-altering. Productive collaboration within schools depends on collegial relationships (Louis et al., 1995). A dysfunctional relationship can have a detrimental effect on a group or organization. Participation in a learning environment can feel risky for those who feel isolated. Without trust and feeling safe, teachers may resume their isolating routine and fail to participate in professional growth or develop collegial relationships (Louis et al., 1995). Barth (1990) examined collegiality and described four specific areas in detail: talking about practice, observation of practice, engagement around practice, and teaching the practice. Teachers who perceive their work relationships as lacking authenticity may never fully engage in collegiality with others. In a study of objective isolation and subjective alienation, Zielinski and Hoy (1983) revealed that if a teacher feels isolated in one context, the probability of feeling isolated in another is significantly increased. Isolation from their superiors, power, friends, or trusted colleagues can produce harmful effects, such as interpersonal relationships, student and school achievement, and others (Bautista et al., 2021; Bakkenes et al., 1999; Flinders, 1998; Sindberg, 2011; Tahir et al., 2017 Zielinski & Hoy, 1983).

Negative Effects of Teacher Isolation

Isolation can negatively affect teachers and students (Bautista et al., 2021; Flinders, 1998; Sindberg, 2011; Tahir et al., 2017). A predominant result of isolation is teacher burnout and helplessness (Gaikwad & Bantley, 1992). Psychological isolation can lead teachers to believe that no one cares for their well-being (Eisner, 1992), causing disturbances in one's mental and physical health (Neveu, 2007). Burnout is also associated with decreased job satisfaction and teacher retention (Carlson & Thomas, 2006). Workplace isolation may raise barriers against teachers seeking support (Tahir et al., 2017). Those who recognize their struggles may encounter structural barriers and lack of opportunity as they seek guidance and direction. Furthermore, adverse outcomes associated with isolation affect the educational environment, learning, and students, ultimately impacting student achievement (Cooper & Alvarado, 2006; Durr et al., 2014).

In the United States, in 2012, teacher turnover for those within the first three years of service was just over fifty percent (Parker et al., 2012). Comparatively, in a study of Philadelphia schools for a time ranging between 2011 and 2017, the turnover rate for teachers within the district was a staggering 77% (Dillion & Malick, 2020). Teacher turnover was attributed to the educational environment and job satisfaction. Low job satisfaction resulting from isolation is a predominant factor contributing to teacher burnout (Tatar & Horenczyk, 2003).

Isolation can also lead to decreases in student achievement (Durr et al., 2014; Mahmoodi & Shahrebabaki, 2018), teacher satisfaction (Cooper & Alvarado, 2006; Tatar & Horenczyk, 2003), and self-efficacy (Skaalvik & Skaalvik, 2007). In 2020, a study showed that isolated physics teachers contained students who performed substantially weaker in physics than the national average (Krakehl et al., 2020). This outcome was partly due to the lack of opportunity to

converse with other physics teachers. Australian researchers used a self-study methodology to explore how experienced teachers' adaptive strategies can support early career teachers (Hogan & White, 2021). Predominantly concerned with teacher burnout, the researchers focused adaptive strategies towards components of isolation, such as a loss of energy and concern, lack of support, and expectations vs. realities. The emerging themes concern workplace and psychological isolation (e.g., collegiality and networks, relationships and community) and reflection and perception of long-term goals (Hogan & White, 2021).

Many researchers are investigating ways to decrease isolation and its negative effects through collaboration or collaborative events (DuFour & Mattos, 2013; Hargreaves & Fullan, 2012; Leana, 2011). Decreased student achievement has been linked to isolation, and a common trope is to combat isolation with collaboration, increasing student achievement by negating all harmful effects of isolation. This vein of reasoning is common in most research. For example, a qualitative study of six high-minority, high-poverty schools in a Massachusetts city examined how collaborative teams affect student achievement (Johnson et al., 2018). Five of the six schools expressed positive sentiment towards teacher groups when the principal was less involved with the event. A higher level of teacher agency in work completed led to lower isolation levels and higher levels of student achievement (Johnson et al., 2018). Studies regarding collaboration and its effects will be discussed further in a future section, but more recent studies focused solely on isolation in schools are sparse.

Isolation can be expressed in many ways: a loss of purpose, idealism, energy, and support. Many individuals enter the teaching profession to support others (Howes & Goodman-Delahunty, 2015), and when they are unable to help, either through a lack of support from leadership or their peers, they may suffer burnout or leave the profession (Pearce & Morrison,

2011; Johnson, Down, Le Cornu, Peters, Sullivan, Pearce, & Hunter, 2010). How an educator understands their school's culture and collegiality, or the lack thereof, contributes to feelings of isolation, leading to a separation of ideals and alienation from their peers (Hogan & White, 2021). The imbalance of expectations and reality can lead teachers to mental fatigue, depersonalization, and isolation.

The researcher of this study states that educational organizations are complex systems and may not be best explained by cause and effect. Instead, complex systems may be best understood through the lens of complexity, a theory of understanding systems with many parts, how simple rules can create complex structures, and how emergent properties are produced from seemingly endless complexity. The impact of isolation on individuals and the environmental factors that influence it may be more effectively understood through a complex systems approach.

Types of Collaboration

Teacher collaboration can be defined as a system of relationships engaged in knowledge transfer that combines resources to meet objectives traditionally unattainable by individuals (Graham & Barter, 1999; Kelchtermans, 2006; Kruse, 1999). While researchers like Little (1990) and Hargreaves (1994) have helped redefine the basic characteristics of collaboration, the format and structure of collaboration have continued to evolve. This portion of the literature review will cover various forms of collaboration in greater detail. By inspecting where various forms of knowledge transfer succeed and fail, the reader may better grasp how to create a collaborative environment conducive to the conditions for self-organization.

Peer coaching

Peer coaching is one of the most effective methods of information knowledge transfer. Ning, Lee, and Lee (2015) stated that previous research by Boyd and Hord (1994) separated teacher collaboration within a collaborative event into two distinct dimensions: collective learning and shared personal practice. Peer coaching is a dominant component of the second dimension in that it concerns sharing personal knowledge and experience (Ning et al., 2015). Peer coaching is defined as a nonjudgmental relationship between individuals built on collaborative and reflective dialogue (Dalton & Moyer, 1991; Heider, 2005). Peer coaching defines an avenue for information transfer, an opportunity to show support and assistance, discuss and define curriculum, reflect on teaching practices (Robin, 1995), and refine pedagogical implementation (Ostovar-Nameghi & Sheikhahmadi, 2016). Foulger (2005) adds to this by stating that peer coaching provides a place for teachers to argue, think, try out, and refine new practices.

The non-threatening environment promoted by peer coaching may impact the degree of isolation in schools but has failed to catch on in the United States due to a lack of available time (Heider, 2005). It has been shown to increase awareness of an individual's strengths and weaknesses and increase self-efficacy (Slater & Simmons, 2001). In a study of four teachers, researchers attempted to understand the effects of peer coaching on instructional design (Kohler et al., 1997). They conducted an experiment that instructed novice teachers to prepare and deliver a lesson on their own, prepare and deliver a lesson with a peer coach, and finally, plan and deliver another lesson on their own. The results showed that the planned and delivered lesson assisted by a peer coach was more effective than the first prepared event. This study measured the lesson result, not a teacher report (more commonly studied) (Kohler et al., 1997).

Another study looking at the mathematical efficacy of teachers claims that peer coaching was an effective model for improving student achievement (Bruce & Ross, 2008). The study did not report on teacher feelings or satisfaction. Peer coaching may deliver an immediate result, but these studies fail to observe the possibility of teachers revolting from the process due to peer coaching's impact on time and availability.

Peer coaching can be implemented in numerous ways. A commonly implemented practice is three-fold: pre-observation, observation, and post-observation (Ostovar-Nameghi & Sheikhahmadi, 2016). This process gives others feedback on their teaching effort and techniques (Bruce & Ross, 2008). To better serve the observed, the observer should be well prepared, record events objectively and as accurately as possible, discuss events and not impressions, and be present (time and commitment) (Murdock, 2000; Shannon, 1991; Wajnryb, 1991).

Although peer coaching can be an effective tool for information transfer, many scholars have criticized collaborative events because they can be opinionated, are threatening (Cosh, 2010), and contain imperfections in objectivity (Cakir & Gungor, 2017). Peer coaching increases the demand for a teacher's time and provides very few practical resources for instruction (Flinders, 1988). Implementing peer coaching is usually a district push to counteract psychological isolation by increasing interpersonal communication and social interaction (Walley & Stokes, 1981). While these reforms are meant to focus on skill development, the self-help activities typically increase demands on teachers and may be considered a danger to their survival (Flinders, 1988). Among the first to use the term 'coaching' concerning information transfer between new teachers, Joyce and Showers (1980) completed a 2-year study researching the power of teachers to acquire skills and knowledge. Peer coaching may do little to differentiate between a collaborative culture and contrived collegiality (Hargreaves & Dawe,

1990). By utilizing a case study of peer coaching, Hargreavew and Dawe (1990) determine that peer coaching may be undermined by context and meaning: 1) it does not compensate for the different perspectives teachers bring to the profession, 2) the collaborative event does not consider the real-world issues teachers must contend with when implementing new strategies into the classroom—time and attention, and 3) the process is not self-aware, neglecting political and ideological implications that enrich its administrative appeal (Hargreaves & Dawe, 1990).

Mentoring

A different approach to collaboration and counteracting isolation is teacher mentoring. With increased concern for the lack of effective professional development and teacher support, researchers suggest a mentoring environment to facilitate administrative support and knowledge transfer (Heider, 2005). It would be best to clarify how research views mentoring or a mentoring culture. Mentoring is different from a coaching relationship (Ostovar-Nameghi & Sheikhahmadi, 2016). Coaching is characterized as an exchange between equivalent teachers for the purposes of professional development through feedback and reflection (Greene & Grant, 2003). The mentoring process assists inexperienced teachers through the guidance and support of an experienced teacher (Little, 1990; Ostovar-Nameghi & Sheikhahmadi, 2016; Unruh & Holt, 2010). By modeling five functions (teaching, sponsoring, encouraging, counseling, and befriending) (Anderson & Shannon, 1988), a mentoring program aids the relationship in developing a new teacher (Gay, 1995). The remainder of the discussion on mentoring will focus on alternatively certified (AC) staff and the implementation of mentoring as a collaborative method for their development.

Mentoring programs have been crucial for school administrators to counteract teacher shortages. Teacher shortages have plagued schools for many years (Ingersoll, 2003; Ingersoll &

Smith, 2003; Madkins, 2011; Malow-Iroff et al., 2007; Podolsky et al., 2016) and in response, districts and States have increased the number of granted alternative certifications (Malow-Iroff et al., 2007; Podolsky et al., 2016). Alternative certifications accelerate entry into the teaching field by circumventing the traditional college route (Constantine et al., 2009). The alternative certification process relies on administrative support and mentoring programs (Wechsler, 2007). AC instructors have a high probability of turnover (e.g., transferring schools or leaving the profession), a concern for schools because the departure typically occurs before training and support is fully vested (Henry et al., 2011). This cyclical occurrence—the training of AC teachers before they leave in two years—becomes expensive and difficult to sustain. One particular study from Redding and Smith (2016) on the role of preparation and support for AC teachers found that mentoring was consistent in length between traditional and AC teachers even though AC teachers lack formal training. Also, no significant decrease in teacher turnover was found in relation to mentoring programs (Redding & Smith, 2016; Unruh & Holt, 2010). Although mentoring proved to be an effective method of training and support, the study hypothesis was not supported—AC teachers would receive more support than traditionally certified teachers because of their lack of experience, and mentoring would reduce the rate of teacher turnover for AC teachers (Redding & Smith, 2016). It has been stated that mentoring is a suitable method of teacher induction (Unruh & Holt, 2010) but should not be the sole method of support and should be combined with other forms of teacher induction practices (Johnson et al., 2004).

Teachers are encouraged to work together and collaborate for the purpose of student achievement (Harris & Anthony, 2001). Whether it be teacher teams, teacher networks, study groups, or professional learning communities, teachers are shifting away from self-isolation and

one-on-one mentoring to a culture of collaboration and collegiality (Middleton, 2000). A study in 2010 considered many unanswered questions regarding induction programs for AC staff. By looking at first-year teachers within twelve districts in North Carolina belonging to the Center for Support of Beginning Teachers, they found many similarities between traditional and AC staff (Clotfelter et al., 2010).

According to Flinders (1988), mentoring does not provide the necessary resources to be successful. Without proper support, the increase in structural demands for instructional staff will not be enough to cause lasting change. The typical implementation of a mentor program assumes blending an organizational perspective with one of a teacher. It has been suggested that a user-oriented approach may be better suited for leaders when implementing mentoring as an induction program (Krupp, 1987). By removing the contrived organizational perspective, leaders could provide appropriate resources for a successful program. Mentoring will be ineffective in increasing school achievement if the proper perspective and support are never achieved (Flinders, 1988). A prescribed relationship between those involved in a mentorship program may be limited in the long term (Cole, 1991). Many individual characteristics—such as age, gender, role, and philosophy—play a part in the effectiveness of a mentor (Galvez-Hjornevik, 1986), and it can be challenging for school leaders to pair inexperienced teachers with the perfect teacher mentor. For example, a study of Teacher Fellow—a New York City urban approach to addressing the teacher shortage—showed that a mentor program failed to address teacher turnover effectively. This was partly due to the contrived pairing of experienced and inexperienced individuals (Malow-Iroff et al., 2007). The study concluded that there is a need to strengthen support for new teachers from the administration and their peers.

Mentor programs can benefit new teachers (traditional or alternatively certified) if combined with other inductive programs, but they seem to miss the mark if implemented independently. "Teachers enjoy the rewards of working in a strong, positive professional culture. They recognized that participating actively with colleagues on their team helped them teach better and achieve a greater 'sense of success' with their students, which research shows contributes to the retention of teachers" (Johnson & Birkeland, 2003). New teachers can count on consistent and purposeful interaction with their peers, far exceeding the inconsistent quality of a mentoring program (Johnson et al., 2018).

Professional Learning Communities

Professional learning communities (PLC) have become a powerful form of school collaboration (Cansoy & Parlar, 2017; DeFour, 2003; Harris & Jones, 2010; Servage, 2008; Stoll & Louis, 2007; Stoll et al., 2006). PLCs are a group of devoted educators working collaboratively to increase student achievement (Defour, 2004; Hoaglund et al., 2014; Wahlstrom & Louis, 2008). Additionally, PLCs are described as the combination of teacher professional behavior (Hargreaves, 2000) with a community devoted individuals supporting, enhancing, and developing a culture of learning (DuFour et al., 2006); PLCs are enthusiastically implemented at all levels of an educational organization (Meiers & Buckley, 2009). A 2017 study seeking to understand the relationship between teacher professionalism and PLCs found a moderate increase in teachers' perception of PLCs and their level of professionalism (Schaap & Bruijn, 2017). Also, a statistically significant relationship was found between teacher professionalism and a shared mission and vision, collective learning and application, shared personal practice, and supportive conditions of collegiality and structure (Schaap & Bruijn, 2017). Only collective learning and application showed a statistically significant opportunity to

influence professional behaviors among the mentioned findings. Teachers describe PLCs as a community of like-minded individuals focused on improving their environment through a culture of collaboration (Hargreaves & Dawe, 1990). Teachers who participate in a PLC feel lower levels of loneliness, help to improve their school, and report increased satisfaction (Hord, 1997). Whether through developing a PLC or creating an environment of community learning, something can be said about constructing the conditions for collaboration within a school.

To achieve and maintain an authentic PLC, participants must meet consistently to improve already established goals and to advance in new avenues (Schmoker, 1999). A PLC must be built on accountability, collaboration, and shared governance (Wilson, 2016) and less on teaching (DeFour, 2004) to produce change within a school. Mitchell and Stackney (2000) have identified three dimensions crucial to a PLC: 1) a personal dimension that refers to an individual's ability to create knowledge and employ current empirical findings for implementation, 2) an interpersonal dimension that steers an individual's ability to collaborate and that is rooted in shared goals and learning, and 3) an organizational dimension that concentrates on the organization's ability to support the first two dimensions. PLCs have been an essential topic in the educational literature and have evolved into a 'catch-all' state for many forms of collaborative groups (Vangriekken et al., 2015). A stated difference between PLCs and other forms of collaboration is the intended focus. PLCs should be used for more than determining learning objectives; the collaborative group should also utilize information exchange to assist those whose students fail to learn (Hoaglund et al., 2014). Focusing on teacher and student results, PLCs have ushered in a new culture of collaboration (Ning et al., 2015).

Many researchers point to a critical component of PLC success: distributive leadership and a focus on volunteerism (Schaap, 2018). DuFour's (2004) PLC model focuses intently on the

empowerment of teachers and supportive leadership. Hargreaves (1992) and Head (2003) state that professional learning should be supported through collaboration and not mandated by leadership. A 2017 study looked at elements that affect PLC development in schools. By observing four PLCs over three years, the authors determined that affective PLCs must begin with an explicit focus on creating and facilitating reflective dialogue and ownership over time (Schaap & Bruijn, 2017). Schaap and Bruijn (2017) claim that positive feelings towards the group (or work) and individual ownership of the collective are critical to a successful PLC. PLCs owned by the participants and create a positive place to share may produce higher levels of teacher satisfaction and increase student achievement.

Researchers warn that events for information exchange can be founded on contrived collegiality and that friendly interaction and congeniality may hinder a collaborative culture (Hargreaves, 2004; Jarzabkowski, 2001). PLCs deprivatize instruction and attempt to build a community around shared values and interdependence (Owen, 2014). In this regard, leadership needs to support PLCs in navigating structural and environmental obstacles. Owen (2014) states that researchers highlight that PLCs do not happen on their own simply because individuals are working together. According to Owen, utilizing group development phases is critical (e.g., forming, storming, norming, performing, transforming, dorming, and mourning [Mulford, 1998]). The researcher also refers to DuFour's (2004) phases of a PLC (e.g., preinitiation, initiation, developing, and sustaining). The two constructs of structural formation require a leader to be intimately involved in creating and sustaining PLCs. A study by Vanblaere and Devos (2018) shows a critical link between an effective department head and PLC participants. The authors state that it is crucial to a PLC's success that the 'right' facilitator is chosen, and that the department head must be group-oriented and well-versed in reflective dialogue.

Inversely, PLC leaders or facilitators must be wary of their impact while leading PLCs. Rather than being a supporter, a facilitator may assume the role of a leader, possibly creating contrived collaboration and removing a sense of culture grounded in collaboration. Instead, it may be more beneficial if a leader could create a space conducive to collaboration among individuals, removing themselves from Mulford and DuFour's phases of group construction and allowing participants to manage the groups independently. Collectivism, an individual's ability to view themselves as part of a large whole, has received much attention from organizational theorists over the past twenty years because of its importance to team connections, exchanges, and collaboration (Basabe & Ros, 2005; Gibson & Zellmer-Bruhn, 2001). When an individual places group interests above their own, a group has been shown to possess more harmony than one containing self-centered individuals (Hofsteded, 2001). A collectivist mindset was present in more PLCs when a group experienced less collaboration of a contrived nature and possessed more ownership over their endeavors (Ning et al., 2015). This study showed that collegiality could mediate between collectivism and collaboration.

Contrived Collaboration

Collegiality is inherently positive for organizational culture (Kelchtermans, 2006) and is defined as the relationship between individuals who share responsibilities. In other words, collaboration is the joint action of individuals working together to complete a task (Vangrieken et al., 2015), while collegiality is the relationship between those collaborating. Datnow's (2011) research distinguishes between collaborative cultures that encourage and create self-organized knowledge transfer and contrived collaboration. Vangrieken et al. (2015) states that collaborative cultures originate from teachers perceiving collaboration as valued, supported, productive, and pleasant. Contrived collegiality is defined as administratively forced interactions between

individuals, recreating participants in the image of administration and pushing results towards organizationally held expectations (Hargreaves, 1997; Hargreaves & Dawe, 1994). Within contrived events, administration controls the pace of progression while encouraging specific outcomes (Hoyle, 1992). Characteristics of an organization that influences collaborative groups are rooted in cultural issues. Creating an environment of mutual trust under observation to prevent contrived collegiality may proactively achieve a proper school structure for true collaboration (Datnow, 2011; Fulton & Britton, 2011). Contrived collegiality and other group characteristics (e.g., balkanization, goal disagreement, poor communication, ineffective leadership) can lead to a breakdown in a collaborative culture.

The time of teacher-isolated work has passed, and the 'need to collaborate' is imperative for organizational success (Hargreaves & O'Conner, 2018; Truijen et al., 2013), but it may be the 'need' to collaborate that leads teachers to collaborative work instead of intrinsic motivations for increasing student achievement (Vangrieken et al., 2015). When individuals collaborate because of administrative order, the process can become contrived and shallow rather than deeply embedded (Hargreaves & Dawe, 1990; Vangrieken et al., 2015). Forced collaboration can lead to feelings of apprehension and withdrawal from collaborative events (Hargreaves, 1994). This may be why many U.S. teachers state that they dislike professional development, which is meant to be "collaborative" (Jacob & McGovern; Owen, 2014). Too often, collaborative events rooted in solid research are perceived by participants as contrived (Hargreaves, 1994). However, if the program is not embedded in a culture of independence among teachers and between teachers and administrators, the grouping may be meaningless (Hargreaves & O'Conner, 2018).

A significant contention for teachers is the threat to their autonomy and independence (Hargreaves, 1992; Ostovar-Nameghi & Sheikhahmadi, 2016). When a collaborative group is not

functioning correctly, resources must be made available, and the environment must be prepared to prevent forms of contrived collegiality (Vangrieken et al., 2015). Preparing the environment can be viewed as obstacle removal or systemic cultural change. There are many thwarting factors concerning cultural change and components related to the attitude of teachers (Vangrieken et al., 2015). An organization rooted in individualism, autonomy, and independence is typical across educational organizations. These cultural characteristics raise concerns about the mentality of school staff and need to be changed (Vangrieken et al., 2015) because, without openness to collaborate, any provocation towards collaboration may be relinquished to an environment of contrived collegiality.

Contrived collegiality—forcing teachers to work together (Fielding, 1999; Hargreaves, 1994; Hargreaves & Dawe, 1990)—may be counterintuitive; it is the opportunity to exchange information that is critical to improving teacher satisfaction and increasing student achievement (Stoll et al., 2006). Leadership can facilitate opportunities based on the organizational culture. Instead of contrived collegiality, research has defined another form of opportunity in the phrase 'arranged collegiality' (Hargreaves & Fullan, 2012). Ford and Youngs (2017) proposed that the question is, "How much intervention is needed and what forms—arranged collegiality—might remain largely open yet have significant implications for leadership theory, policy, and practice." This dissertation posits that school administration arranges collegial interaction and collaboration by creating specific conditions for self-organization. This arrangement does not mitigate the need for formal collaborative events such as professional development, staff meetings, leadership teams, etc. (Hargreaves & Dawe, 1990). Instead, it opens an avenue for intrinsically motivated self-organized teacher groups.

Typically, research on collaboration in education is characterized by a cause-and-effect methodology that often mirrors research on isolation. Empirical studies typically analyze a few data points to demonstrate observed behaviors or establish causal relationships between variables. For instance, Johnson et al. (2018) interviewed over 140 teachers from diverse backgrounds and analyzed the data using formal collaboration, administrative interaction, and other variables. Through this analytical process, the researchers discovered that teacher teams benefit from focusing on curriculum development and lesson creation. Similarly, Bruce and Ross (2008) examined how to mitigate isolation through contrived peer coaching and math instruction training. Their study found that such training led to positive outcomes, including adjustments in teaching practices, increased efficacy, and improved reflection through peer coaching. However, the study did not account for the potential influence of other variables, such as more effective interaction, environmental factors, or merely time away from class. In contrast, this research seeks to understand self-organizing teacher groups through complexity theory, which recognizes non-linearity and considers the intricate interactions of various components to produce emergent properties. Rather than relying on deterministic statements to explain causality, complexity theory offers a more nuanced approach to analyzing complex educational systems.

Conditions for Self-Organization

This dissertation hypothesizes specific conditions for self-organization. Based on the flocking theory of self-organization (centering, avoidance, and velocity [Reynolds, 1984]), its migration into the social sciences (Davis & Sumara, 2007; Laroche et al., 2007; Turner & Baker, 2019), the author has proposed parallel conditions for self-organizing teacher groups. The conditions (interdependence, independence, and goal-setting) are composed of various components: interdependence (collaboration and trust), independence (autonomy and efficacy),

and goal-setting. The preceding paragraphs will discuss each component and its place in literature. The following information will aid the reader in understanding the necessity of each component, its standing within the associated condition, and the reason for its place within the hypothesized structure for self-organized teacher groups.

Interdependence

Collaboration

Many school districts are encouraged to rebuild themselves as a 'collaborative organization' so they can be more competitive, produce better results, increase capacity, and be more accountable (Anderson & Grinberg, 1998; Blaze & Blaze, 1999; Horn & Little, 2010; Johnson, 2003; Lieberman & Miller, 2011; Stoll, 2009). Collaboration is essential to an organization's cultural planning, reflection, growth, and research (Hargreaves, 1994). Hargreaves (1994) views the cultural component as a means to provide support, increase and improve efficiency and effectiveness, reduce workload, promote confidence and reflection, define boundaries, and increase learning and professional growth (Rosenberge & Sindelar, 2005).

Schools organize teachers for many reasons. One reason is to increase knowledge of data-driven decisions and implementation around those decisions (Datnow et al., 2013). Data-driven decisions are prevalent in America and are becoming a widespread technique across the globe (Schildkamp & Lai, 2012). A data-driven decision is a technique for improvement and action that involves carefully analyzing student learning and other important data points (Mandinach & Honey, 2008). The purpose of grouping teachers around a focus is that teachers will be able to help each other make decisions, engage in a group effort, and share commonly used strategies (Datnow et al., 2013). Teachers collaborate to help students become future collaborators, a 'practice what you preach' approach to increasing student achievement and planning for the

future (Coke, 2005). This requires an innovative and student-centered methodology that will require individuals to work together (Shipley, 2009; Slavit et al., 2011). Collaboration fluctuates depending on the hierarchy of the situation, ranging from preserving individualism (focusing on the teacher as an individual [responsibility and autonomy]), coordination (coordinating responsibilities and tasks), cooperation (establishing a foundation for content and process), and sharing (sharing pedagogical practices and clarifying teaching and learning) (Havnes, 2009).

As previously mentioned, many collaborative events are categorized as professional learning communities. While there is sparse agreement on the definition of a learning community, empirical research consistently states that a grouping requires teachers to form communities that support each other in critical inquiry around pedagogy and curriculum (Stoll et al., 2006). Beyond their goal, collaborative groups should move to a singular focus of teaching and look towards learning, viewing collaboration as an action rather than a means (DuFour, 2004). Collaboration is the act of sharing information between individuals to pursue improvement (Vangrieken et al., 2015). For self-organizing groups to be successful, collaboration must be present between members. Knowledge transfer is rooted in the reasons for group formation but may change over time as objectives change. If collaboration is absent, knowledge transfer may not exist and cause the group to disband or separate.

Discussion of deep-level topics can be sensitive and could lead to disagreements and conflict (Vangrieken et al., 2015). This would eventually lead teachers to discuss surface-level topics to avoid hostility, focus on safe ideals, pursue conflict avoidance, and maintain norms of autonomy (Gunn & King, 2003; Hargreaves, 2001; Ohlsson, 2013). Another reason teachers may resist collaboration is that collaboration must incorporate a high level of interdependence. An increase in interdependence may be interpreted as an attack on a teacher's autonomy (Moolenaar,

2010). Deep-level collaboration is less frequent in schools than one might think. Schools more commonly host collaborative events focused on daily teacher tasks (student enrichment and effective teaching). These collaborative events are essential for increasing teacher effectiveness (Williams, 2010). Deeper-level collaboration is needed to increase teacher efficacy, school change, and community influence (Doppenberg et al., 2012; Levine & Marcus, 2010). These may be achieved by creating an environment that is conducive to self-organization. Encouragement from leadership for teachers to pursue their learning when and where it is desired could lead to a deeper level of relationship and community. Commonly suggested actions are teacher-teacher observations, reflection, and feedback, all commonly mentioned as missing from their collaborative endeavors (Plauborg, 2009).

Trust

Within a school context, empirical literature depicts trust in various ways depending on the role of the individual and the environmental context: collective (Forsyth et al., 2011), faculty (Smith et al., 2001), teacher-student, and teacher-principal to name a few. For this writing, the focus on trust will be the interactions between teachers, a component of faculty trust (Hoy & Tschannen-Moran, 2007). Trust in colleagues—the trust between teachers—has been a critical factor when considering other forms of trust (e.g., trust in clients and the principal) (Smith et al., 2011).

This study hypothesizes a condition (interdependence) for self-organization rooted in collaboration and trust. For teachers to collaborate, they must have a sense of trust between group participants. With the lack of centralized leadership or formal authority (i.e., principal), trust in the principal may be less critical for self-organizing groups (Bovaird & Sharifi, 1998). While trust-in-principals is essential for educational organizations and teacher success, teachers

are still cognizant of leadership. They will pay particular attention to leadership as they work with their colleagues (Bryk & Schneider, 2002) because a disorganized or untrustworthy administrator will fail to elicit trust between teachers (Hoy et al., 2006). The same may be said about trust in clients. The self-organization of teachers may be less concerned with their trust in clients (i.e., students) for group formation than their trust in colleagues. According to Smith et al. (2011), in their study of faculty trust and its dimensional effects on one another, the authors stated that trust in the principal is unrelated to trust in clients. However, trust in the principal is related to colleagues, and trust in the client is related to colleagues. This speaks to the mediating effect of teacher-teacher trust on administration and those served by educational organizations. Another interesting finding of the Smith et al. (2011) study is the environmental effects on trust in colleagues. A significant variance in faculty trust and trust in colleagues could be attributed to organizational health and environmental conditions. Twenty-six percent of the variance in results could be explained by organizational health.

As stated before, this study investigates school conditions associated with participation in self-organized teacher groups. The hypothesized conditions can guide administrators to improve their school environment, leading to more trust between teachers, an essential component of interdependence. Smith and their colleagues show that environmental conditions play an important role in facilitating trust among teachers (Smith et al., 2011).

Bryk and Schneider (2002) state that teachers must work together to accomplish the goals for increased student achievement and school improvement, but if trust between teachers sufferer, collaborative events may never start, and if they do, they may quickly dissolve. Bryk and Schneider (2002) also stated that trust between colleagues is constantly supported by feelings of competence and teacher reliability. This leads to the notion that teachers' trust in

others could affect their beliefs in individual efficacy and the collective. Teacher efficacy is crucial to self-organizing groups. If participants feel that others are not confident, reliable, or knowledgeable, they may exit the group prematurely. While self-organizing groups are considered an open system (a free exchange of participants), frequent turnover may do more harm than good concerning trust in faculty.

One study (Hoy et al., 2006) looked at the dimensions of faculty trust (trust in principal, colleagues, and clients) as it relates to the mindfulness of schools. Mindfulness is defined by Hoy (2003) as "a continuous scrutiny and refinement of expectations based on new experiences, appreciation of the subtleties of context, and identification of novel aspects of context that can improve foresight and functioning." Their survey of teachers across seventy-five middle schools concluded that trust in colleagues and the principal represents almost 97% of the variance in organizational mindfulness. Trust in the principal explained a more significant portion of the variance. It was explained by the authors to mean that principals play an essential role in creating an environment that is conducive to a state of mindfulness, a continual observance of expectations, and the identification of new and creative ways to tackle organizational problems (Hoy, 2003; Hoy et al., 2006; Langer; 1989).

Trust is critical to effective school systems, outstanding leadership, change, and collaboration (Hoy et al., 1996). Trust has been considered necessary for interpersonal relationships, effective communication, developing emergent leadership, creating culture, and risk-taking (Coleman, 1990; Hoy et al., 1996). Trust in colleagues—a belief that teachers can depend on each other and rely on their colleague's integrity (Hoy et al., 1996)—is a crucial component of interdependence (a condition for self-organization). Complexity and flocking theory show that self-organizing groups require a force to unite individuals. This paper

hypothesizes that collaboration and trust are essential to self-organizing teacher groups, and without trust, the collaborative event may never be initiated or fail quickly. Without formal leadership, a group of individuals must trust one another to increase the probability of successfully forming a self-organized group that works toward common goals and decreases isolation levels.

Independence

The condition of independence speaks to a participant's ability to make their own decisions and the confidence to do so. Decisions consist of whether to meet with other individuals, conduct self-prescribed pedagogical practice, or control any other aspect of instruction within a given environment. The following description of relevant literature will not attest to complete independence from leadership but instead lay out an argument for personal choice and the confidence to revel in that choice. The following two components comprise the condition for independence within a self-organization structure. These two components help define independence for individual participants, not the group.

Autonomy

Teacher autonomy has been interpreted in various ways depending on the structural position of the person (Spaull, 1984). Most focus on the various degrees of self-governance and freedom within their professional practice (Mausethagen & Molstad, 2015). Autonomy implies that professionals have governance over the content of their work and the terms of implementation, all founded on their knowledge of a subject and their honest opinions (Molander & Terum, 2008). Also, autonomy is affiliated with self-governance (Cribb & Gewirtz, 2007) and a person's ability to create, protect, and implement information (Mausethagen & Molstad, 2015). Self-governance has had less focus within empirical research than the conceptualization of

freedom. In return, autonomy is often seen as an individual's release from authority within the profession rather than an idea of self-governance (Keane, 1999; Musanti & Pence, 2010).

Research has shown that teacher results are connected to the daily activities of educational organizations and the combined aspects of their profession (Molander & Terum, 2008). The bond between teachers and the organization can affect teacher productivity if teachers perceive the organization is changing the environment dramatically without teacher input or choice. For example, suppose organizational guidelines oppose the intrinsic values of teachers. In that case, tensions can rise, leading to teachers reminding leadership of the value of teachers maintaining control over pedagogy, curriculum, and knowledge transfer methods. The rise in tension can lead to a decline in teacher involvement across various developmental initiatives (Mausethagen & Molstad, 2015). Mausethagen and Molstad's (2015) study of the understanding of autonomy at various levels of the organization shows that a traditional style of autonomy is worth protecting (pedagogical and curriculum freedom and an absence of control). The study concluded that discrepancies existed while autonomy was expressed at all levels of the organization. For example, administration and leadership viewed the ability of teachers to have freedom in pedagogy as essential, but clarification regarding the concept of control was needed.

According to Gagne and Deci (2005), autonomy and perceived confidence are foundational for individual motivation and psychological well-being (Deci & Ryan, 2000). This is under self-determination theory, which assumes individuals' basic psychological needs. The theory suggests individuals must feel confident and autonomous to preserve intrinsic motivations (Gange & Deci, 2005). While this dissertation does not utilize self-determination theory, the theory does expect autonomy to predict individual engagement and job satisfaction (Skaalvik & Skaalvik, 2014). Autonomy has numerous benefits associated with its presence in an educational

organization. Skaalvik and Skaalvik found in their 2009 study of teacher autonomy that autonomy is negatively associated with traditional characteristics of burnout: emotional exhaustion, departmentalization, and feelings of reduced accomplishment (Skaalivik & Skaalvik, 2009). A study of 2500 Norwegian elementary and middle school teachers asked about their levels of experienced self-efficacy and autonomy (Skaalvik & Skaalvik, 2014). The questionnaire measured self-efficacy, teacher autonomy, engagement, job satisfaction, and emotional exhaustion. The results of the questionnaire sought to answer three hypotheses: 1) teacher self-efficacy and teacher autonomy will be uniquely and positively related to job satisfaction and engagement, 2) self-efficacy and autonomy will be negatively related to emotional exhaustion, and 3) a statistically significant relationship will be observed between self-efficacy and autonomy. Results showed a significant but weak relationship between self-efficacy and autonomy regarding engagement, job satisfaction, and a negative relation to emotional exhaustion. The study showed that both self-efficacy and autonomy relate to increased teacher satisfaction and engagement levels. These results may be due to the relationship between the tested variables and the heightened motivation levels. Also, these results support the claim that self-efficacy may determine how individuals perceive environmental opportunities and barriers (Bandura, 2006).

This dissertation views autonomy as a release from authority, the need to determine an individual path when pursuing knowledge transfer, pedagogy, and curriculum. In combination with teacher self-efficacy—to be discussed in the next section—teacher autonomy and teacher self-efficacy can lead to a positive emotional state and produce an environment more conducive to increasing teacher satisfaction and lowering burnout. Together, the two concepts represent components of a condition for the self-organization of teachers, such as independence. Schools

can cause isolation in teachers, and in response, school leaders create collaborative events to bring staff together. These collaborative events typically revolve around a common idea or task. Collaborative events have shown to be successful in accomplishing a goal, but because the events appear to be contrived, they seldom survive long-term. Creating an environment that harnesses interdependence and independence could mean the difference between short-term and long-term collaboration (Pearson & Moomaw, 2005). As researchers are beginning to discover, autonomy may be the critical variable when investigating school reform initiatives, with a few authors stating that when teachers are granted autonomy and are empowered by leadership, problems once challenging to solve may become attainable (Melenyzer, 1990; Pearson & Moomaw, 2005; Short, 1994).

Teacher Self-Efficacy

Teacher self-efficacy (TSE) is rooted in the ideas of Bandura (2002) and his self-efficacy theory. TSE is the teacher's belief in their abilities to facilitate learning (Bandura, 1994)—teachers with high levels of TSE exhibit distinguishable characteristics from those with low levels of TSE. For example, teachers with heightened levels of TSE are more organized, provide better instruction, possess greater skills in questioning and explaining, and provide better feedback to struggling students (Ashton & Webb, 1986). Inversely, teachers with low levels of TSE express an authoritarian leadership style rather than a personal one (Smylie, 1989), resort to group work rather than whole-class instruction and are more threatened by misbehavior (Mojavezi & Tamiz, 2012). Teachers with high TSE also increase the opportunities for student communication and divide the student body into small groups to provide more one-on-one interactions (Mojavezi & Tamiz, 2012). Multiple empirical studies show that high TSE leads to greater student achievement (Muijs & Reynolds, 2001; Tournaki & Podell, 2005). This is due to

teachers with high TSE administering multiple methods of instruction within the classroom, utilizing classroom management and suitable teaching strategies, addressing students with special learning needs, and keeping students on task (Allinder, 1994; Chacon, 2005). Teachers with high TSE can also influence student motivation (Mojavezi & Tamiz, 2012; Skaalvik & Skaalvik, 2004). For example, a study of eighty high school teachers across four cities in Iran showed through a self-efficacy, motivation, and student achievement questionnaire that teachers with high levels of TSE can influence student motivation (Mojavezi & Tamiz, 2012; Skaalvik & Skaalvik, 2007). The increase in motivation can lead to an increase in student achievement.

Bandura (2006) stated that individuals self-organize, are proactive, reflective, and self-regulate. They focused on how people construct intentions, set goals, have expectations, anticipate future events, and reflect on personal efficacy (Skaalvik & Skaalvik, 2007). Efficacy accentuates the relations between personal characteristics, actions, and environmental conditions (Schunk & Meece, 2006). Efficacy beliefs can define the interpretation of environmental opportunities and barriers and affect individual activities, effort, and perseverance (Pajares, 1997). Compared to individuals with low levels of TSE (Bandura, 2007), individuals with high levels of TSE may be able to recognize collaborative opportunities not explicitly declared by leadership (Bandura, 2006; Skaalvik & Skaalvik, 2007). For example, a study by Skaalvik and Skaalvik (2007) showed that teachers with low levels of TSE experience higher rates of burnout. Increased burnout may be caused by low mastery and limited time to seek support because of preparation.

Successful collaboration is achieved when teachers participate in knowledge transfer and explore various pedagogical and curriculum strategies (Chong & Kong, 2012). Discussing methods, processes, and knowledge has increased student achievement and teacher satisfaction

(Goddard et al., 2007; Strahan, 2003). Collaborative events and professional development help link teacher motivation to successful outcomes and confidence in abilities (Hochberg & Desimone, 2010; Nielsen et al., 2008). Teachers with high levels of TSE have been empirically linked to successful collaboration that leads to increased student achievement and teacher psychological effects (e.g., well-being, adaptability, and adjustment) (Goddard et al., 2007). For example, a study by Chong and Kong (2012) of ten school teachers in Singapore suggests that when teachers intentionally work together around new curriculum or pedagogy strategies, TSE will increase due to collaboration. When TSE increases, student achievement and school improvement can occur. The school environment or leadership can affect how teachers develop or maintain TSE, collaboration, and autonomy. A study by Liu, Bellibas, and Gumus (2020) looked at how leadership methodologies directly or indirectly impacted TSE and job satisfaction and the mediating roles of teacher collaboration and school culture. Analyzing data from the 2013 Teaching and Learning International Study, the authors determined a statistically significant link between instructional and distributive leadership and TSE and teacher satisfaction. These leadership styles were indirectly linked to school culture and teacher collaboration. The type of leadership can determine the level of TSE and collaboration teachers feel within a student organization (Liu et al., 2020). This is important as this dissertation seeks to understand hypothesized conditions for self-organizing teacher groups.

This dissertation views TSE as a component of independence, one of the three conditions of self-organizing teacher groups. The claim is that for teachers to self-organize, they must be free of administrative control (within reason) and have confidence in their ability to work without administrative control. Autonomy and TSE combine to create a condition of independence that—when operating in conjunction with interdependence and goal-setting—can

serve as the most optimal environmental conditions for self-organizing groups. By harnessing the power of school leadership, a culture can be created that can serve self-organizing groups rather than forcing mandated collaborative events.

Goal-setting

Goal-setting is a highly respected strategy within corporate and educational environments (Cullen et al., 2001; Erez & Earley, 1987; Shunk, 2001; Johnson et al., 1997; Strecher et al., 1995). Research shows potential positive outcomes from using goal-setting for teachers and students (Butler, 2007; Camp, 2007; Reelsdorf et al., 2011; Shim et al., 2013). For example, teacher goals may affect career growth and instructional effectiveness. Goal-setting may also increase the staff's likelihood of seeking help when confronted with barriers or challenges (Butler, 2007; Camp, 2017). Additional positive effects of goal-setting in the classroom are the teachers' willingness to focus on growth over competition (Shim et al., 2013), an emphasis on social and emotional support for students (Butler, 2012), and a reduction of experienced teacher burnout (Reelsdorf et al., 2011).

One empirical study examined goal-setting as a crucial component of teacher education (Camp, 2017). By analyzing twelve teaching assistants within a single department, the author looked at how the assistants were familiarized with essential components of goal-setting theory, setting goals, and goal reflection. The study's results suggest that a few teachers may experience impediments in goal progression due to a lack of commitment and low self-efficacy. The researcher concluded with a few suggestions for increasing the likelihood of teacher goal-setting: 1) public goal-setting, 2) leadership investment, 3) intangible rewards, 4) concerted planning, and 5) goal clarity. These suggestions are related to increasing teacher self-efficacy and goal difficulty. Goals should be difficult enough to drive progress but within the teacher's capabilities

to pursue the goal. Proper goal-setting may require leadership support via guidance for goals and/or proper professional development (Camp, 2017).

Depending on the context, a goal can carry various meanings. Cumulatively, goals can refer to "the object or aim of [any] action" (Locke & Latham, 2013). This definition can include broad, ambitious, mundane, and specific goals. Commonly, goals refer to the concrete and finality of meaningful progress (Camp, 2017). They are used to measure oneself, an outcome of performance, and a target for progress, a point to which individuals can monitor and guide current action (Little, 2014; Pintrich, 2000). Often lofty, they can be used as a guide for a hopeful future state (Shah & Kruglanski, 2000). According to Locke and Latham (2006), goals relate to the goal-attainment process because they establish a primary standard for self-satisfaction for performance. Challenging goals are inspirational (motivational) because they require an individual to improve or grow and to be satisfied with difficulty compared to completing easy goals. Goals help individuals and groups navigate their environment by removing irrelevant tasks and emphasizing goal-relevant activities (Locke & Latham, 2006). Crucial moderators of goal-setting are feedback (used to monitor progress), goal commitment (important to self-efficacy and goal understanding), situational complexity (progress is difficult for challenging goals), and environmental constraints (Locke & Latham, 2006).

Goal-setting within groups is possible but can be more difficult due to group members' holding conflicting goals. A laboratory study by Seijts and Latham (2000) examined how performance is affected when individuals and groups possess conflicting and non-conflicting goals. In other words, how do groups perform when individuals hold individual goals that may or may not coincide with the group? The study concluded that individuals with high personal goals more compatible with the group's enhanced goals performed better than when individual goals

were incompatible with the group (Seijts & Latham, 2000). Knowledge transfer and group identity played an important role in group goal-setting and subsequent performance (DeShon et al., 2004; Locke, unpublished).

DeShon et al. (2004) analyzed information related to group goal attainment concerning strategy, individual effort, and feedback. When feedback is given to the individual rather than the group, the focus is placed on the individual's performance rather than the group. This can lead to decreases in individual performance, lowering group goal attainment. If feedback is given to the group, the focus is placed on group performance, which can lead to increased individual performance, ultimately leading to a higher probability of group goal attainment (DeShon et al., 2004). Goal-setting focuses heavily on motivation and task-specific strategies (Crown & Rosse, 1995). Motivation is increased by steering individual attention and acquiring effort and perseverance, and, in addition, it spurs the creation and use of effectual task strategies (Saaverdra et al., 1993).

Task strategies are fundamental to group goal-setting because groups need constant care and direction due to the individualistic need to separate from the group (Kozlowski & Bell, 2003). Task strategies, the individual's choices regarding performing a specific group task, can be competitive or cooperative (Tauer & Harackiewicz, 2004). Group goal-setting would favor cooperative task strategies as they involve working together towards a common goal rather than trying to outperform group members (Tauer & Harackiewicz, 2004).

Goal-setting theory submits goals as the primary controller of behavior (Latham & Locke, 2007; Locke & Latham, 1990, 2002). The goal-setting theory was formed to predict, explain, and influence motivation in an environment. The theory possesses three fundamental tenets: 1) high goals produce better results than low, vague, or no goals at all, 2) considering goal

commitment, a loftier goal will produce better results, and 3) specific variables (e.g., feedback, knowledge of results, participation, competition, and incentives) only affect an individual's undertaking as it relates setting and commitment of high goals. This dissertation's stance is that self-organized groups function by creating high goals. Through cooperative tasks, feedback, participation, and incentives (intrinsic), groups can move towards accomplishing their primary objective. With trust, collaboration, teacher efficacy, and autonomy, group members can effectively accomplish high goals. It takes more than trust and autonomy for individuals to work together for the sake of collaboration. They must set a high goal, understand how to accomplish it, collaborate on cooperative tasks with various individuals they trust, and have the space to reflect and work as individuals.

Chapter 3: Theoretical Framework

History of Complexity

Often recognized as a new science (Ma & Osula, 2011; Phelan, 2001), complexity science is a framework for evaluating the emergent behavior of spontaneous groups from chaotic environments (Turner & Baker, 2019). Complexity science is a novel approach against standard linear methodologies (Turner & Baker, 2019) that are traditionally used to study system behavior. Strathen and McGlade (2014) state that complexity science targets a subset of all systems. A subset with many members in which novel ideas and structures emerge, co-evolving with the environment and establishing self-organized groups through dynamic interactions with heterogeneous members. Found across biology, chemistry, physics, social, technical, and economic domains, this subset is known as a complex system.

Complexity science established its roots throughout the twentieth century. From holism and gestalt theory to cybernetics and general systems theory, researchers have attempted to study complex systems as a totality of their parts. For example, gestalt psychology revolted against earlier ideals such as elementalism and structuralism, viewing a person as a 'whole' rather than an individual component (Fong, 2006). Cybernetics and general systems theory became popular because they attempted to replace reductionist thinking by modeling complex systems instead of reducing them to cause-and-effect relationships (Turner & Baker, 2019).

From the mid-20th century to the beginning of the 21st, theories began to focus on system equilibrium (Simon, 1996). Two critical theories of this time were catastrophe and chaos theory. Catastrophe theory explained that small fluctuations in stable systems could alter system equilibrium (Thom, 1975), and chaos theory demonstrated that seemingly random systems could be deterministic (Gleick, 2008). Such systems are governed by underlying patterns and

deterministic laws that are sensitive to initial conditions (Gleick, 2008), leading to significant environmental changes. Because of the quantitative nature of chaos theory, it struggled to address the properties of people groups, ecosystems, financial markets, and other nonlinear systems (Froot et al., 1992). In other words, chaos theory provides simple rules producing complicated behavior, but many social systems demonstrate the emergence of complicated behavior that is neither chaotic nor random (Heylighen, 2008). Complex systems typically produce particular stability throughout their existence (Gell-Mann, 1994), but they can be highly unpredictable too (Bar-Yam, 1997).

Complexity theory identifies and understands patterns within complex systems (Colijn, 2000). The focus of research has been emergent phenomena, organizational structures, and systems evolution (Smith & Bower, 2009; Gregory et al., 2013; Hammer et al., 2012; Hanseth, Lyytinen, 2016; Turner & Baker, 2019). Researchers typically addressed these topics through qualitative methods and applying theory to case studies (Aagaard, 2012; Bovaird, 2008; Felix-Bortolotti, 2011; Gear, Eppel, & Koziol-McLain, 2020; Hanseth & Lyythinen, 2010; He, Rayman-Bacchus, & Wu, 2011; Thompson et al., 2016; Thurston et al., 2008). However, with the increasing sophistication of computers and computer networks, researchers are becoming more dependent on computers to track components of complex systems (Anderson, 1999; Battiston et al., 2016; Batty, 2016; Chwe, 1996; Foss & Saebi, 2017; Gershenson & Heylighen, 2005; Mason, 2001, 2008; Phelan, 2001; Sterman, 2000), and because of the perceived importance of quantitative methods, more and more research is utilizing computer models for understanding complexity theory (Andreoni & Miller, 1995; Davis & Samura, 2007).

Again, complexity theory was developed and has evolved through multiple disciplines, such as economics, chemistry, and physics. Complexity theory continues a couple of essential

ideas of chaos theory (Mason, 2008): sensitivity to initial conditions and the concern with wholes (Author, 1989; Holland, 1987; Mason, 2008). The progression of complexity theory from early orders of thinking attempts to better understand complex systems rather than reduction. There is a call to alter research methods for complexity theory because it is descriptive but can be misunderstood as prescriptive and may lack the ability to fully address key concepts of specific domains (e.g., outcomes, ethics, and philosophies), limiting the theory's results or leading to misrepresentation of research (Morrison, 2002). To counter these possibilities, Morrison (2002) states that, "...complexity theory suggests a need for case study methodology, qualitative research and participatory, multi-perspectival and collaborative (self-organized), partnership-based forms of research, premised on interactionist, qualitative and interpretive accounts."

There are plenty of applications of complexity theory within an educational organization. Complexity theory offers the opportunity for discovery typically overlooked by reductionist methodologies (Turner & Baker, 2015). Complexity theory expands on reductionist thinking by considering the parts that contribute to the whole and how those parts interact with each other (Westhorp, 2012). Complexity theory delivers the means to understand better open and nested systems that exchange information. By viewing educational organizations through the lens of complexity theory, observers will be able to understand that schools are more than the sum of their parts; they may understand better that increasing student achievement and teacher satisfaction may take more than pedagogical adjustments, staffing changes, and technological upgrades. What may be needed is a combination of many minor and straightforward adjustments. For example, complex systems characteristics and complexity theory could assist with policy formation, allowing policy creators to consider the educational environment as a complex system of variables instead of a simple cause-and-effect relationship (Aagaard, 2012; Antonacopoulou &

Chiva, 2007). Complexity theory may help school leadership anticipate emergent behaviors based on environmental conditions and community structures (Aagaard, 2012). The ability to anticipate change and diversity in educational outcomes could benefit future decision-making processes. Complexity theory can also help teachers, administration, and central leadership develop and understand strategies that work or have failed based on feedback and feedback loops; organizations can determine a course of action that is beneficial and eradicate those that are detrimental to student achievement and teacher satisfaction (Boal & Schultz, 2007; deMattos, Miller, & Park, 2012). Complexity theory has been applied in organizational change (Bovaird, 2008; Lauser, 2010; Waddock et al., 2015), professional learning communities (Borzillo & Kaminska, 2011), evaluation practice (Westhorp, 2012), mentorship relationships (Jones & Corner, 2012), organizational development and learning (Antonacopoulou & Chiva, 2007), policy implementation (Butler & Allen, 2008), and strategic management (Bovaird, 2008; Burgelman & Grove, 2007; Campbell-Hunt, 2007). Complexity theory delivers another point of view for observing systems and change.

This study will utilize complexity theory as a lens to better understand environmental conditions for teachers' self-organization. Through a qualitative approach, the research will attempt to identify and understand particular conditions and components of self-organized groups within an educational environment. After identifying the conditions, the data will help describe how teachers understand them.

Complexity Theory

Most scientific domains use a mechanistic perspective to explain system outputs (Dent, 1999; McDaniel et al., 2013). From physics to social science, a cause-and-effect relationship has been the predominant method to understand complex relationships between individual

components (Gear, Eppel, & Koziol-Mclain, 2018). This approach is considered reductionist: removing complexity and stripping a system to its essential parts (Haslberger, 2005). For some, a linear model seems to be the only way to understand the world, but for many, complex systems should not be reduced to their individual components (Heylighen, 2008). For example, the internet contains and produces emergent properties that cannot be reduced to a single cause, global warming cannot be attributed to a single factor, and organisms cannot be explained by a single cell. At most, complexity theory can ascertain specific statistical regularities through quantitative study, but a better understanding of complex systems is achievable through qualitative inquiry (Heylighten, 2008). Newtonian methodologies have been wildly successful across many domains, but the reductionist approach may not be best for all inquiries (PBS, 2021).

Complexity theory is focused on complex systems and phenomena that are difficult to explain through traditional analytical methods (McMurtry, 2006). Based on holism, the refusal of linear systems, and a rejection of Newtonian mechanics, a complex system is defined as an organization comprising many parts containing many interactions (Simon, 1996). Described as a group of interdependent components, they combine to produce something greater than itself (Thompson, 1967). Through a process known as self-organization, these novel structures are considered, or can lead to, novel phenomena known as emergence (McDaniel & Driebe, 2001; McDaniel et. al., 2013; Thompson et. al., 2016). Self-organization and emergence are best understood through a key tenet of complexity theory: nonlinearity. Nonlinear systems allow system components to form self-organizing structures that can lead to emergent phenomena. In a nonlinear system, the outcome is not as predicted as in a linear model. This leaves room for system components to connect, redirect, and synergize.

The core components of complexity theory must be considered: nonlinearity and feedback, self-organization and emergence, edge of chaos, openness and nesting, and evolution and adaptation. A basic understanding of these components is crucial to viewing a system accurately through the lens of complexity. Following an explanation of each component, a description of flocking will be delivered. Finally, a description and explanation of how the theoretical framework applies to the study of self-organized teacher groups will be given.

Nonlinearity and Feedback

Classical sciences are Newtonian, utilizing a cause-and-effect methodology, reducing systems to their basic components. Composed of inputs and outputs, a linear model produces outputs proportional to its inputs (Gershenson & Heylighen, 2005). Complex systems do not utilize this process but instead follow a core component of nonlinearity. Complex systems are dynamic and can rarely be explained by inputs or simple cause-and-effect relationships (Plowman et al., 2007); nonlinearity states that the effects are not proportional to their causes (Fuchs, 2003; Gershenson & Heylighen, 2005; Heylighen, 2008; Weaver et al., 2011). In other words, system inputs may not lead to system outputs. For example, referred to as the butterfly effect, a notion that the flap of a butterfly's wings in Tokyo can lead to a hurricane in New York, speaks to the notion that complex systems are sensitive to initial conditions (rooted in chaos theory) (Cooksey, 2001) and that positive feedback loops lead to unpredictable outcomes (Fuchs, 2006; Heylighen, 2008; Lorenz, 1963; Marion & Baker, 1999; Tasaka, 1999). Complex systems are considered nonlinear due to the constant interaction of components within a web of feedback loops (Anderson, 1999; Gershenson & Heylighen, 2005; Plowman et al., 2007; Stacey, 1995), and these interactions allow for emergent and unpredictable outcomes (Marion & Baker, 1999).

In a nonlinear complex system, feedback and feedback loops are essential concepts to understand. This is due to the constant interaction of system components via a web of feedback loops (Anderson, 1999; He, Rayman-Bacchus, & Wu, 2011; Stacey, 1995). Component interactions either self-reinforce or dampen interactions (or outcomes) within a system, causing a system to react unpredictably or remain relatively stable. Stemming from its origins in chaos and catastrophe theory, feedback is key to the deterministic nature of complex systems (Mason, 2001). There are two forms of feedback: negative and positive (Aritua, Smith, & Bower, 2009; Gershenson & Heylighen, 2005; Lotfi, 2019; Mason, 2001; Heylighen, 2002;). Negative feedback occurs when one component causes itself or other components to obtain stability (dampening effects) (Gear et al., 2018; Heylighen, 2002; Mason, 2001), limiting significant causes to produce little or no effect. Positive feedback is self-reinforcing, causing a component or set of components to move rapidly toward a point of no return (Mason, 2001; Heylighen, 2002). For example, population growth may halt due to a lack of resources or grow indefinitely.

Feedback influences self-organization (Chiles, Meyer, & Hench, 2004; Heylighen, 2002). A component's initial state can be amplified through positive feedback, leading to rapid growth or expansion until all components are aligned and all initial resources for growth are spent. The system has reached equilibrium (or a stable state) (Heylighen, 2002; Heylighen, 2008) and continued expansion is no longer possible. If the components attempt to move out of the stable state, the same forces that placed the system into stability will act again, moving the system back toward stasis. Complex systems can have many positive and negative feedback loops attempting to keep a system stable or create unpredictable behavior (Heylighen, 2002; Keane, 1999; Singh et al., 2013; Youngblood, 1997).

Self-Organization and Emergence

Self-organization and emergence are central components of complexity theory (Beck & Plowman, 2014). Initially observed in the natural environment (e.g., nature, biology, physics, etc.) (Morrison, 2006; Singh et al., 2013), self-organization is now being adapted to social systems (spontaneous self-organization of people) (Eppel, 2017; Gregory et al., 2013; McDaniel & Driebe, 2001). Self-organization is the formation of structural patterns within a complex system without direct control (Gear et al., 2018; Turner & Baker, 2019). The structures, or patterns of stability, that emerge from self-organizing behavior are known as emergent properties (Cilliers, 1998; Larson, 2016). Forming from the bottom-up (Kauffman & Kauffman, 1995) and by creating an optimal environment, an emergent self-organized group can pursue their plans and future states (Gregory et al., 2013; Gilley et al., 2002).

Originating from Ashby's work in cybernetics (Anzola et al., 2017) and continued by others such as Heinz von Foerster, Ilya Prigogine, and Hermann Haken (Heylighen, 2008), self-organization has more recently been implemented within complexity theory and should not be considered a subordinate concept. Considered more 'cross-fertilization' (Anzola et al., 2017; Heylighen, 2008) than integration, its introduction into social systems can be seen as an attempt for complexity theory to understand more than structures but processes as well (Capra, 1996; Skar, 2003). Themes, patterns, and measurements have surfaced from decades of research into self-organization: cooperation and collaboration (patterns within social sciences), autonomy (controlling force or process mechanisms) (Morgan, 1987), robustness (stability and resistance to change) and resilience (endurance despite change) (Singh et al., 2013), and dynamic (variance over time) (Anzola et al., 2017; Gilbert et al., 2015; Heylighen, 2008).

Any system concerning complexity theory is considered an open system containing components of self-organization and emergence, and within an open system (Prigogine & Stengers, 1984), these components will evolve towards new states of stability (Richardson, 2005; Turner & Baker, 2019), also known as an attractor (Gershenson & Heylighen, 2005). Within these stable states, researchers are attempting to understand self-organization and emergence (Ball, 2004).

Self-organized groups cannot be reduced to their individual components because self-organizing groups emerge ultimately from their component interactions (Gershenson & Heylighen, 2005). The random interaction of components within a self-organized group pushes the system towards an attractor more quickly, creating a more stable state (Schieve & Allen, 1982). This phenomenon is called 'order from noise' (von Foster, 1960; Heylighen, 2002). Inversely, too much perturbation can cause disorder in a system, eventually evolving towards the 'edge of chaos' (also known as self-organization criticality [Bak & Chen, 1991]) (Gershenson & Heylighen, 2005; Waldrop, 1993), a state between equilibrium and disequilibrium. Nonlinearity plays an essential role in deciding which state the group enters but once entered; the state is difficult to exit (Fontana & Ballati, 1999; Sanders, 2019; Scheinkman & Woodford, 1994). The state of the group and various other characteristics belonging to the system within a given attractor are considered emergent of the component interactions (Heylighen, 2001; Heylighen, 2002).

Finally, according to complexity theory, new and unexpected properties and behaviors will emerge—from the lowest levels of the system (Anderson, 1999)—given enough complexity in a given environment (Mason, 2008). These emerging properties and behaviors lead to the whole becoming more than the sum of its parts (Gershenson & Heylighen, 2005; Heylighen,

2008; Mason, 2008; McKelvey & Lichtenstein, 2007). Emergent properties can represent 'holism' (or order [Anderson, 1999]) of a system, seen as the nonlinear interactions or relations between system components, exhibiting characteristics of coherence, symmetry, and function (Heylighen, 2008; Thietart & Forgues, 1995). Underlying currents of emergent phenomena are scale and complexity, and when a variety of system components group together, they may form a web of complex networks of unprecedented scale (Chiles et al., 2004; Mason, 2008). According to Maguire and McKelvey (1999), organizations exit stability and enter a realm of complexity, giving rise to emergent self-organizing groups.

Edge of Chaos

Researchers have observed that self-organized groups within complex systems typically avoid two extremes: order and disorder (Kauff-man, 1993; Bak, 1996). These spontaneous groups find a stable position at the 'edge of chaos,' allowing for adaptation and change without losing structure (Gunz et al., 2002). This point in time and space has been investigated by Per Bak and his peers (Bak & Chen, 1991; Bak, 1996), in which they coined the term self-organized criticality. This is a state of spontaneous grouping at a point between two or more stable states. A well-known example of the edge of chaos is the 'sandpile experiment' (Bak & Chen, 1991). By pouring a steady stream of sand onto a flat surface, a sandpile will form before grains begin to cascade off the edge. The pile will eventually reach a critical point when no more growth is observed because equal amounts of sand cascade off the edge as it is added. The sandpile is consistent and predictable (retaining slope) from an outside observer, but the outcome for each new or current grain of sand is unknown. As a grain of sand is added to the pile, it may become stationary or cause a chain reaction displacing grains that may eventually lead to a large discharge of sand. If the rate of adding sand is consistent, then the large removal of sand

becomes more frequent but rare (Bak, 1996). This example shows the natural need to attribute causes to a disruptive event. Just because a change occurs in organizational structure, there may be no explanation or cause to associate. The change could be attributed to the emergent characteristics of a complex system that has evolved to the edge of chaos (Gunz et al., 2002).

Open and Nested

Contrived systems (groups) created by a central authority for any purpose may be considered a closed system (Allen et al., 2011). These systems may be considered closed because they are typically available only to participants who fit specific criteria (e.g., grade level, subject matter, age group, etc.). Closed systems do not allow the free flow of resources (people) or ideas (Kast & Rosenzweig, 1972; Turner & Baker, 2019). Closed systems are also considered bounded (Turner & Baker, 2019) and are meant to protect the system and subsystems from outside forces. Closed systems may be the most optimal perspective for Newtonian methods, allowing reductionists to show cause-and-effect.

Inversely, an open system (group) is considered to be embedded in context (Weick, 1995). Without boundaries, open systems encourage the flow of resources (people) and ideas (Anzola et al., 2017). As a system of interdependent activities (Scott, 2003), the boundaryless system is freely open to the exchange, addition, and/or removal of resources or ideas, or both. While complexity theory exhibits structure from a set of simple rules or principles (Mason, 2008; Phelan, 2001), the system is considered adaptable and can change without collapsing (Mason, 2008). Because open systems are not bounded, they are not separated from the environment and can be affected by external and internal forces (e.g., leadership, community, and resources) (Turner & Baker, 2019).

Nesting is a unique characteristic of a complex system. Considered ecologically structured (Weaver et al., 2011), a part-whole relationship emerges as a foundation of the structure. A collection of parts makes a whole, which places the whole next to a collection of parts, feeding the structure with complexity creates a more inclusive whole (Mason, 2008). These embedded, or nested systems, help describe how systems co-evolve, stay adaptable, or change due to internal and external forces (Allen et al., 2011). For example, classical sciences may reduce a system to inputs and outputs, attempting to determine if a set of environmental characteristics caused an outcome. By describing a complex system as nested, or embedded, researchers can observe broader connections a component in a complex system has with other components. The structure created from these connections is considered emergent (Ashmos & Huber, 1987) and may only be understood because of the nested nature of organizations (Anderson, 1999). In schools, the combination and flow of information between students, teachers, administrators, and other stakeholders demonstrate multiple layers of interconnection. The dynamic relationship between nested systems speaks to the whole as an interaction of its parts (Mason, 2008; Morrison, 2008; Radford, 2006).

Evolution and Adaptability

"Complexity theory is a theory of survival, evolution, development, and adaptation…concerning itself with environments, organizations, and systems that are complex in the sense that very large numbers of constituent elements or agents are connected to and interacting with each other in many different ways" (Morrison, 2002). Complexity theory suggests that complex systems constantly evolve (Anderson, 1999; Mason, 2001). Through emergent behavior like self-organization (Kelly & Allusion, 1999), a system exhibits dissipative behavior, becoming less structured before resuming a pattern (Schieve & Allen, 1982), repeating

this pattern of randomness and stasis (edge of chaos) (Bak & Chen, 1991; Holland & Miller, 1991; Morel & Ramanujam, 1999). This cyclical pattern can cause complex systems to constantly evolve and adapt to their environment (Mason, 2001). Also, an evolving group creates positive feedback within the system, and on system components, leading to interactions that are greater than negative ones (Allen, 2001; Morel & Ramanujam, 1999). If participants attempt to better themselves (evolve), each pursuing personal growth, the group may be more cooperative than competitive (Allen, 2001). This co-evolutionary process is key to complexity theory and its description of a system (Marion & Bacon, 1999).

There is no proper prescriptive method of evolution. Manipulated by various beliefs, the path traveled may not be optimal in any way because of subjective ideals and personal intentions. Behavior reflects past experiences, and these interactions are what shape the future. Evolution is a continual human experience (Bar-Yam, 1997; Holland & Miller, 1991), imperfect and often misunderstood, caused by the difference between what is expected and what occurs, rarely resulting in finality (Turner & Baker, 2019).

Complex systems are adaptive because they are flexible, and by altering their structure, these groups can respond to internal and external forces (McMurty, 2006). Because they are open, these systems can adapt in a self-organizing—emergent—fashion (Davis & Sumara, 2004). Complex systems are adaptive because they are emergent; they learn and grow due to changing circumstances (Clarke et al., 2005). Complex systems are adaptive because they improvise (Clarke et al., 2005). With enough diversity in its components, the system can produce creative responses to the environment. As evolving systems strive for more, adaptive systems seek increased payoff over time (Holland & Miller, 1991). An open system that pursues better returns tends to evolve and adapt to internal and external forces (Aritua et al., 2009).

Most empirical research on complexity theory has typically refused to use quantitative methods due to complexity theory's requirement of nonlinearity, emergence, and unpredictability (Uhl-Bien et al., 2007). These characteristics make it difficult to predict and measure the behavior of complex systems such as self-organizing groups of teachers. The current dissertation will use a mixed-methods approach to understand self-organizing groups of teachers. Specifically, the study will gather date to inform a set of interviews to understand better self-organizing teacher groups and the conditions for self-organization. Participants will be invited to participate in interviews to observe their perceptions and experiences of the hypothesized conditions. This qualitative approach will provide a complete understanding of the complex dynamics involved in the self-organizing groups of teachers.

Flocking

An example of spontaneous self-organization is the formation of flocks (Heylighen, 2001). Flocks, shoals, herds, and swarms mirror behavior and react similarly. Whether pursuing food or avoiding danger, the groups move in elegant formations (Reynolds, 1987) for survival or progression. A vital feature of these self-organizing groups is that their movement and formation occur without needing a central authority (e.g., head bird or leader fish) (Heylighen, 200; Reynolds, 1987), a core concept of self-organization.

Reynolds (1987) simulated a set of boids (simulated objects) flocking in elegant patterns by defining only a few simple rules and without explicitly stating for them to flock. According to Craige Reynolds (1987) and Mitchel Waldrop (1993), there are three simple rules for flocking: 1) flock centering (cohesion): move towards center mass, 2) collision avoidance (separation): avoid collisions with nearby flockmates, and 3) velocity matching (alignment): attempt to match speed and direction of nearby flockmates (Singh et al., 2013). An important note is that the rules

do not apply to the flock but to the individuals within the flock (Reynolds, 1987). Interactions between individuals create a dynamic and flexible system, starting from the bottom rather than the top (Stacey, 2001). The complex behavior of a flock does not have to be complex. From a few simple rules, self-organized systems or groups can form spontaneously (Marshall, 1996). This idea removes the notion that group behavior must be instructed from the top of an organization's hierarchy. Instead, a few simple rules located at the level of the agent are enough to produce self-organizing behavior (Fong, 2006).

Groups are formed to share and transfer information depending on the size of the group (Turner & Baker, 2019). In nature and social systems, the smaller the group, the more quickly information will permeate throughout (Clarke et al., 2005). An individual's needs at the local level (e.g., protection, exploration, nourishment, etc.) can initiate local information transfer between individuals without the need for a central leader (Couzin & Krause, 2003; Parrish et al., 2002), and will affect how the individuals move through their environment (Levis et al., 2020). Group members will rely on social information observed from those nearby to sustain spatial cohesion (Belz et al., 2013; Levis et al., 2020). The likelihood of an individual staying with a self-organized group depends not only on group size, but also on social relationships and group productivity (Sueur et al., 2009). The group's structure may change through local information transfer and interaction with the environment, but how the individuals are organized does not (Rosen et al., 2010). Under the concept of homophily, individuals will stay together if their reasons for self-organization remain homogeneous (Monge & Contractor, 2003; Rosen et al., 2010). For example, individuals may observe an unmet need through available outlets. A group may form because their need is homogenous, but if their needs are met or corrected and cease to exist, the group may disband.

Various theories for human flocking have been suggested (Rosen et al., 2010; Frey & Goldstone, 2018), but they differ in how they assign the three simple rules suggested by Reynolds. For this paper, and to be discussed further in later sections, the three simple rules for flocking will help build a theoretical model for self-organization. By substituting cohesion for interdependence (collaboration and trust), separation with independence (autonomy and efficacy), and alignment with goal-setting, a simple structure will help define the conditions for self-organized teacher groups.

Chapter 4: Methods

The purpose of this study was to investigate the conditions for teacher self-organization and determine if those groups experience lower levels of isolation. It has been previously noted that school leaders may encourage individuals to collaborate when school isolation exists. Collaboration can take many forms (e.g., mentoring, PLCs, coaching, etc.). School leaders may establish instruction-free time to unite people and mandate various forms of collaboration. When collaboration is mandated, it is considered to be contrived.

As previously written, contrived collaboration may not produce the outcomes that leaders desire. Instead, this study hypothesizes specific conditions for bringing teachers together without central authority or mandates; school leaders could create a culture that spurs self-organizing groups by creating an environment conducive to self-organization. Through the lens of complexity and flocking theory, the researcher hypothesized conditions that help teachers work together without needing administrators.

The mixed-methods approach explored the self-organizing conditions in the educational environment and how teachers interact with them. The design was an explanatory sequential design that attempted to explain quantitative results through qualitative methods. To determine the existence of the proposed conditions, the researcher used complexity theory and its components: nonlinearity and feedback, self-organization and emergence, edge of chaos, openness and nesting, and evolution and adaptation. Complexity theory aided the researcher in determining the presence of the hypothesized conditions for self-organization and how individuals may interact with those conditions. Complexity theory's nonlinearity component requires a qualitative investigation because complexity theory cannot determine cause and effect. The qualitative phase consists of 18 interviews. The interviews allowed the researcher to

understand individuals' interactions with their environment, peers, administration, and the conditions for self-organization. The study helped determine if the proposed self-organizing conditions exist in the participant's educational environment and how individuals interpret those conditions. The results provided valuable insight for school leaders as they create environments for their staff.

Table 1

Phase 1 and 2 Study Questions

	Research Question	**Design**
Quantitative Research	Do teachers experience the conditions for self-organization, and do teachers feel isolated?	Quantitative: A survey of 24 questions was served to teachers across Oklahoma.
Qualitative Research	How do teachers describe the conditions for self-organization in their schools?	Qualitative: Eighteen semi-structured interviews with participants were conducted to understand an individual's relationship with hypothesized conditions related to isolation levels.

Quantitative Research

The quantitative section of this mixed-methods study represents the first of two phases. It collected data on hypothesized conditions for self-organizing groups and isolation levels within schools across Oklahoma. A structure for self-organizing teacher groups has been proposed,

interpreted through flocking theory, and critically analyzed using complexity theory to understand complex human behavior and systems. Flocking theory posits that flock participants stick together by observing three conditions: cohesion, separation, and alignment (Reynolds, 1984). Transposing this idea to the social sciences has been accomplished, but there is a lack of empirical research or focus on educational organizations. Phase one asked, "Do teachers experience the conditions for self-organization, and do teachers feel isolated?"

Study Setting

The survey aims to determine the level of hypothesized conditions for self-organizing teacher groups and experienced isolation levels. This study focuses solely on teachers' understanding of the specific conditions for self-organizing teams and the potential relationship between teachers and these hypothesized conditions. The results could aid administrators in fostering an environment more conducive to self-organizing groups. The researcher was interested in how teachers collaborate in relation to their levels of isolation. The leadership's perspective does not contribute to understanding the teacher’s perception of their isolation and their interpretation of environmental conditions. The findings justify further studies on school leadership, their interpretation of current conditions, and their role in creating those conditions.

Sampling

This study employs a mixed-methods approach that investigates the effect of self-organized teacher groups on mitigating isolation among educators. The sampling framework includes a diverse cohort of active schoolteachers across various districts, reflecting a broad spectrum of socio-economic backgrounds. Approximately 1070 participants were recruited for an online survey to assess the prevalence and characteristics of self-organized groups within their working environment and the associated levels of perceived isolation. A purposive sampling

technique was utilized to select 18 teachers for in-depth interviews. These participants were chosen based on their participation in the survey. This selection strategy provided insights into the conditions that foster the formation of self-organizing groups and their effectiveness in reducing feelings of isolation among teachers. By targeting educators from a wide range of settings, the study sought to uncover generalized patterns and specific conditions that promote or hinder the development of supportive, self-organized teacher networks, thus contributing to a nuanced understanding of the educational environment.

Data Collection

The survey gathered 1070 survey submissions. The survey was created and distributed through Qualtrics. Surveys were shared directly with teachers using a database of teacher contacts acquired via the University of Oklahoma. The survey consisted of 24 questions or statements. Each statement or question contained Likert-type responses ranging from strongly disagree to strongly agree. Questions and statements were evenly distributed, and participants were asked for their opinions on various topics. Questions and statements were crafted into short phrases related to the conditions for self-organization and isolation. An example of a self-organization statement is, " I collaborate well with other teachers when we meet without school leadership (collaboration)" or "Teachers trust each other when collaborating without school leadership (trust)." Participants responded by choosing between the strongly agree to strongly disagree range. The six components contained roughly three to four survey questions or statements. Another three to four questions or statements related to teachers' isolation levels were asked. Finally, a series of seven questions were asked for an organization variable. Refer to Appendix 1A for survey questions and the conditions/components they are meant to discover.

Table 2

Survey Questions: Collaboration, Trust, Efficacy, Autonomy, Goal-Setting

Question	Component/Condition
1, 9, 12, and 22	Collaboration
5 and 16	Trust
8, 14, and 18	Efficacy
3, 4, and 13	Autonomy
2, 20, and 23	Goal-setting

The survey was formulated using empirical studies related to self-organization components: three questions about collaboration (Woodland, Lee, & Randall, 2013), two about trust (Adams & Miskell, 2016; Hoy & Tschannen-Moran, 2007), three about autonomy (Friedman, 1999; Pearson & Hall, 1993; Pearson & Moomaw, 2006), and three about efficacy (Tschannen-Moran & Hoy, 2001; Zhang et al., 2018). The questions were edited to align with the literature review. For instance, statements using verbiage such as "team meetings" were revised to "collaborative events." The author developed three goal-setting questions to ascertain if participants set, work towards, and accomplish goals. The survey included seven questions on an organization variable influenced by complexity and flocking theory. The survey included three questions to gauge a participant's isolation level. The survey aims to identify the level of isolation and presence of self-organization conditions. Refer to Appendix 1A for survey questions.

Table 3

Survey Questions: Isolation, Self-Organization

Question	Variable
11, 17, and 21	Isolation
6, 7, 10, 15, 19, and 24	Organization

Dependent Variables

Data was collected on numerous composite variables derived from two or more survey items. The survey used for this research yielded data for four components. These four components were combined to create two conditions. The survey gathered data to form a third condition. These three conditions are the core constructs hypothesized by the researcher for self-organizing teacher groups. Table 3 illustrates the construction of these composite variables.

Data related to isolation was collected. Isolation was determined from multiple survey responses. The statements or questions about isolation were derived from empirical research on teacher isolation. As the literature review describes, teacher isolation combines workplace and psychological conditions. The isolation experienced within schools will be understood better during phase two.

Table 4

Component/Composite Variable Construction

Composite Variable
Isolation

Table 5

Independent Variables

Composite Variable	Components
Interdependence	Collaboration, Trust
Independence	Efficacy, Autonomy
Goal-setting	The sum of four survey questions
Organization	The sum of six survey questions
Self-Organization	The average value of all conditions

Composite Variables

The study's methodology involves using composite variables to examine the multifaceted nature of self-organizing teacher groups. These variables were carefully designed to encapsulate the hypothetical conditions for self-organization. The study outlines three core composite variables: interdependence, independence, and goal-setting, each embodying critical dimensions of self-organizing conditions.

The construction of these composite variables involved the strategic grouping of related components, such as trust and collaboration for interdependence and autonomy and efficacy for independence. These components were operationalized through targeted survey questions designed to capture the extent of each condition within participants' educational environment. Participants' responses to these questions were quantified using a Likert scale, ranging from

strongly disagree to strongly agree, with a nuanced scoring system to reflect the intensity of each sentiment. Likert were converted to a numerical scale to create composite variables (Strongly Disagree = 1; Somewhat Disagree = 2; Neither Agree nor Disagree = 3; Somewhat Agree = 4; Strongly Agree = 5).

The study employs a rigorous methodology for calculating the composite scores. The sum of component scores within each condition was averaged, yielding a nuanced measure of interdependence and independence. Unlike interdependence and independence, the goal-setting variable was directly assessed through specific survey items, streamlining its computation.

The culmination of this process was generating a self-organizing score, an aggregate measure derived from averaging the condition values. This score quantifies the propensity for self-organization within a given educational setting, providing insights into teacher organizational practices.

Table 6

Component Structure for Conditions

Interdependence		**Independence**		**Goal-Setting**
Collaboration	**Trust**	**Efficacy**	**Autonomy**	

Quantitative Data Analysis

The results were recorded, tabulated, and used to plan the second phase of the research. Because of the nature of complexity theory, the researcher could not calculate a regression using quantitative results. These results verified the hypothesized conditions, informed interview questions, and helped plan phase two.

Each row in a colored data table represents a teacher or district. All tables will be labeled as teacher or district and contain the value range. For example, if a table displayed district results for the interdependence variable sorted for its maximum values, it will say '(Maximum/Minimum/Median) Values of Interdependence for (Districts/Teachers).' When a table is sorted for a given variable, the reader should observe the values of each condition or component and attempt to understand how the conditions and components relate to the maximized variable.

Color formatting in the tables symbolizes the variability within a column using gradients to indicate the magnitude of values. This method aids in quickly evaluating the relative data points and communicates the conditions and components of self-organization. Interdependence, independence, autonomy, efficacy, goal-setting, isolation, and self-organization have a maximum value of 15. Collaboration has a maximum value of 20. Trust is given a maximum value of 10, and organization has a maximum of 25. A higher numerical value equates to a higher presence of the variable.

When interpreting these tables, the highest values for each variable are indicated in red, marking each variable's upper limits. The lowest values are displayed in blue, marking the minimum. Intermediate values are shown through a transition of shades between red and blue, indicating their relative proximity to the maximum or minimum. The median values, serving as a neutral benchmark, is usually white, symbolizing a midpoint in the data range. This practical color scheme allows for a quick and intuitive understanding of the data.

Darker shades of red signal higher values, reflecting more vital manifestations of variables like collaboration or self-organization. In contrast, deeper shades of blue indicate lower

values, which might identify potential areas needing attention. Hues approaching white represent values near the middle, offering a means to gauge the impact of each variable visually.

When observing conditions for self-organization, these tables are often organized to highlight the maximum value for a variable. This organization allows researchers to observe how the remaining variable amounts compare, providing valuable insights into how teachers perceive and engage with the conditions for self-organization. Such visual cues are instrumental in identifying areas where conditions for self-organization are well understood, present, and in need of further support. These data points serve as a preliminary analysis, guiding researchers in developing deeper inquiries during interviews. This methodological approach enables a nuanced exploration of the variables influencing self-organization, paving the way for a richer understanding of its dynamics within the educational setting.

A specific method was employed to accurately depict the maximum levels of each variable in the color-coded charts. First, every row in the dataset was assigned a random number using the random function. These numbers were then sorted in descending order. The variable of interest was then sorted in descending order, positioning the highest values at the top. This sorting procedure was repeated five times, incorporating the random numbers and the variable. Each sorting action automatically creates a new random number to be used when sorting the data. This repeated randomization was essential in scenarios where multiple rows had the same maximum score for a variable. The random numbers added variability to their positioning, leading to a randomized yet accurate arrangement of data.

Qualitative Research

As noted, complexity theory's nonlinearity condition rules out linear modeling or cause-and-effect predictions. Thus, most complexity theory research is interpretive, employing

qualitative methods for results. This research adopts a two-phased approach. The study uses quantitative methods to detect hypothesized conditions and qualitative methods to explore their relationship to individuals.

Participant Selection and Preparation

Random selection was used to select interview participants for the study. To ensure a representative sample, SPSS randomly selected 40 submissions from the initial 415 respondents who volunteered. Participant selection for phase two aims to understand participants' relationship with the conditions, regardless of their presence.

Interview Execution

The semi-structured interviews were conducted via Zoom, each lasting approximately forty-five minutes. The goal was to gather comprehensive insights into the conditions for self-organization. To maintain structure while allowing flexibility, the researcher used a mix of open-ended and structured questions.

The initial segment focused on five open-ended questions exploring hypothesized conditions for self-organization: interdependence (trust and collaboration), independence (autonomy and efficacy), and goal-setting. These questions were designed to help participants reveal their organization's environment. For instance, the first question asked participants to describe their school's culture, followed by a question about whether the environment was collaborative, isolating, or both. The answer to this question would lead to another question, asking which area of the school aligns with the described culture and why. The remaining four questions followed a similar structure. While the interview flow was planned, it could deviate based on various factors. The key was that participants had the opportunity to share their views.

In the next section, the researcher explored the presence of hypothesized components for self-organizing teacher groups. Teachers were asked whether a component was present in their environment and instructed to provide a yes or no answer followed by context. This approach helped the interviewer determine the presence of conditions that may not have been evident based on the initial five questions.

Finally, the last section was guided by four questions from the survey. Participants offered contextualized responses using Likert-scale items, exploring their current understanding. The interviewer emphasized that participants were not bound by their previous survey responses, and follow-up questions were only asked when necessary for clarification or consistency.

Qualitative Data Analysis

Coding was completed for each transcription for theme discovery. A list of a priori codes was derived from literature. Initial codes from literature fostered a sense of purpose that allowed for theme discovery. Codes followed a simple pattern understood to align with a generic definition of hypothesized conditions. Emergent codes were extracted from the transcripts, while a priori codes were assigned. During a second coding session, new codes extracted from transcripts were assigned to existing transcripts. After the second coding session, codes were categorized in Microsoft Excel, defined with short descriptions, and linked to existing literature. Categories were then grouped further to develop themes. The themes that evolved from a combination of semi-structured interviews and existing literature facilitated the discussion and conclusion portion of this writing.

Ethical Considerations and Data Management

Throughout the study, ethical compliance was given high importance. Detailed information about the recording process, data storage, and their rights to access their data was

provided to the participants. Interviews were recorded, and to manage storage effectively, video files were removed, maintaining only the audio file. All data was securely kept in an encrypted local folder. The confidentiality of participants was prioritized by systematically eliminating identifiable information and assigning them unique identifiers. Upholding ethical research standards was key, and anonymization was crucial to this process.

Compensation and Data Security

After each interview, participants would receive a $15 Visa gift card electronically or by mail. Their preferences were recorded and securely managed. Information stored on Zoom was downloaded and processed offline for enhanced data security.

Chapter 5: Findings and Analysis

This study includes a diverse population of active teachers from various educational settings in Oklahoma, such as elementary, middle, and high schools, as well as those engaged in virtual or alternative educational institutions. This approach ensures comprehensive insights into different teaching contexts, from traditional classrooms to non-conventional formats, reflecting the evolving landscape of educational systems. By considering teachers from urban, suburban, and rural schools, the study seeks to understand the influence of geographical context on teacher isolation. This comprehensive approach recognizes that the location might significantly influence the feasibility and dynamics of self-organizing groups, capturing the unique challenges and opportunities across different community settings.

The study includes educators at all career stages, acknowledging the importance of the career phase in shaping teachers' experiences with isolation and their involvement in self-organizing groups. The study strives to capture the diverse impacts of teacher isolation and the role of self-organized groups across different career phases, from new teachers facing initial challenges to experienced veterans with over thirty years of experience.

The participants include teachers with various certifications, including emergency, alternative, and traditional pathways into teaching. This diversity allows for a detailed understanding of how different entry points into the profession might impact experiences of isolation and participation in self-organizing groups.

The study also acknowledges the importance of subject matter and school size in shaping teachers' experiences. The research explores how these factors might influence teachers' sense of isolation and involvement in self-organizing groups by including teachers who instruct in various

subjects, from core academic areas to specialized fields, and those working in large and small schools.

Through this expansive and inclusive approach, the study can provide a detailed exploration of the conditions under which self-organizing teacher groups can reduce isolation. These findings offer valuable insights that are relevant and empowering for educators, administrators, and policymakers committed to fostering collaborative and supportive educational environments across Oklahoma.

Demographics of Survey Participants

The participants in this study were reduced from an initial database of over 85,000 educators across Oklahoma to approximately 30,000 active teachers by removing duplicate emails, administrators, and positions not explicitly identified as teaching roles. The refined list was used to distribute a survey via Qualtrics for two consecutive weeks, resulting in 1,070 submissions. Submissions with missing or invalid demographic information were excluded from the study. Invalid data included misspelled or illegible entries for district or school names, grade levels, and subjects taught. The filtering process ensured the reliability and accuracy of all data analyzed.

The participants represented various districts, including urban, suburban, rural, and virtual schools. Six hundred sixty-three participants represented 216 districts, lending to significant diversity. The response rate per district ranged from 0.7% to 2%.

Table 7

Participants Per Oklahoma District (Top 7)

	Classification	Total Count	Participation
A	Urban	71	.7% - 2%
B	Urban	40	.7% - 2%
C	Suburban	23	.7% - 2%
D	Virtual	21	.7% - 2%
E	Suburban	20	.7% - 2%
F	Rural	20	.7% - 2%
G	Rural	20	.7% - 2%

Table 8

School Classification Rates

Classification	District Totals	Rate	Sub. by Class.	Rate
Urban	4	1.8%	116	17.5%
Suburban	32	14.7%	226	34.1%
Rural	179	82.5%	298	44.9%
Virtual	2	.9%	23	3.5%

Table 8 lists the classification totals for school districts. Rural districts represented the most prominent grouping, surpassing the next classification (suburban) by more than 68%. While rural districts represented the most significant number of participants, the margin between the next group had been significantly diminished (10%). The study shows that while rural districts had the most participating districts, more teachers from suburban and urban districts submitted surveys. Most districts contained only one survey submission, but there were between 5 and 70 submissions in a few urban and suburban districts.

Participants included elementary, middle, high school, and virtual teachers. The distribution indicated a significant representation of elementary and high school participants. These teachers covered a range of subjects, with the largest group comprising elementary school teachers who taught all subjects, followed by significant numbers of English, mathematics, and special education teachers.

Table 9

Grade Level Distribution

Education Level	**Number of Teachers**	**Rate**
Elementary	240	36.4%
Middle	134	20.3%
High School	259	39.2%
Virtual	27	4.1%

The distribution across elementary, middle, and secondary schools is relatively even. Given the nature of teaching different age groups, components of the learning environment could vary significantly (e.g., curriculum, collaboration, efficacy, methods, etc.). Surveying these diverse groups helped the author investigate the hypothesized conditions for self-organizing teacher groups.

Table 10

Subjects Taught (Top 7)

Subjects Taught	Teacher Count	Participation Rate
All - Elementary	107	16.1%
English	70	10.5%
Math	69	10.4%
SPED	61	9.2%
Science	56	8.4%
Social Studies	35	5.3%
Band/Performing Arts	20	3%
English Language Learners	20	3%

During their interviews, teachers expressed that educators within core subjects collaborated in various ways, and specific subjects were viewed more favorably than others. Teachers spoke of competition within subjects of a single school. Accounting for and

understanding competition and pride is crucial when examining the survey and interview data. Furthermore, inherent biases were observed at various tenure levels and district locations. The survey captured grade levels and subject matter. This information revealed insights into the workings of school culture and its drive to improve continually.

Demographics of Interview Participants

Many educators expressed their willingness to participate in further qualitative inquiry. Of the 1,071 survey respondents, 362 educators indicated their availability for in-depth interviews via Zoom. However, logistical constraints and scheduling conflicts resulted in only 18 interviews being completed. The group consisted of 15 females and three males.

These educators were actively engaged in their practice and represented a diverse range of educational settings across Oklahoma, including urban (5), suburban (7), rural (5), and virtual (1) districts. This distribution highlights the geographical and modal diversity within the state's educational landscape. The participants taught at different levels, including high schools (5), elementary schools (7), middle schools (4), and one alternative school. The lone virtual teacher taught students from 2nd to 12th grade, further adding to the study's comprehensive demographic scope.

The participants had a range of teaching experience, with 3 educators having less than 5 years of experience, 3 educators having 6 to 10 years of experience, and 12 educators having more than 11 years of experience. This range of experience provides diverse perspectives on the challenges and rewards of teaching at different career stages. The variability in teacher tenure also suggests that the participants have varying degrees of institutional familiarity and commitment, which could influence their views on educational reforms and practices.

Scheduling interviews proved challenging due to the educators' limited availability, who often opted for sessions during their planning periods, after school, or before work. Despite initial reservations, the participants provided candid answers and offered reflective insights as they became more comfortable with the interview process. This gradual deepening of dialogue suggests a growing comfort and understanding of the study's aims, contributing valuable qualitative data to the overarching research objectives.

Quantitative Results

As mentioned, classical sciences are Newtonian, utilizing a cause-and-effect methodology, reducing systems to their essential components. Composed of inputs and outputs, a linear model produces outputs proportional to its inputs (Gershenson & Heylighen, 2005). Complex systems do not utilize this process but instead follow a core component of nonlinearity. Complex systems are dynamic and can rarely be explained by inputs or cause-and-effect relationships (Plowman et al., 2007). The following analysis of quantitative data is meant to spur further investigation based on quantitative data. Each dataset observation does not suggest a cause but calls for more context. All observations that are not mentioned will be discussed and analyzed through interviews with survey participants.

Six combined questions in the survey evaluated participants' organizing opportunities. These six questions combined to form a variable called 'organization.' The organization variable was compared to average total—composite variable for self-organization—for interdependence, independence, and goal-setting. Each organization question was specifically designed to address the components of self-organization. Most questions ended with, '… without school leadership.' See tables 2 and 3 and appendix 1A for survey questions.

Comparing the organization and self-organization variables resulted in an interesting observation: high values of the organizational variable did not always correlate with the highest values of the self-organization, but high levels of organization did produce interesting results for components of self-organization. The inconsistencies between organization and self-organization suggest that a participant's ability to fulfill components of self-organization without school leadership may not align with what is currently present within their school environment.

Table 11

Maximum Levels of Teacher Organization

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
13	18	8	13.5	12	15	12	5	25	12.83
14	18	10	14	13	15	13	3	25	13.67
14	18	10	12.5	13	12	13	3	25	13.17
13.5	19	8	14.5	15	14	15	9	25	14.33
14	18	10	12.5	11	14	11	3	25	12.50
15	20	10	13.5	13	14	15	5	25	14.50
13.5	18	9	13	12	14	13	10	25	13.17
14.5	19	10	13.5	13	14	14	4	25	14.00
15	20	10	14	14	14	15	3	25	14.67
15	20	10	15	15	15	11	4	25	13.67
15	20	10	15	15	15	14	4	25	14.67
13	18	8	14	13	15	14	5	25	13.67
14	18	10	13.5	12	15	7	4	25	11.50
14	18	10	10	5	15	15	5	25	13.00
15	20	10	15	15	15	15	3	25	15.00
14.5	19	10	14	13	15	15	6	25	14.50
13.5	17	10	12.5	10	15	14	4	25	13.33
15	20	10	14	13	15	15	7	25	14.67
14	18	10	12	11	13	11	4	25	12.33
14.5	20	9	15	15	15	13	10	25	14.17

Bottom Results

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
9	12	6	7.5	5	10	8	12	14	8.17
11	13	9	10.5	10	11	6	13	14	9.17
8.5	8	9	10.5	9	12	5	10	14	8.00
8.5	9	8	13	11	15	11	15	14	10.83
10.5	13	8	10.5	9	12	6	12	14	9.00
11	17	5	10	11	9	10	11	14	10.33
7	6	8	12	11	13	6	10	14	8.33
11.5	15	8	11	9	13	11	12	13	11.17
12	18	6	9.5	9	10	9	12	13	10.17
10.5	14	7	10.5	8	13	8	10	13	9.67
11.5	15	8	9	9	9	8	12	12	9.50
7	10	4	7	4	10	7	14	12	7.00
8	10	6	9	9	9	6	13	12	7.67
10.5	15	6	11.5	10	13	12	12	11	11.33
8	14	2	10	8	12	8	12	11	8.67
8	10	6	10	8	12	5	14	10	7.67
8	14	2	8	5	11	5	14	10	7.00
7.5	12	3	12	14	10	6	15	9	8.50
7	10	4	15	15	15	9	14	9	10.33
8.5	13	4	5.5	7	4	3	15	6	5.67

Comparing isolation in Table 12 to the hypothesized components of self-organization highlights a few interesting observations. For example, participants with high isolation levels showed lower levels of trust and goal-setting and higher levels of efficacy and autonomy. An assumption could be that when people do not trust, they may not organize. When people do not organize, they may feel isolated or disconnected. Teachers who do not trust may resort to fulfilling their obligations within the confines of their classroom, separating from their peers, and relying on their own expertise or professional development. For most educators, goal-setting may feel district set; if individuals do not organize, goal-setting may suffer. This observation is recognized by the elevated results of efficacy and autonomy when isolation is reported as high.

Table 12

Maximum Levels of Teacher Isolation

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
8.5	15	2	10.5	14	7	11	15	16	10.00
10.5	15	6	13	11	15	11	15	19	11.50
8.5	9	8	13	11	15	11	15	14	10.83
8.5	13	4	5.5	7	4	3	15	6	5.67
7.5	12	3	12	14	10	6	15	9	8.50
11.5	17	6	11.5	13	10	12	15	18	11.67
7	10	4	15	15	15	9	14	9	10.33
7	10	4	7	4	10	7	14	12	7.00
13	18	8	14	14	14	12	14	23	13.00
12	18	6	10.5	9	12	9	14	20	10.50
12	15	9	12.5	12	13	9	14	18	11.17
10.5	12	9	12	11	13	5	14	15	9.17
7.5	7	8	15	15	15	8	14	19	10.17
9	12	6	12.5	12	13	9	14	16	10.17
12	16	8	13	13	13	8	14	22	11.00
8	14	2	8	5	11	5	14	10	7.00
8	10	6	10	8	12	5	14	10	7.67
11.5	15	8	14.5	14	15	7	14	16	11.00
13	16	10	11.5	10	13	11	13	22	11.83
9.5	13	6	11.5	11	12	7	13	16	9.33
9	12	6	11	9	13	3	13	20	7.67
11	13	9	10.5	10	11	6	13	14	9.17
14	19	9	15	15	15	15	13	24	14.67

Bottom Results

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
13.5	18	9	12	10	14	6	3	24	10.50
14.5	19	10	14.5	14	15	15	3	25	14.67
11.5	13	10	10	11	9	10	3	21	10.50
13.5	17	10	13.5	13	14	13	3	21	13.33
14.5	19	10	15	15	15	14	3	25	14.50
13.5	18	9	14.5	14	15	15	3	23	14.33
15	20	10	14	14	14	15	3	25	14.67
13.5	18	9	11.5	10	13	15	3	24	13.33
14.5	20	9	15	15	15	15	3	25	14.83
13	16	10	13	11	15	12	3	20	12.67
15	20	10	14.5	14	15	14	3	25	14.50
13	16	10	9	4	14	14	3	17	12.00
15	20	10	15	15	15	12	3	24	14.00
13.5	17	10	15	15	15	11	3	24	13.17
14.5	19	10	13.5	14	13	14	3	23	14.00
14	18	10	13	12	14	13	3	21	13.33
10.5	14	7	11.5	9	14	13	3	22	11.67
13	17	9	12	11	13	12	3	20	12.33
15	20	10	15	15	15	8	3	25	12.67
14	18	10	15	15	15	9	3	25	12.67
11	13	9	11.5	12	11	13	3	20	11.83
15	20	10	14.5	14	15	15	3	25	14.83
14.5	19	10	13	13	13	13	3	25	13.50
13.5	17	10	13	12	14	13	3	22	13.17

The data suggests that isolated individuals (see Table 12) pursue and develop their growth away from mandated or self-organized opportunities. It also suggests that higher isolation levels result in lower levels of collaboration and trust, leading to lower levels of interdependence. At the same time, increased efficacy and autonomy suggest higher levels of independence.

The lowest levels of isolation do not show high levels of self-organization or organization. An interpretation could be that teachers collaborate when they trust their peers and when they offer or need knowledge. Individuals who show the highest levels of each component, resulting in maximum levels of self-organization, do not show the lowest levels of isolation. Understanding the delicate balance of each component is important for this study. Interviewing participants will evaluate further interpretations of this data.

When reviewing high levels for hypothesized conditions, a few observations stood out. For participants with the highest reported levels of independence (see Table 13), goal-setting was the most dispersed, resulting in moderate to low levels of reported goal-setting. Only a few participants reported maximum goal-setting. Interdependence was sporadic, with only a handful of participants reporting complete interdependence. As independence decreased, some participants expressed increased levels of interdependence. This result seems logical, as maximum independence would lead to decreased interdependence, but further investigation must be conducted.

Maximum interdependence in Table 14 resulted in the lowest feelings of isolation with moderate levels of efficacy and autonomy. Interdependence at the highest levels resulted in data showing higher levels of organization but not necessarily self-organization. The results may be due to participants associating collaboration or the questions representing the organization variable related to administratively led collaboration, resulting in combining positive collaboration when administrators are absent. Additionally, participants expressed increased feelings of independence and isolation at lower levels of interdependence. The top thirty-eight participants expressed full interdependence—collaboration and trust—but the next twenty showed slightly less trust and higher levels of isolation (see Table 15). Further investigation will shed light on the relationship between high levels of interdependence and organization data.

Finally, goal-setting may be closely linked to interdependence. Data observations in Table16 suggest that participants expressing the highest levels of goal-setting also feel higher levels of interdependence. This result does not mean that independence is low, but higher levels of goal-setting could be attributed to district- or site-level goals rather than individual goals. Further investigation will be conducted through the interview process.

Table 13

Maximum Levels of Teacher Independence

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
14	19	9	15	15	15	13	3	23	14.00
14	18	10	15	15	15	9	3	25	12.67
14.5	19	10	15	15	15	14	3	25	14.50
15	20	10	15	15	15	13	3	23	14.33
15	20	10	15	15	15	15	6	25	15.00
15	20	10	15	15	15	14	4	25	14.67
7	10	4	15	15	15	9	14	9	10.33
14.5	20	9	15	15	15	12	6	23	13.83
13	18	8	15	15	15	13	6	22	13.67
15	20	10	15	15	15	11	4	25	13.67
13	19	7	15	15	15	14	13	24	14.00
15	20	10	15	15	15	15	3	24	15.00
13.5	17	10	15	15	15	13	7	25	13.83
15	20	10	15	15	15	15	3	25	15.00
14	18	10	15	15	15	14	3	25	14.33
14.5	20	9	15	15	15	14	3	25	14.50
13.5	17	10	15	15	15	11	3	24	13.17
13.5	19	8	15	15	15	12	5	22	13.50
15	20	10	15	15	15	8	3	25	12.67
14.5	20	9	15	15	15	10	4	25	13.17
15	20	10	15	15	15	14	7	25	14.67

Table 14

Maximum Levels of Teacher Interdependence

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
15	20	10	15	15	15	15	3	25	15.00
15	20	10	11.5	11	12	14	6	24	13.50
15	20	10	14.5	14	15	15	3	25	14.83
15	20	10	15	15	15	15	3	24	15.00
15	20	10	13	11	15	9	3	24	12.33
15	20	10	13	12	14	13	7	25	13.67
15	20	10	15	15	15	14	7	25	14.67
15	20	10	15	15	15	15	3	25	15.00
15	20	10	12.5	12	13	15	3	22	14.17
15	20	10	15	15	15	15	6	25	15.00
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	13	3	23	14.33
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	13	3	23	14.33
15	20	10	15	15	15	15	3	25	15.00
15	20	10	13.5	13	14	13	9	23	13.83
15	20	10	13.5	12	15	15	3	25	14.50
15	20	10	14	13	15	14	4	19	14.33
15	20	10	11.5	13	10	9	9	24	11.83
15	20	10	14	14	14	15	3	25	14.67
15	20	10	13.5	13	14	15	5	25	14.50
15	20	10	12	9	15	14	7	25	13.67

Table 15

Lower Levels of Teacher Interdependence

14.5	19	10	13.5	14	13	14	3	23	14.00
14.5	19	10	13	12	14	15	3	24	14.17
14.5	20	9	13.5	13	14	14	5	24	14.00
14.5	20	9	15	15	15	12	6	23	13.83
14.5	19	10	12	9	15	13	4	24	13.17
14.5	19	10	13	14	12	13	5	25	13.50
14.5	19	10	13	12	14	11	3	25	12.83
14.5	20	9	15	15	15	13	10	25	14.17
14.5	19	10	13.5	13	14	14	4	25	14.00
14.5	19	10	13.5	12	15	15	3	25	14.33
14.5	19	10	11.5	10	13	13	9	24	13.00
14.5	19	10	14.5	14	15	12	4	23	13.67
14.5	19	10	14	14	14	12	9	25	13.50
14.5	19	10	13	12	14	14	4	24	13.83
14.5	19	10	14	14	14	15	10	25	14.50
14.5	19	10	14	13	15	14	4	24	14.17
14.5	19	10	13.5	15	12	15	3	24	14.33
14.5	20	9	15	15	15	7	7	25	12.17
14.5	20	9	12.5	11	14	15	3	24	14.00
14.5	19	10	14	13	15	11	7	24	13.17
14.5	19	10	13	13	13	13	5	22	13.50

Table 16

Maximum Levels of Teacher Goal-Setting

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
14	19	9	13	13	13	15	4	24	14.00
14.5	19	10	14.5	14	15	15	3	25	14.67
14.5	19	10	13.5	12	15	15	3	25	14.33
15	20	10	15	15	15	15	6	25	15.00
15	20	10	15	15	15	15	3	25	15.00
14	19	9	13.5	12	15	15	4	24	14.17
15	20	10	15	15	15	15	3	25	15.00
13.5	17	10	12.5	10	15	15	5	22	13.67
14	19	9	15	15	15	15	13	24	14.67
14	19	9	13	13	13	15	10	24	14.00
15	20	10	14	13	15	15	7	25	14.67
14	18	10	13.5	13	14	15	4	16	14.17
13.5	17	10	14.5	14	15	15	4	23	14.33
15	20	10	15	15	15	15	3	25	15.00
15	20	10	12.5	12	13	15	3	22	14.17
14	19	9	10.5	7	14	15	10	24	13.17
13	17	9	13	14	12	15	9	24	13.67
14	20	8	13.5	12	15	15	4	25	14.17
15	20	10	14.5	15	14	15	4	24	14.83
13.5	19	8	12	12	12	15	4	24	13.50

Separating component variables resulted in some interesting observations (see Table 18). For example, maximizing trust did result in the lowest levels of isolation. The results were moderately weighted towards lower isolation. This could mean that even when trust is present, other factors could lead to feelings of isolation (i.e., workplace conditions). Another example is that goal-setting and isolation fluctuate when collaboration is at its highest (see Table 17). One interpretation that should be investigated is that high levels of collaboration do not equate to less isolation or goal-setting. This could be due to the type of collaboration offered at the school. The survey did not distinguish between types of collaboration. Understanding the types of collaboration experienced by participants is essential and will be pursued during the interviews.

Another example is that higher levels of autonomy show moderate isolation levels and lower levels of goal-setting (see Table 19). This could be due to higher levels of autonomy

equating to less collaboration. Many districts in the study were small and only contained a limited number of teachers. With a limited number of teachers, teachers are often isolated by the subjects they teach, leading to less collaboration and goal-setting. Finally, one of the more interesting observations is when participants express high levels of efficacy (see Table 20). At the highest levels of efficacy, data suggests lower trust, collaboration, and goal-setting. Higher levels of efficacy also show moderate to low levels of isolation. Each one of these component observations must be investigated further during the qualitative phase of this study.

Table 17

Maximum Levels of Teacher Collaboration

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
14.5	20	9	15	15	15	13	10	25	14.17
15	20	10	14.5	14	15	15	3	25	14.83
15	20	10	13.5	13	14	13	9	23	13.83
14.5	20	9	10.5	7	14	14	4	19	13.00
15	20	10	14	13	15	14	4	19	14.33
15	20	10	15	15	15	15	3	25	15.00
15	20	10	14	13	15	14	3	24	14.33
14.5	20	9	15	15	15	7	7	25	12.17
15	20	10	15	15	15	12	3	24	14.00
14.5	20	9	12.5	10	15	11	4	24	12.67
12.5	20	5	10	7	13	13	9	22	11.83
15	20	10	15	15	15	15	3	24	15.00
15	20	10	13.5	12	15	15	3	25	14.50
14.5	20	9	15	15	15	12	6	23	13.83
15	20	10	14	13	15	15	4	25	14.67
14	20	8	12.5	13	12	9	10	23	11.83
15	20	10	15	15	15	14	4	25	14.67
15	20	10	15	15	15	15	6	25	15.00
15	20	10	15	15	15	13	3	23	14.33
15	20	10	11	11	11	11	8	23	12.33

Table 18

Maximum Levels of Teacher Trust

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
13.5	17	10	11.5	10	13	13	11	23	12.67
15	20	10	14	14	14	15	3	25	14.67
14.5	19	10	12.5	11	14	14	3	24	13.67
15	20	10	15	15	15	14	7	25	14.67
14.5	19	10	14	13	15	15	6	25	14.50
13.5	17	10	13.5	13	14	13	3	21	13.33
12.5	15	10	13.5	12	15	13	3	15	13.00
15	20	10	14.5	15	14	15	4	24	14.83
15	20	10	12	9	15	14	7	25	13.67
14	18	10	13	12	14	13	3	21	13.33
14.5	19	10	12.5	11	14	15	6	25	14.00
14	18	10	13.5	12	15	8	5	25	11.83
14	18	10	12.5	13	12	14	6	24	13.50
14	18	10	12	11	13	11	4	25	12.33
15	20	10	14	13	15	15	4	25	14.67
14.5	19	10	14	14	14	15	10	25	14.50
15	20	10	15	15	15	14	4	25	14.67
12.5	15	10	11.5	9	14	12	4	23	12.00
14.5	19	10	13.5	13	14	14	4	25	14.00
14	18	10	13	12	14	13	6	23	13.33

Table 19

Maximum Levels of Teacher Autonomy

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
10.5	17	4	15	15	15	11	12	23	12.17
14	19	9	14.5	15	14	10	5	22	12.83
15	20	10	15	15	15	8	3	25	12.67
14.5	19	10	14.5	15	14	13	3	24	14.00
7.5	7	8	15	15	15	8	14	19	10.17
14	19	9	15	15	15	14	4	25	14.33
13	17	9	14	15	13	13	7	24	13.33
14.5	19	10	14	15	13	14	10	23	14.17
15	20	10	15	15	15	15	6	25	15.00
14.5	20	9	15	15	15	7	7	25	12.17
13	17	9	14	15	13	13	12	24	13.33
13.5	17	10	15	15	15	11	3	24	13.17
14.5	20	9	15	15	15	14	3	25	14.50
15	20	10	15	15	15	15	3	25	15.00
14	18	10	15	15	15	9	3	25	12.67
15	20	10	15	15	15	15	3	25	15.00
15	20	10	14.5	15	14	15	6	25	14.83
13.5	17	10	12.5	15	10	9	7	21	11.67
15	20	10	14.5	15	14	15	4	24	14.83
12.5	16	9	14.5	15	14	10	8	23	12.33

Table 20

Maximum Levels of Teacher Efficacy

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
14.5	19	10	14	13	15	15	6	25	14.50
14.5	19	10	14	13	15	10	10	22	12.83
13.5	17	10	12.5	10	15	15	5	22	13.67
7	10	4	15	15	15	9	14	9	10.33
13	18	8	14	13	15	14	7	23	13.67
13	17	9	11	7	15	12	8	25	12.00
8	13	3	14	13	15	10	12	20	10.67
15	20	10	15	15	15	15	3	25	15.00
10.5	17	4	15	15	15	11	12	23	12.17
13.5	18	9	13	11	15	12	3	22	12.83
13.5	18	9	13.5	12	15	11	3	21	12.67
13.5	18	9	12.5	10	15	14	8	19	13.33
13	18	8	12	9	15	13	6	19	12.67
14	19	9	14.5	14	15	14	4	25	14.17
13.5	18	9	12.5	10	15	14	4	24	13.33
11.5	14	9	13.5	12	15	13	8	23	12.67
13.5	19	8	15	15	15	12	5	22	13.50
11	18	4	14.5	14	15	12	13	18	12.50
13	18	8	13	11	15	13	9	21	13.00
12	15	9	14.5	14	15	12	8	24	12.83

Two hundred sixteen districts participated in the study. Most districts had one or two teachers, while the remaining had three or more. To gain insight into the teachers' submissions and the school's culture, the data was combined and averaged by district. Districts represented by one or two teachers were excluded, leaving only districts with three or more teachers. As a result, 216 districts were initially included, but 162 were removed, leaving 54 districts with three or more teachers.

The data indicates that districts with lower isolation levels tend to have higher levels of self-organization (refer to Table 21). As isolation levels increase, self-organization decreases. Combining and averaging teacher survey submissions by district provides more precise insights into how conditions influence the formation of self-organizing teacher groups and isolation levels. Analysis of individual teacher observations reveals that moderate levels of each

component lead to moderate levels of self-organization and isolation. However, when combined, the results present a more accurate view of the role of conditions against isolation. Further investigation will be carried out during individual interviews by asking teachers how they interpret the conditions for self-organization.

Table 21

Lower Levels of District Isolation

Interdepedence	Collaboration	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
14.50	19.00	10.00	13.83	14.33	13.33	13.33	3.67	23.67	13.89
13.17	16.67	9.67	12.83	12.67	13.00	13.67	4.33	23.00	13.22
13.17	18.00	8.33	13.67	13.00	14.33	11.67	4.33	23.00	12.83
13.33	17.00	9.67	13.50	13.33	13.67	11.33	4.33	21.67	12.72
13.00	17.50	8.50	12.13	11.75	12.50	12.00	4.75	20.75	12.38
13.56	17.56	9.56	12.39	11.33	13.44	11.78	5.22	22.11	12.57
13.33	18.00	8.67	12.67	13.00	12.33	13.67	5.33	22.33	13.22
12.83	16.00	9.67	12.33	12.00	12.67	12.00	5.33	19.33	12.39
13.05	17.00	9.11	11.92	11.00	12.84	11.68	5.53	21.84	12.22
13.67	18.33	9.00	12.67	11.33	14.00	11.67	5.67	24.00	12.67
12.67	16.83	8.50	11.17	10.67	11.67	13.33	5.67	21.83	12.39
13.07	17.29	8.86	12.29	11.57	13.00	12.00	5.71	21.29	12.45
13.33	17.65	9.00	12.30	11.30	13.30	12.35	5.75	21.85	12.66
13.14	17.86	8.43	12.86	11.14	14.57	13.57	5.86	22.86	13.19
13.50	18.00	9.00	13.17	13.67	12.67	13.33	6.00	22.67	13.33
13.25	17.17	9.33	12.58	11.83	13.33	11.50	6.33	22.33	12.44
13.17	18.33	8.00	12.33	11.67	13.00	11.33	6.33	23.67	12.28
13.39	17.74	9.04	12.07	11.13	13.00	12.09	6.43	22.26	12.51
13.38	17.48	9.29	12.81	12.24	13.38	11.43	6.48	21.48	12.54
12.25	15.67	8.83	11.92	10.67	13.17	11.67	6.50	20.67	11.94
13.00	17.00	9.00	13.83	14.00	13.67	13.00	6.67	22.00	13.28
13.67	18.00	9.33	12.17	10.67	13.67	13.00	6.67	23.00	12.94
12.50	17.33	7.67	12.83	12.00	13.67	12.33	6.67	21.33	12.56
13.64	18.43	8.86	12.29	10.71	13.86	13.00	6.71	22.29	12.98
12.70	16.89	8.51	11.63	10.37	12.89	11.75	7.06	21.04	12.02
12.92	17.42	8.42	12.58	12.08	13.08	12.17	7.08	21.75	12.56
12.64	16.91	8.36	12.91	12.55	13.27	11.55	7.09	22.45	12.36
12.43	16.29	8.57	11.93	11.00	12.86	12.14	7.14	22.86	12.17
12.56	16.44	8.67	13.33	13.22	13.44	10.00	7.22	21.33	11.96
12.69	16.50	8.88	12.16	12.00	12.31	11.50	7.38	21.44	12.11
12.50	16.90	8.10	11.38	10.33	12.43	11.13	7.48	20.68	11.67
12.83	17.00	8.67	12.50	11.83	13.17	12.33	7.50	20.67	12.56
11.67	16.00	7.33	12.83	13.67	12.00	10.67	7.67	18.33	11.72
13.31	17.63	9.00	12.50	12.06	12.94	11.56	7.69	22.00	12.46
12.70	17.00	8.40	11.40	10.60	12.20	11.00	7.70	22.50	11.70
13.40	18.40	8.40	12.20	11.40	13.00	11.80	7.80	23.00	12.47
12.80	17.20	8.40	12.20	11.80	12.60	11.80	7.80	23.20	12.27
13.00	17.67	8.33	10.67	8.00	13.33	11.67	8.00	21.00	11.78
11.67	16.00	7.33	11.00	9.00	13.00	12.33	8.00	21.00	11.67
13.00	17.33	8.67	12.67	12.00	13.33	11.67	8.33	21.00	12.44
11.67	16.67	6.67	12.67	11.67	13.67	12.00	8.33	19.67	12.11
12.00	15.67	8.33	12.83	13.00	12.67	11.33	8.33	20.67	12.06
11.67	15.33	8.00	12.17	10.00	14.33	11.00	8.33	19.67	11.61
11.17	14.83	7.50	12.50	12.33	12.67	10.50	8.67	18.83	11.39
13.75	18.75	8.75	10.38	7.25	13.50	10.50	8.75	21.50	11.54
10.33	12.67	8.00	12.00	9.67	14.33	12.33	9.00	20.00	11.56
11.83	15.00	8.67	10.67	9.33	12.00	8.67	9.00	18.67	10.39
11.63	15.60	7.65	12.00	11.40	12.60	9.75	9.10	20.35	11.13
13.08	17.67	8.50	12.50	13.17	11.83	12.00	9.50	21.67	12.53
11.50	15.67	7.33	12.00	11.67	12.33	12.00	9.67	20.33	11.83
11.50	16.67	6.33	11.50	10.00	13.00	9.67	10.00	18.00	10.89
11.67	14.67	8.67	12.67	12.67	12.67	11.00	10.33	19.33	11.78
13.17	18.00	8.33	12.50	12.00	13.00	8.00	11.00	21.67	11.22
10.00	13.33	6.67	12.50	11.33	13.67	10.67	11.00	19.67	11.06

The study's mixed-methods approach utilizes an explanatory sequential design. This design is as follows: quantitative data is collected and analyzed, followed by qualitative data collection and analysis, and then interpretation. This design determines what quantitative results need further explanation. This study's observations gleaned from the survey data are meant to guide the interview process. The interview questions were meticulously crafted to understand how components interact with other components, how components build conditions, and how conditions support the opportunity for teachers to self-organize. Because this study uses the lens of complexity theory, and due to the nature of non-linearity, quantitative observation does not suggest causality. Simply put, the data is being utilized to develop better tools for qualitative investigations.

Qualitative Results

Interdependence

Collaboration

Collaboration is an essential topic for educators. It is important to understand that collaboration and the act of collaborating are interpreted differently depending on many factors: experience (age and tenure), workload, district location, and more. Each interview offered insight into how teachers collaborate, their interpretation of collaboration, the pros and cons of collaboration, and where they hope collaboration will lead.

This study has covered many forms of collaboration: mentoring, PLCs, coaching, and contrived. Each holds a special place within an educational organization. Due to factors such as the structure of the school, class schedules, school events, contractual obligations, and more, workplace conditions can cause isolation even when collaboration is a school focus. Workplace conditions may cause feelings of isolation, a significant barrier to overcoming. Mandating

collaboration time may bring people together but may fall short of creating the collaborative culture leadership hopes to achieve. Leaders must understand the types of collaboration educators need to accomplish their goals, the time needed to collaborate for their goals, and the adjustments that must be made when active collaboration is not working.

There were approximately four survey questions focusing on collaboration, each referencing collaboration. Due to the semi-structured interview approach, the questions elicited various responses. Interview questions for collaboration were 1, 2, 5, 6B, and Q15 (see Appendix 1B).

Collaboration questions one and two asked about the nature of the school environment. The interviewer wanted to know if teachers had opportunities to collaborate with their peers without leadership present. There may be benefits for people to meet without leadership. This question did not ask if a group of teachers self-organized, which is asked later in the interview.

Teacher responses were interesting, adding context to survey results and leading to further inquiry. Most interviewees spoke about ample opportunities to meet with their peers. Many districts enacted PLCs, team meetings, vertical and horizontal teams, and more. Most collaborative events had purpose and direction. Many teachers felt confident that their administration supported the events and wanted them to be successful through collaboration. For example, one teacher said that they felt that leadership truly cared about what goes on in their classroom. They spoke about their regular PLC meetings, which were used to discuss common student issues. They said the administration was present and active in the conversations. Additional participants said staff meetings were crucial for leadership to share information with the school. Also, the administration used this time to answer questions regarding changes, issues, and school events. Finally, question one opened critical dialogue around the most opportune

times for teachers to meet with their peers. Teachers mentioned hallways, classrooms, recess, lunchtime, and before school as the best times to meet. While time was typically short, the impromptu conversations carried more weight than mandated times associated with school collaboration. One teacher said they were 'early birds' and loved getting to school early. The mornings gave them time to finish work and meet with friends across the school. When I asked them for more explanation, they said, "During the day, I mainly meet with my team (subject or grade-level teachers). Getting there early gave me time to talk to people I've worked with forever." In other words, teachers are collaborating but not regularly collaborating the way they want with whom they want. To combat incorrect collaboration, teachers find ways to have their needs met.

The third collaboration question asked if participants had opportunities to meet with their peers outside mandated events. The responses were mixed. Many teachers said, "Yes," and when I asked for some examples, the teachers would mention talking in the hallways, lunchroom, and in passing when time was sparse. These passing moments were the non-mandated collaboration moments the researcher had expected. A few said they would meet before school regularly.

Further examination determined that a few teachers had discovered their friends were also 'early birds' and they liked to hang out before the day began. They would, "...get coffee and just talk.", according to a teacher who taught high school. A few teachers said they did not have time to meet with people separate from the numerous collaboration times dictated by the schools. Others said they had tried to meet their peers for drinks or dinner, but it never lasted. A few spoke about a group of friends they regularly hung out with. When asked for more information, they said, "I don't know, we go out to eat sometimes on Fridays, have some drinks. There is a place super close to the school we meet at. Sometimes people invite their families, but mostly it

is just us teachers." I followed up by asking about their 'typical' conversation. They said, "We try to talk about anything but work, but it never happens. We are teachers, and we end up talking about everything related to education." When asked if anything good comes from these get-togethers, they said, "Yes, we just get to know each other a little better. I trust them. I think I trust them more when you know more about them, you know?" A few other teachers talked about cliques that were formed within the school. Interestingly, the teachers I spoke with talked of cliques they were not a part of and rarely spoke about close groups they have joined or left since being in a school.

Another question asked participants whether a self-organizing component was present in their environment. The interviewer would say the name of a component, and the participant was asked to say yes or no to its existence and then add context. When asked about collaboration, participants overwhelmingly said yes. The context for their answer revolved around the number of collaborative opportunities available to them (e.g., PLCs, team meetings, dept. meetings, staff meetings, etc.).

Finally, four questions were pulled from the survey and asked during the interview. The teachers were told to answer with Likert responses and add context. They were informed beforehand that they did not have to remember how they responded to the survey and were encouraged to respond based on their current beliefs. The question was, "When collaborating without school leadership, teachers I meet feel they can develop and implement the outcomes of that collaborative event." Most participants answered with somewhat agree to agree strongly. Their context fits a previous question, sharing that most collaborative events focused on student achievement and that they feel most teachers set goals for their students' success.

Survey data showed that individuals with higher isolation levels experience lower levels of collaboration and trust. Interviews did not fully support the survey data observation. When participants were asked if they felt isolated, many teachers answered yes or occasionally, even if their school offered collaboration opportunities. Further questioning revealed that they rarely experienced or participated in meaningful conversations outside their subject-matter team or with people in their hallway. They felt separated from others, occasionally seeing teachers during staff meetings. Some stated that meaningful relationships were rare, and they typically corresponded with people from other schools. One cause for investigation was understanding the high levels of collaboration and its relationship to isolation. The interviews revealed misconceptions about collaboration and isolation. Participants associated isolation with no personal contact and collaboration with any personal contact. Participants said they rarely have time for meaningful information exchange and found little to no benefit from 'most' collaborative events. For example, a teacher said, "I go because I have to go. When I'm done, I'm out. Most people leave or just do their own thing." Another said, "It's good, but I don't really see the point. I know what I'm doing in the classroom, and people let me teach what I want, how I want. I believe most people are good at their job," and another said, "I just don't connect to them [teachers] because I've been here a long time." Opposing statements were also expressed. Other teachers said they did not connect with long-term teachers because they do what they want. They said, "I never felt like part of their group. It's like they didn't want me around." These statements highlight sentiments such as collaboration exists but not collaborating, or that they are not isolated but never connect. Asking teachers how they feel can help leaders craft an environment conducive to collaboration, but it may not be easy. A more appropriate approach may combine multiple methodologies, collaborative opportunities, and a push for independent thought.

Trust

Apart from questions associated with trust, "trust" was cited as influencing actions taken or not taken in the school. Examples of actions include participating in collaborative events, curriculum development, and after-hours hangouts. According to interview participants, they want to trust the other person before connecting with them.

The interview included a question about trust, intended to initiate a conversation about whether trust was present in the school. The interview aimed to understand how other factors influence trust and encourage discussion about trust in relation to collaboration and isolation. Interview questions for trust were 6A (see Appendix 1B).

The researcher wanted to know more about the relationship between trust and isolation. Survey data showed that participants with higher isolation levels showed lower levels of trust and goal-setting. Still, higher levels of isolation and lower levels of trust did not equate to lower levels of collaboration. When participants expressed concern about isolation, many said they had little time to meet. This reply was often counterintuitive to their district- or school-wide collaboration statements.

Further investigation revealed that individuals with higher isolation levels and many collaborative opportunities frequently interpreted those events as meaningless. In other words, current collaboration opportunities did not fulfill their needs. Participants who saw little value in current offerings often lacked substantial bonds between their peers. The lack of meaningful relationships with co-workers affected their educational lens, associating any issues between peers with the larger group.

Another interesting observation of isolation and trust was generational. I began to call it the generational gap because many participants described the inability to connect with co-

workers from different generations. The age gap was typically large. Individuals with many years of experience looked negatively upon teachers who lacked an educational degree or were alternatively certified. Also, older teachers were not as receptive to new ways of teaching, siloing new teachers with new ideas. This hindered mentoring opportunities. New teachers (of any age) struggled to connect with long-term (experienced) teachers. New teachers spoke of cliques within teacher groups that were difficult to penetrate. This frequently left mentoring programs flat and unproductive. The lack of connection leads to lower levels of trust and a higher propensity for isolation (psychological).

Survey data showed that trust resulted in lower isolation levels but did not eliminate isolation. The observation suggests that a different type of isolation is present. When teachers trust each other and are actively participating in collaboration, they can still feel isolated. Interviews highlighted a common barrier within schools: classroom layout and time. Schools are isolating in nature, which is apparent in a school's design. Teachers are often placed in classrooms with little to no interaction between teachers who teach the same subjects. One teacher said, "I'm in an old building that used to be a gym. I have to walk a long way to meet with anyone. The staff break room is in another building." Another teacher said, "I'm the science chair, and my science teachers are in the high school building." Finally, another teacher said, "I'm in a hallway with my teacher team (grouped by subject). So, I don't see anyone else." Thoughtful placement of teachers is a must. It is critical for culture building to build culture. Leaders should unite people who do not share common goals, teach the same subjects, and think differently. Another barrier mentioned was time. Schools follow regimented schedules, leaving little time for collaboration or trust-building. Teachers begin early in the morning and may have little or no breaks from their students. Elementary school teachers may have the same students all

day. During the interviews, a few elementary teachers stated that they only had to meet with co-workers outside of mandated events: before school, during plan time, during lunch, or after school. Those times were typically limited or brief, leaving little opportunity to enter deep conversations or solve problems. A teacher said, "I'm in the second-grade hallway and never see teachers from other grades." The lack of vertical collaboration can cause difficulties with student goals and progression. Most elementary teachers stated that they only collaborated with their admin or team (grade-level teachers) and rarely met with anyone else.

High school teachers struggle, too. Most have four to seven minutes between classes and short periods for instruction. Short class periods make it difficult to collaborate with their peers. This limits cross-curricular activities and larger projects. A teacher told me, "There is just not enough time in a day to get everything done. I talk to my colleagues in the hallway, like when I stand by the door between classes, but that is it." Another teacher responded when I asked about working on projects with other teachers. They told me that they had enough material to cover. Why would they worry about one more project that may not benefit their class?

A few more observations for trust should be mentioned. When efficacy is high, trust is lower. Higher levels of efficacy and lower levels of trust could be related to autonomy. When teachers feel they have greater freedom in the classroom, they may collaborate less, or teachers who have fewer opportunities to collaborate must become 'self-taught,' leading to higher levels of reported efficacy. If teachers teach themselves and seek less collaboration, fewer bonds may have been formed, leading to participants reporting lower trust levels. New teachers stated they felt more alone than expected and had little support. Being alone forced them to learn the material on their own. A few teachers said it was because they were a small school with fewer dollars to spend on materials and professional development. When asked, these individuals also

stated they did not have a dedicated mentor teacher. Over fifty percent of participants used the phrase 'on an island' to describe their recent or current situation. In other words, teachers who feel they are on an island may feel less connected to their co-workers, which provides fewer opportunities to build trust.

Independence

Autonomy

Based on interview responses, autonomy existed on a spectrum: too much, not enough, or just the right amount. Autonomy could fluctuate with the size of the school. A few participants expressed a lack of leadership engagement in curriculum and pedagogy. The disconnect requires teachers to become self-taught, leading to more autonomy and, at times, greater efficacy. Inversely, teachers at larger districts spoke to 'canned' curriculum or more significant outside influence. Between these two poles, a few teachers were elated with the amount of control and shared responsibility they have at their school.

Participants with higher levels of autonomy experienced moderate levels of isolation and lower levels of goal-setting. A few teachers phrased their situation as 'being stuck on an island,' and those who used this phrasing were either isolated at larger schools by the structure of the building or worked at a smaller district with fewer resources. Most interview participants working at smaller schools stated they had great relationships with their administration and trusted their peers. Still, their isolation was experienced through a lack of collaboration opportunities. One participant said, "No one teaches what I do. Actually, I teach the entire graduating class math, so there is no one to talk to." They spend most of their time learning independently, developing their curriculum alone, and exploring new math projects. This degree of autonomy is severe and can increase efficacy in most people. A residual effect was lower

levels of goal-setting. The survey framed goal-setting questions as an action associated with a group. If a teacher with high levels of autonomy in a small school has few opportunities to collaborate, the survey data for goal-setting could be lower. Goal-setting will be discussed in more detail later. Interview questions for autonomy were 3 and 6C (see Appendix 1B).

The interview consisted of two autonomy questions. One question asked if the participant had opportunities to work independently. Most respondents said yes, they are given leeway to develop projects if they match the objectives of the curriculum. Some teachers stated that the projects they create are usually discussed in detail with their team teachers; each teacher does not have to implement the same project, but the projects implemented should resemble each other. For example, the elementary teachers said, "I can make my own projects; I just want to make sure that it fits the curriculum."; "Usually, we all [team teachers] work together to make cool projects. Sometimes, we steal ideas from each other." High school teachers express more autonomy than elementary teachers. Teachers collaborate within their respective departments to discuss and plan their curriculum. These discussions help teachers effectively implement the curriculum for their students. While high school teachers want to present the information in the most engaging way possible, they must adhere to the curriculum and state standards. Being part of a math department does not mean teaching the same subject, such as algebra, calculus, geometry, etc. For instance, a high school with a math department could have five teachers teaching different subjects that fall under math. This scenario could result in high school teachers having more autonomy. On the other hand, second-grade elementary teachers may feel less autonomous due to the alignment among all second-grade teachers.

One interview question asked if autonomy was present in their school environment. The interviewer asked the interviewees to answer yes or no and for context around their answer. Most

participants said that they had autonomy. The context ranged from I can teach the way I want to I may have too much autonomy. An interesting observation is that too much autonomy makes people feel alone or isolated, with little collaboration and insufficient support. No teacher described an equal mix of autonomy and collaboration. Only elementary teachers spoke of autonomy when they had little to no input on the curriculum.

Efficacy

Most participants in the study expressed confidence in their pedagogical abilities, capacity to prepare students, and potential to enhance student achievement. Nevertheless, the views of all participants were not unanimous. A teacher who had received emergency certification in an urban district reported feeling unsupported, unprepared, and isolated. They conveyed a feeling of being disliked among colleagues and perceived a lack of integration among staff members. Their depiction of the school highlighted an absence of conditions promoting self-organization, although it remains unclear whether this was a shared perception among their peers. Another participant worked in a school district that had limited resources. They expressed that they lacked support in terms of curriculum and pedagogy. To overcome this challenge, they connected with teachers from other districts and found free materials online. They were the only high school math teachers who had to prepare for five different classes and taught the entire grade in one period. When asked if they felt confident in their abilities to introduce such a vast range of math subjects, they responded, "No, but who else will do it? I do my best and hope students are prepared for State tests."

Participants were asked if an efficacy component existed in their environment. They were asked to answer yes or no and provide context for their response. Participants were asked about efficacy—between twenty-five and fifty percent needed efficacy defined or an example of

effectiveness. Two participants did not feel prepared to teach students of any age, while most felt confident in their ability to teach students. There were no questions targeted at the preparedness of each participant, but those who stated they were not prepared were asked about past preparation. Each one said that they had no formal training. This does not imply that individuals without formal training are unsuccessful teachers. Still, it does speak to support and development for those who enter the field without proper preparation. Interview questions for efficacy were 6D (see Appendix 1B).

While there was only one direct question about efficacy, the component was addressed during questions about autonomy. As a follow-up question, participants were asked if they could do the job, perform specific tasks, or prepare students within their subject. The answers varied based on the preparation, support, and tenure. One of the most interesting findings from the survey was that high levels of efficacy resulted in lower trust, collaboration, and goal-setting. Higher levels of efficacy showed moderate levels of isolation. Asking about efficacy highlighted what I was beginning to call the generational gap—long-term teachers separating from new teachers due to a gap in knowledge, likability, and efficacy. The survey did not ask how many years they have been in education, but that question was asked during the interviews.

Six participants have served for six plus years, with 5 serving 11 years or more. Many experienced teachers express their inability to connect with newer teachers. They stated they felt the new teachers were unprepared to teach students at their school. When asked about learning new topics, one person said, "I've been doing this for over 30 years. I will retire soon, and then it will be someone else's problem." Another long-term educator said, "It's hard to talk to them. They are too timid or don't want to listen. I let them do it the way they want and do it the way I want." These statements shed light on the idea that when efficacy is high (for long-term

teachers), collaboration, trust, and goal-setting (group-based) can be low. These feelings were also expressed by those who have been in education for less than five years. One teacher said, "They have their buddies and don't talk to us. So, we [new teachers] work on our own." A new teacher partnered with an experienced mentor said that the mentor did not help them in their subject, just navigated them through the computer and other school-related functions; by Christmas break, they were on their own.

The generational gap exposes possible reasons why survey data shows higher levels of efficacy and lower levels of other components. Survey data shows that lower levels of efficacy can produce higher levels of autonomy and isolation (psychological). Interview responses from participants with less than five years of experience felt isolated, not from the lack of collaborative events but because they lacked support beyond mandated collaboration (e.g., mentoring, coaching, and more).

Goal-setting

Two of the survey's goal-setting questions were organization-focused, while one was individual-focused, potentially affecting the relationship between goal-setting and interdependence. This does not diminish independence related to goal-setting (setting individual goals). Instead, it highlights the question's premise and a teacher's relationship to goal-setting within an educational organization. The relationship between goal-setting and the organization was investigated during the interview.

The interview included three goal-setting questions: one semi-structured, one yes/no with context, and the final question taken from the survey. The survey question was answered with Likert responses and context. The participants were informed that they were not required to

remember how they answered the survey but to answer based on their current feelings and understanding. The interview questions for goal-setting were 4, 6E, and Q15 (see Appendix 1B).

Goal-setting responses can be summarized as student-centered, focusing on state testing, graduation, attendance, behavioral factors, and more. Most teachers stated that their goal-setting activities involved working with their peers—typically through teacher teams (same-subject or grade-level teachers)—to create measurables related to student achievement. Many teachers referenced collaborative events—PLC or teacher teams—focusing on behavioral issues. Teachers would meet 1 to 2 times a week with their peers to discuss students they shared and devise strategies to help students get back on track. Optimal group attendees were never assured, but interview participants did express their willingness to seek out peers to address student issues.

Schools would form data-driven results teams. Teachers would come together during work hours to discuss current data trends for students. These teams would discuss attendance, testing, and other data to set goals. Teams analyzing data would meet at pre-determined dates based on data drops (e.g., testing, attendance, etc.). One teacher described data teams within an elementary school, "Admin has a select committee that discusses testing scores. Usually, it is the department chair or grade leader (team leader). After they discuss the results, we would then meet as a team. They're good with letting us determine how the data affects us and our kids, but we were given some mandates (goals)." A few other teachers verified the basic structure, but that was not the same sentiment found in secondary education. A high school teacher at a small rural school said, "We get to see the results. Usually, they tell me what needs to be done. I agree with them." Another said, "I get a stipend for attending meetings like this. They're usually after school, or I normally wouldn't go."

Teachers were asked if they set their own goals: Do you have goals for yourself as a teacher? Do you set goals for something you want to achieve each year, and are goals a 'normal' task for teachers at your school? While the wording of these questions may change for each participant, the objective was the same. Time and time again, participants regurgitated what seemed at the time to be district- or school-based goals focused on student achievement. Teachers may have internalized these goals instinctively.

The descriptions provided by the survey participants regarding goal-setting appear to be in line with the survey data. In educational institutions, goals are set as a community effort and in a collaborative environment. Over time, individual goals align with the group goals, making it challenging to differentiate between individual and collective goals.

Isolation

During the interviews, isolation emerged as an intriguing topic. Many participants, initially reluctant to admit feeling isolated, eventually expressed that they did experience such feelings. It became apparent that isolation was much more common than previously thought. Although many teachers described their environment as highly collaborative, they found it challenging to connect with colleagues due to classroom location or a lack of time. They relied only on district- or school-wide events, which were often insufficient in fostering meaningful connections. As a result, large swaths of individuals remained unconnected (e.g., new and experienced teachers).

According to survey data, individuals who feel the most isolated tend to report lower trust, collaboration, and goal-setting levels. People who are isolated and have a high level of collaboration reported extremely low levels of trust. However, these same individuals tended to have higher levels of autonomy and efficacy. Understanding how a combination of the

hypothesized conditions is related, not predicted, to feelings of isolation is crucial. Each component 'summarizes' an untold number of organizational activities, variable combinations, or relationships. When combined, the components may help leaders understand their environment and how they can craft a culture to diminish feelings of isolation.

Participants were asked multiple questions to better understand isolation and its environmental effects. Isolation was frequently mentioned in responses to other questions about collaborating with others, understanding relationships, or establishing autonomy. For example, when asking teachers to describe the ‘feel’ of their environment, if it was collaborative or isolating, teachers regularly described it as a little of both. They reasoned that the school provided many opportunities to collaborate but that they did not always connect with their colleagues. There were many reasons why people did not connect, but most stated separation and time. Teachers said they collaborate with their teacher teams but do not collaborate with other grades, subjects, or departments. Horizontal collaboration—collaborating with people like them—is easier and more efficient. Vertical collaboration—collaborating with other grades—is much more challenging to accomplish. Collaboration with other subjects was stated as complicated and rare. One science teacher said, "I always work with the 7th-grade science teachers. I never see anyone else." When asked if they get to collaborate with any other grades or subjects, they said, "No, like I said, I never see anyone. We are in the science hallway, and we usually just talk to each other." I then asked if they would ever like to partner with other subjects or grades and work with them to create cross-curricular projects. They said, "I never really think about it, but I think that would be fun. I tried one time, and it was a little difficult. We are so far away, and it's just easier to stay near my room." This teacher may not describe this situation in a classical definition of isolated, but the teacher appears to be isolated from a large group of people

and opportunities. Hypothetically speaking, if further research was conducted asking participants detailed questions about opportunities and barriers concerning collaboration, I suspect isolation would be more recognized within the school. Interview questions for isolation were 1, Q11, Q17, and Q21 (see Appendix 1B).

Three isolation questions were pulled from the survey and asked during the interview. Participants were encouraged to answer based on their feelings today and were not required to remember how they answered the survey. Interview participants were instructed to respond using Likert responses followed by context for their answers. When responding to the statement, I feel isolated from others in this school; most respondents said either strongly agree, somewhat disagree, or strongly disagree. These responses suggest that most people are genuinely isolated and know they are isolated, while others are unaware of possible isolation or have been recently introduced to the idea. Another statement garnered similar responses, but more people strongly disagreed. Participants said most teachers care for their students and are invested in student success. While an isolated individual might state they are the only ones who care, those feelings do not seem to be expressed by those who experience isolation. Finally, a statement read: Those around me do not share my interests or ideas, and most responded with somewhat or strongly disagree. Their context focused on the idea that most teachers believe in student success. When asked if they felt their peers shared their personal interests or ideas, most participants said they infrequently connect with their peers in that way. A few mentioned trying to connect after work, but those collaborative events were few and far between.

Several teachers have opted for self-isolation. While some study participants preferred self-isolation, it does not necessarily mean they want to be isolated or have not attempted to reduce their isolation. For instance, as discussed earlier in the study, a generational gap was

apparent among several participants. Each was a veteran teacher with many years of experience—some had spent their entire career in the same school or district, while others had recently joined a new school. However, they all seemed to struggle to connect with new teachers. Connecting with new teachers was commonly tied to knowledge. A few teachers expressed a new teacher's lack of preparedness and their teaching methods as a reason for not connecting. One teacher stated, "I tried to help them, but they never seemed to like my ideas." When asked if they were ever asked to mentor, a way to help new teachers acclimate to a new school or career, a teacher told me, "I was asked to mentor, but it was a lot of work. I have a lot to do and very little time." One participant told me that the new teachers usually associate with other new teachers or that their school was very cliquish. A few experienced teachers talked about being close to retirement, and that connecting with others was a waste of time. One teacher said they considered themselves 'fully prepared,' and since they work hard, they put in their time and go. A few rural teachers said, "Teachers that have been here the longest do their own thing. A few have even come back from retirement." Teachers exiting retirement to serve a few more years have become more frequent during teacher shortages. Long-term experienced teachers may choose to self-isolate, but it is not always due to the lack of trying. Over the years, they may have convinced themselves that working and going home is easier than connecting with others. One disheartening revelation is that this perspective is also shared with new teachers. New teachers often expressed during the interview that they did not feel welcomed or supported at the school. After many attempts to connect or seek help, they decided to find support elsewhere and focus on themselves.

Complexity Theory

Nonlinearity and Feedback

Nonlinearity can be defined as the inability to simplify a relationship to a simple cause-and-effect. Too many variables affect each other, making it impossible to declare that a change in one variable will necessarily result in another change. Complexity and nonlinearity are concepts that help individuals understand and interpret complex systems. Feedback loops result from these interactions within the system, either causing growth, decline, or stabilization. Investigating data through the lens of complexity theory can help clarify why a single action does not always lead to an expected outcome. School administration often creates policies or initiatives to improve the culture, but these efforts may not produce the desired results. Expecting results from a single action reflects a Newtonian view, whereas complexity theory's nonlinearity allows observers to view relationships differently.

One might assume teachers at small schools work better together because classrooms are closer (leading to more interaction and better relationships), shared students, fewer teachers, and so on. However, the interviews revealed that this is not always the case. Teachers from small schools may feel unsupported by administration, peers, or both and lack the necessary curriculum or materials. Moreover, teachers at small schools may be the only ones teaching a particular subject, leaving them with more preparation. One teacher said, "I have a lot to do but no time to do it. I am the only math teacher here, teaching four different subjects to three grades. No one else teaches what I do, so it doesn't help me to meet with other teachers often." When asked what is discussed when they meet with each other teachers, they said, "We meet to talk about shared students, and I work with my admin on school stuff, but nothing beyond that." Compare this to another teacher who attributed their school's success and extraordinary

collaboration to being a small school. They often said they feel close to their peers because the school is small. This teacher worked at an alternative school next to a large high school in a wealthy district.

The number of teachers at the alternative school was similar to that of a small rural school, but there were differences in how classes were organized and taught. The alternative school used a block-schedule method, giving teachers more time to teach core and elective courses. Teachers were encouraged to create new courses and collaborate with their peers who taught different subjects. This approach aimed to reduce isolation and promote autonomy, trust, and collaboration. The rural and alternative schools were small, but their curriculum and scheduling differed. Controlling environmental, social, and internal variables is challenging, and there is no clear way to determine which inputs lead to the best outcomes. Viewing complex environments through the lens of complexity helps us understand the intricate interplay of variables.

When studying complex systems, feedback loops are a great way to understand successful or declining organizations. Within a complex system, a web of feedback loops is utilized, and every so often, a catalyst ignites and propels the system to the point of no return. Equilibrium can be achieved if a negative feedback loop is in place. Within a school, feedback loops may exist in the form of population growth, student achievement, declining test scores, teacher turnover, or graduation rates.

During interviews, a few feedback loops were highlighted. One such loop was the lack of proper funding. Teachers across Oklahoma expressed that funding and the lack of materials are issues. The lack of funding required them to seek outside funding sources, apply for grants, or use personal funds. A lack of funding represents a negative feedback loop that hinders growth for

students and teachers. Improving funding may result in a positive feedback loop that produces a 'runaway effect.' Stakeholders who no longer worry about money can spend time and resources elsewhere.

The lack of training for new teachers could be considered a negative feedback loop. Most new teachers felt unprepared for their careers due to insufficient initial training or competent mentors. New teachers had to spend valuable time researching curriculum, practicing pedagogy, seeking collaboration, and more. However, one teacher spoke highly of their new teacher training, especially the teacher coach role. This teacher had a mentor and a teacher coach who provided additional support and resources through meetings. This positive feedback loop helped the new teacher improve in their job and support more students. Teachers could then pass on their knowledge to new teachers, creating a system that promotes collaboration and trust. The teacher said, "My teacher coach is a lifesaver. I reach out to them anytime I need new material or have questions. The coach and my mentor are close, and I feel good about asking them anything." Although these supports are expensive, they are not regularly implemented or supported. Implementing these supports is crucial for the growth and support of educational organizations, regardless of their size.

Self-Organization and Emergence

The interviews provided an insightful examination of self-organizing teacher groups and their potential to counteract isolation. By leveraging complexity theory's principles, particularly those related to self-organization and emergence, we can analyze the dynamics within these groups to understand their implications for teacher collaboration and support networks.

Self-organization, a core concept within complexity theory, describes the spontaneous order arising from local interactions among hypothesized components without external influence.

This concept is pivotal in understanding how teacher groups can form organically within a complex system. These groups often emerge from shared challenges, interests, or goals, illustrating the principle of emergence, where new properties and behaviors emerge at the macro level that are not apparent at the micro level.

The study emphasizes conditions conducive to self-organization among teachers, including interdependence (collaboration and trust), independence (efficacy and autonomy), and goal-setting. These conditions foster an environment where teachers can form supportive networks, share knowledge, and problem-solve, thereby reducing isolation. Through the lens of complexity theory, this emergence of self-organizing groups can be seen as teachers navigating toward the "edge of chaos," a state characterized by a balance between order and disorder. This balance is crucial for innovation, adaptability, and the emergence of new strategies to enhance teaching practices and student learning outcomes.

Teacher interview responses highlighted instances when the conditions were right for self-organizing teacher groups. The interviews also revealed when teachers do not self-organize. For example, a few teachers described a highly collaborative environment where teachers trust each other. The administration supported them by allowing time to solve problems, discuss struggling students, and set goals. The teachers described their school as a great place to work, where they have made friends and were willing to do 'whatever it takes' to promote student achievement. Other participants described their school as problematic, providing few resources or time for meaningful collaboration. They felt that teachers formed cliques that refused new members. These tight groups consisted of new or long-term teachers, but seldom both. The separation of teachers hindered growth, stifled goal-setting, and led to isolation.

Finding a participant who described their teacher groups as self-organizing was not easy. This could be because the term was not explicitly used during the interview, and when it was mentioned, it might have seemed foreign to the teacher. Most participants percieved their informal groups as beneficial to their work. When asked if they discussed work at informal meetings, the majority said yes and that after-hours conversations were mainly work-related. Initially, the groups seemed unimportant, but their connections were woven into their daily activities. They met at different times, sought guidance, communicated outside of required collaboration, talked in the hallways, and more. Although the self-organizing group did not look like a traditional collaborative meeting, the teachers consistently described the emerging behaviors theorized in this study: a group of teachers that formed without central authority and had the conditions for self-organization.

Analyzing self-organizing teacher groups through complexity theory provides a nuanced understanding of how these groups contribute to combating isolation among teachers. The spontaneous emergence of collaborative networks within the educational environment supports teacher well-being and fosters a culture of continuous improvement. This analysis illustrates the potential of complexity theory as a framework for exploring and enhancing collaborative efforts within the education sector, offering insights into creating conditions that encourage the formation and sustainability of self-organizing teacher groups.

Table 22

Maximum Levels of Teacher Self-Organization

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	15	6	25	15.00
15	20	10	15	15	15	15	3	24	15.00
15	20	10	15	15	15	15	3	25	15.00
15	20	10	15	15	15	15	3	25	15.00
14.5	20	9	15	15	15	15	3	25	14.83
15	20	10	14.5	14	15	15	3	25	14.83
15	20	10	14.5	15	14	15	6	25	14.83
15	20	10	14.5	15	14	15	4	24	14.83
14.5	19	10	14.5	14	15	15	3	25	14.67
15	20	10	14	14	14	15	3	25	14.67
14	19	9	15	15	15	15	13	24	14.67
15	20	10	15	15	15	14	4	25	14.67
15	20	10	15	15	15	14	7	25	14.67
15	20	10	14	13	15	15	7	25	14.67
14.5	19	10	14.5	14	15	15	5	25	14.67
15	20	10	14	13	15	15	4	25	14.67
14.5	20	9	14	14	14	15	5	24	14.50
14.5	19	10	14	13	15	15	6	25	14.50
15	20	10	13.5	13	14	15	5	25	14.50
14.5	19	10	14	14	14	15	10	25	14.50
15	20	10	13.5	12	15	15	3	25	14.50
14.5	20	9	15	15	15	14	3	25	14.50
14.5	19	10	15	15	15	14	3	25	14.50
14	19	9	14.5	14	15	15	6	25	14.50
14	19	9	14.5	14	15	15	3	25	14.50
15	20	10	14.5	14	15	14	3	25	14.50
15	20	10	15	15	15	13	3	23	14.33
15	20	10	14	13	15	14	3	24	14.33
13.5	17	10	14.5	14	15	15	4	23	14.33
15	20	10	15	15	15	13	3	23	14.33
13.5	19	8	14.5	15	14	15	9	25	14.33
14	19	9	15	15	15	14	4	25	14.33
14	18	10	15	15	15	14	3	25	14.33

Table 23

Moderate Levels of Teacher Self-Organization

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
13	17	9	13	12	14	13	8	21	13.00
13.5	18	9	12.5	12	13	13	10	21	13.00
13.5	17	10	14.5	15	14	11	9	24	13.00
14	18	10	13	12	14	12	8	22	13.00
13.5	17	10	13.5	13	14	12	5	24	13.00
11.5	15	8	13.5	12	15	14	10	24	13.00
13	17	9	13	12	14	13	6	22	13.00
12	15	9	12	12	12	15	6	25	13.00
13	17	9	13	11	15	13	4	22	13.00
14.5	20	9	10.5	7	14	14	4	19	13.00
14	18	10	10	5	15	15	5	25	13.00
12.5	17	8	12.5	10	15	14	6	22	13.00
11.5	15	8	13.5	13	14	14	7	18	13.00
13.5	18	9	11.5	11	12	14	6	22	13.00
14.5	19	10	11.5	12	11	13	4	22	13.00
14	18	10	13	12	14	12	5	24	13.00
14.5	19	10	11.5	10	13	13	9	24	13.00
13	18	8	13	11	15	13	9	21	13.00
12.5	15	10	13.5	12	15	13	3	15	13.00
11.5	17	6	13.5	13	14	14	9	17	13.00
14	18	10	14	13	15	11	4	21	13.00
13	18	8	14	14	14	12	14	23	13.00
13	18	8	12	10	14	14	8	24	13.00
13.5	18	9	12.5	12	13	13	8	22	13.00
14	18	10	14	15	13	11	11	23	13.00
14	18	10	13	14	12	12	4	23	13.00
14.5	19	10	14	14	14	10	6	21	12.83
13.5	18	9	13	11	15	12	7	24	12.83
12	16	8	13.5	14	13	13	9	20	12.83
13.5	17	10	13	13	13	12	4	23	12.83
13	18	8	13.5	12	15	12	5	25	12.83
14	19	9	13.5	12	15	11	4	22	12.83
12	16	8	13.5	14	13	13	7	21	12.83
13	18	8	12.5	12	13	13	11	20	12.83
13	18	8	13.5	13	14	12	8	24	12.83
12	14	10	14.5	14	15	12	12	21	12.83
14.5	19	10	14	13	15	10	10	22	12.83
13.5	18	9	12	12	12	13	11	24	12.83
14	19	9	13.5	12	15	11	3	22	12.83

Table 24

Lower Levels of Teacher Self-Organization

Interdependence	Collabroation	Trust	Independence	Autonomy	Efficacy	Goal-Setting	Isolation	Organization	Self-Organization
9.5	13	6	11.5	11	12	7	13	16	9.33
6	5	7	10	7	13	12	12	16	9.33
10.5	15	6	6.5	5	8	11	11	20	9.33
11	13	9	10.5	10	11	6	13	14	9.17
12	16	8	10.5	10	11	5	11	18	9.17
10.5	13	8	8	9	7	9	7	15	9.17
9.5	16	3	8	8	8	10	12	17	9.17
10.5	13	8	13	11	15	4	10	21	9.17
10.5	12	9	12	11	13	5	14	15	9.17
12	15	9	7.5	5	10	8	6	20	9.17
11.5	15	8	8	6	10	8	12	18	9.17
9	15	3	10	10	10	8	10	20	9.00
12	15	9	8	6	10	7	5	18	9.00
10.5	13	8	10.5	9	12	6	12	14	9.00
10	16	4	9	8	10	8	10	19	9.00
10	13	7	7	11	3	10	11	16	9.00
13.5	19	8	8	3	13	5	11	18	8.83
8	14	2	10	8	12	8	12	11	8.67
12	16	8	9	6	12	5	5	18	8.67
7.5	12	3	12	14	10	6	15	9	8.50
9.5	13	6	10	8	12	6	12	15	8.50
9	13	5	6.5	4	9	10	11	25	8.50
9.5	11	8	8	8	8	8	5	16	8.50
7	6	8	12	11	13	6	10	14	8.33
9	10	8	8	10	6	8	9	16	8.33
11	13	9	7.5	7	8	6	9	17	8.17
9	12	6	7.5	5	10	8	12	14	8.17
8.5	8	9	10.5	9	12	5	10	14	8.00
8.5	12	5	10	8	12	5	12	15	7.83
8	10	6	9	9	9	6	13	12	7.67
9	12	6	11	9	13	3	13	20	7.67
10	12	8	8	6	10	5	11	16	7.67
8	10	6	10	8	12	5	14	10	7.67
9.5	12	7	6	5	7	6	9	18	7.17
7	10	4	7	4	10	7	14	12	7.00
8	14	2	8	5	11	5	14	10	7.00
9.5	12	7	4.5	4	5	5	11	16	6.33
8.5	13	4	5.5	7	4	3	15	6	5.67

Edge of Chaos

Like the pile of sand analogy mentioned in the theoretical framework, the interview highlighted examples of the edge of chaos. For example, when schools experience teacher

turnover (hiring, firing, or promotion), it disrupts stability. Teachers form special groups within schools, make friends and enemies, and find flow. Any staff changes can alter the dynamics within the school, sending the system in a new direction. Like adding grains of sand to a sand pile, one can never know where the new staff member will land. Will they be a good fit and help grow collegial colleagues, or will they fall? Sometimes, just like a pile of sand will crumble because of one extra grain, one employee can cause a culture to implode. The balance associated with the edge-of-chaos is crucial to complex educational systems.

Complex systems avoid two extremes: order and disorder. Teachers may want to "change things up" when their environment is stable or normal. This may translate to teaching a new class, switching grades, moving schools, or starting a new project. When things are disordered, they may work hard to create order by altering relationships or finding new social groups. For example, one teacher discussed how dysfunctional their school was until a new principal was hired. Soon after, massive turnover occurred, causing dysfunction and uncertainty. A few members left because they realized they were not a good fit with the new leader, while others stayed. The staffing void allowed leadership and current staff to welcome new teachers. Over time, relationships have prospered, and student achievement has risen. The teacher said, "It was a rough few years. We didn't know if our principal would stay after she coached people out, and others quit. I'm really glad I stayed." Within the school, this dynamic relationship between staff members, leadership, and the school was an example of edge-of-chaos. The group found stability within order and disorder. Before the principal, order did exist, even if it was not positive, and after the new principal started, disorder occurred. After some time, order was restored by adding new staff members and reworking the culture. The same teacher added, "She had a different vision about how we would support our community and students. She encouraged us to work

better together, added support, and let us take some control." This teacher described the new environment as welcoming and encouraging. They hang out with co-workers after work, talk shop and personal topics, and trust their colleagues.

Another example is the alternative teacher described in the previous section, who can create and implement unique classes. In the context of the conditions for self-organization, the teacher experiences a state between order and disorder. They have the autonomy to create unique classes for students, possess the efficacy to teach both core and unique classes and trust their colleagues. They are encouraged to collaborate with teachers who teach different subjects. This open organization can add or remove new teachers anytime, but the system does not crash.

Many teachers described their working environment as disordered. They were missing a key component or condition for self-organization. Teachers in small schools lacked essential resources to become proficient in their craft or felt isolated due to workplace and psychological conditions. Others had opportunities to collaborate but lacked trust or were new and unable to perform their job effectively. Some isolated themselves due to a generational gap that leadership did not address. There are many more examples, but these systems were experiencing disorder. Disordered systems can become closed and resistant to change or adaptation. Only when they move back towards stability can the system produce an emergent result, such as self-organizing teacher groups.

Open and Nested

Contrived collaboration would be considered a closed system because members typically belong to a specific group (e.g., grade level, subject matter, new teachers, etc.). Without the free flow of members, the group would not be considered open. For example, if leadership said, "There is a student discipline problem within building A. All teachers in building A will meet

tomorrow at 3 pm." This closed system (group) restricts the flow of ideas. This closed system assumes that only ideas of value come from invited members. An alternative approach would be to call for a collaborative event to address discipline. The invite may sound better if worded as an open invite, "There is a student discipline problem within Building A. Everyone is invited to help us create a better environment for our students and staff." If the school environment is primed for an open system invite, the administration may be surprised by who might join and provide insight.

Teachers frequently mentioned closed systems during their interviews. They described their team meetings as only including teachers who taught similar subjects or the same grade, which was common among elementary teachers. One teacher described a team meeting. They said, "We meet once a week to talk about school. Most of the time, we discussed projects we were doing or projects we wanted to do. We discussed data such as test scores and absences." This teacher added later, when asked if the meetings changed throughout the year, "Not really, it is pretty much the same thing each time, which is fine, but nothing new is really discussed." High school teachers experience the same type of collaboration but usually within department meetings. Both elementary and high school teachers experienced the most collaborative discussions when they met with teachers across their schools to discuss student discipline or student achievement.

During several interviews, a different kind of collaborative event was discussed—voluntary events. For example, one teacher talked about having open coaching sessions with a teacher coach. These sessions were more open than closed, allowing collaboration with peers and a free exchange of ideas. Some groups even met outside of regular work hours, arranging meetings at different times and places for anyone interested in attending. Another teacher

mentioned after-hours events as a 'special meeting,' where teachers from all grades and subjects were invited to gather at a local spot on specific days for communal time, typically consisting of food, drinks, and conversations. These open systems may lead to greater trust, collaboration, and goal-setting. If combined with greater efficacy and autonomy, emergent behavior similar to self-organizing groups can exist.

From a complexity perspective, nested groups can be considered an emergent phenomenon. Information can flow between nested groups, creating a complex system, and the interactions among nested groups contribute to the 'whole' system. Participants in the interview may not initially realize that their groups are nested, but the concept of nested groups became evident during discussions. Teachers discussed their intricate interactions with their peers, forming teams based on student connections, shared interests in a subject, coaching responsibilities, and other factors beyond the formal groups set by their environment (such as team meetings, staff meetings, department groups, etc.). Recognizing complex systems (groups) as nested, the broader connections between groups within the educational environment become more apparent. Instead of interpreting inputs and outputs, leadership can evaluate their culture as an interaction between nested complex systems. Understanding the interactions between nested systems may help with the generational gap, mentoring and onboarding programs, grade-level progression, graduation rates, language barriers (ELL), virtual academies, and more. Also, when trying to create an environment for self-organizing teacher groups, managing a balance between conditions and components for self-organization may be helped by understanding the connections between nested groups within the more extensive complex system.

Evolution and Adaptability

Leadership changes happen often in schools. An outgoing leader may cause structural changes in teachers and staff. When leadership change occurs, teacher groups slowly dissolve and form new structures, seeking stasis when possible. New leadership can influence the new groupings. Pushback on leadership can cause feedback loops, forming unwanted structures that may remain until another leadership change occurs. This scenario plays out frequently and can be cyclical. A few teachers described this scenario during their interviews, noting a cultural shift from autonomy to collaboration and an increased influence in the classroom compared to previous leaders who were absent. A few teachers described their environment as either all collaboration or all autonomous. The polarization causes issues with other components of self-organization, requiring teachers to find resources due to the lack of diversity of components in their environment. Small schools face challenges obtaining resources and support and often lack opportunities for proper collaboration. When collaboration is mandatory, they do not have enough opportunities to enhance their performance. This forces teachers to seek support independently, leading to greater autonomy and effectiveness but reduced collaboration and goal-setting. Another teacher described a leader with an authoritative personality, which caused subjectively good teachers to quit, leaving many teachers without good support. As a result, the school suffered in state testing and the state report card. Teachers rarely met outside of collaborative events. After a few years, new leadership was in place, and the culture changed. The new principal found new assistant principals and shuffled teacher assignments. Teachers who did not support the new administration team moved to new schools. The teacher described the next few years as exciting. The teacher said, "We all started to hang out more. We meet after

school once or twice a month at a local restaurant for food and drinks. It is more fun to come to work."

Groups and individuals within a complex, evolving system will seek growth. A culture that prioritizes personal improvement and allows for voluntary continuous improvement can significantly impact the system. Their growth feeds back into the system, allowing for greater adaptability. If arranged correctly, increased efficacy through autonomy improves collaboration and trust. For example, experienced teachers mentoring new teachers and new teachers teaching experienced teachers allow for evolution. Teachers pursuing professional development outside of mandated collaboration may encourage them to share with their peers, raising the efficacy of their peers. During the interviews, one teacher shared their favorite memory. This teacher had always felt isolated from their peers, not because the building secluded them but because collaboration did not seem essential to education. Once, they had an opportunity to travel out of state with their peers to a conference. Their group included teachers, administrators, instructional coaches, and counselors from their school and other schools in the district. The teacher said, "I got to know so many people, people from all over the district, and I learned I wasn't the only one feeling the way I do." When asked if they had a different take on their role, she said, "Maybe. I know now that I can reach out to people outside my school if I need support." These events will allow this teacher to contribute to their surroundings, evolve through new connections, and adapt to new issues.

Other teachers spoke of their relationship with their instructional coaches. Having a resource to help with their craft allowed them to become better and more confident. This improvement took the pressure off them for professional development, allowing them more time

to seek out others. A teacher said, "When I need an answer, I just text them [instructional coach]. They usually respond pretty quickly, unless they are with another teacher."

There is no universal path for groups and their members to evolve, as each complex system differs. Complex systems evolve through a combination of intrinsic motivations and the system's subjective ideals. These open systems can adapt in a self-organizing, emergent fashion. A mix of self-organizing components allows the system to improvise because the components represent diverse traits. The system can decrease in one aspect while increasing in another and still exist. However, the group may no longer exist if one aspect becomes empty while another is full. If there remains a diverse set of components, the adaptive self-organizing emergent group can weather any environment.

A complex emergent system that sets or contains aligned goals will evolve and adapt more often than other groups. Most self-organizing teacher groups aim to increase student achievement or teacher and student satisfaction. Within those broad categories, teachers may have aligned goals for decreasing absenteeism, evolving course offerings, or improving course curricula. When those goals align, self-organization may exist, but when those goals no longer align due to external factors or objective completion, the group may dissolve. Many interview participants stated that there were many district- or school-mandated collaboration opportunities, but many did not align with their goals. They would instead meet with their peers on their own time, such as in the hallway, before or after school, or during lunch. They described these events as a time to discuss anything, such as students, struggles in the classroom, or personal issues. These scenarios speak to the teacher's need for better opportunities to collaborate, and those opportunities are typically on their own time.

Flocking

This study is based on the idea of self-organizing teacher groups and is inspired by the flocking theory. Flocking theory explains the self-organizing behavior of flocks through three simple rules: flock centering (cohesion), collision avoidance (separation), and velocity matching (alignment). These rules were adapted into the hypothesized conditions for self-organizing teacher groups: interdependence, independence, and goal-setting. Interdependence involves collaboration and trust, while independence consists of autonomy and efficacy.

According to the theory, the conditions for flocking begin at the individual level (bottom level) rather than the top (no central authority). The purpose of self-organizing behavior must be consistent. If the reason for self-organizing remains the same, the group will endure. However, the group may disband if the reasons for organizing become more diverse. This concept is known as homophily. The self-organizing group may also not form if one condition becomes too dominant.

Survey data has indicated that teachers can interpret their environmental conditions differently from their peers at the individual level. When conditions differ or are unbalanced, self-organizing teacher groups may not form. These observations were investigated during the interviews. Teachers routinely spoke of their culture and how it affects their work, relationships, and effectiveness. Many collaboration opportunities did not necessarily translate into better relationships or higher efficacy. Increased autonomy did not result in more goal-setting or higher levels of trust. What most teachers explained is that when schools offer choice (independence), promote collegiality (interdependence), have a vision (goal-setting), and remove barriers (lower workplace and psychological isolation), they feel better about the work. In other words, teachers feel better about the culture. When the outlook for individuals is homogeneous, and the school

supports these hypothesized conditions, self-organization can occur. Interview participants regularly described the groups they are a part of, the friends they hang out with, the meetings they attend, and the results they achieve. They described the great relationships with the administration and the flexibility they feel while working at the school. The participants who felt the most isolated, or isolated the most, described their environment as forced, lonely, hostile, or empty. They described their career as having too many collaborative opportunities but not enough time, or too much autonomy and feeling unsupported; either way, their conditions were not balanced. These individuals were the most likely to describe their workday as, "... I show up, I do my work, and then I leave."

Chapter 6: Discussion

Summary

The study investigated the conditions in schools that encourage the formation of self-organized teacher groups and attempted to determine if participating in these groups reduced feelings of isolation. A statewide survey collected data from teachers in various socioeconomic districts. Key conditions for self-organization—interdependence, independence, and goal-setting—were evaluated along with their components—collaboration, trust, autonomy, efficacy—and teacher isolation. Although the complexity theory framework prevented definitive cause-and-effect conclusions, the findings indicated an association between self-organizing conditions and lower isolation levels. This suggests that culture or environments that promote teacher interdependence, independence, and clear goal-setting may be linked to reduced feelings of isolation, highlighting the potential effect of supportive, self-organizing conditions in educational settings. The survey results were further analyzed through eighteen interviews with survey participants.

The qualitative component provided deep insights into teachers' experiences and perceptions regarding the conditions conducive to self-organization. Through interviews with eighteen teachers, the researcher learned about their views on interdependence, independence, and goal-setting. These elements influenced their sense of isolation or connection within the school environment. The interviews revealed a complex interaction between individual collaboration, trust, autonomy, efficacy, and collective goals within self-organized groups. While self-organizing groups did not remove barriers, they may help mitigate feelings of isolation.

Compare and Contrast

Little to no research has been done on the conditions that lead to forming self-organizing groups within educational organizations, which has been identified as a knowledge gap. This study aimed to understand the formation of self-organizing teacher groups within schools, the conditions and components that contribute to their formation, and their impact on isolation. Existing research focuses on the presumed components hypothesized for self-organization, the theory of complexity, and self-organizing and emergent behaviors across various domains.

The prevalence of isolation among teachers and schools in Oklahoma is a significant issue. However, it is not consistently recognized by teachers and administrators. During interviews, teachers described difficulties but rarely attributed them to being isolated. It took extensive dialogue to highlight isolation, usually recognized as workplace isolation. This was prevalent in the location and layout of the building, lack of time due to school schedules, and contractual obligations, leaving very little time for growth or relationships. These observations were similar to those found in empirical research (Cookson, 2005; Flinder, 1998; Liberman, 1990; Lortie, 1975). At other times, teachers described the inability to connect with other teachers due to constraints such as preparedness, age, cliques, and tenure. These barriers would fall under psychological isolation as described by Hedberg (1981), Lortie (1975), and Stephenson and Bauer (2010). While apparent to the participant, they were not attached to a type of isolation. Either way, these barriers contributed to a disconnect that may have led to difficulties with a few hypothesized conditions. These barriers may also increase other hypothesized conditions, leading to an unbalanced culture. This study highlighted characteristics of isolation through interviews, which align with those outlined in the literature review. It is

essential to conduct further research into innovative approaches for recognizing isolation as an administrator and implementing proactive solutions.

The interviews discussed collaborative events identified in the literature review. The study acknowledges that different types of collaboration serve a purpose in an educational setting, but most are implemented and mandated by school leadership. The study does not argue that mandated collaboration is inherently wrong and should be abolished. Instead, related to observations by Hargreaves and O'Conner (2018), it suggests that mandated collaboration may not meet the needs of every teacher and is not the ultimate solution. Teachers may resist mandated events and fail to collaborate, refusing to attend or not fully engaging if they do. Mandated collaboration is essential for school success, including department meetings, staff meetings, mentorship programs, and curriculum alignment. Most studies attribute positive results to collaboration types without accounting for isolation or contrived collaboration. However, the study suggests that a culture of collaboration is essential, indicating that information exchange is vital for organizational success but is not the only factor. Instead, collaboration, combined with other components, leads to better collaboration without the need for central authority. This similar to empirical findings associating collaboration with other conditions for improved collegial relationships (Lieberman, 1990; Louis et al., 1995). Many interview responses stated that collaboration does not feel authentic. They lose time, energy, and motivation due to the number of collaboration events they must attend. Instead, many participants expressed more enjoyment when they have time to meet with their peers in the hallway, before or after school, or at specific times of their choosing. Mandated collaborations may improve when schools achieve this type of collaboration due to the self-organizing conditions and their ties across the district.

The study covered every condition and component of self-organization: collaboration, trust, efficacy, autonomy, and goal-setting. The trust component was essential to understanding collaboration and isolation levels, which has been found in prior studies (Bryk & Schneider, 2002; Ford, 2019). If teachers do not trust each other, they are more likely to skip collaboration or feel isolated because they do not know who to collaborate with, leading to less collaboration and more isolation. Trust in schools is a complicated subject that has been exhaustively studied and contains many components. This study was mainly interested in teacher-teacher trust. A few times, trust in administration was discussed, but those conversations led to trust in their peers. Participants who described having trust in their peers were more connected to them outside collaborative events, similar to empirical findings stating that trust is critical to the development of culture (Coleman, 1990; Hoy et al., 1996). Some described meeting regularly with their peers during and outside school hours. Occasionally, a teacher would describe meeting with friends for food and drinks or continuing relationships with teachers even after they moved to a new school or district.

During the interviews, the concept of efficacy was difficult to convey as few teachers understood it. Once explained, participants interpreted efficacy as their teachers' focus on student achievement, which would more accurately be attributed to goal-setting rather than the teacher's efficacy or the ability to achieve student success. Efficacy is related to belief in one's ability to produce a result. Teachers who express high levels of efficacy achieve better results relating to student achievement, teacher collaboration, and more. Teachers who were eager to learn from their peers because they felt unprepared possessed higher levels of efficacy. This is because they knew they could produce results and knew they lacked the needed knowledge, something they were eager to seek out. Related to empirical research on efficacy and collaboration (Bandura,

2006; Skaalvik & Skaalvik, 2007), some teachers with high levels of efficacy expressed an eagerness to collaborate and saw themselves as teachers who could help other teachers, but his did not consistently show in the survey results. Survey results showed that high levels of efficacy could correlate to low levels of collaboration. Further investigation discovered that teachers who felt isolated lacked higher levels of collaboration, leading to a need to correct deficits and increased levels of efficacy.

The teachers' understanding of goal-setting aligned with the goal-setting described in empirical (Camp, 2017) research and was considered a critical component of the school's success. Most teachers discussed the type of goal-setting they practiced with their peers and administration. The type of goal-setting depended on the district's goals, which were then interpreted and aligned with those at the school level. Teachers who described a lack of goal-setting also reported low levels of collaboration. They described a setting with no goal-setting or follow-up, a key component in literature (Locke & Latham, 2006). Without proper follow-through, goals were useless to some participants.

Finally, the interview participants had a good understanding of autonomy. Teachers explained that they saw autonomy as making decisions, which is consistent with the empirical research of Keane (1999) and Musanti and Pence (2010). It was interesting to observe that the results varied along a spectrum, with a few at the extremes and most falling in the middle. Teachers discussed their ability to make decisions, choose projects and assignments, and determine how the curriculum was implemented. Some teachers felt they had too much autonomy and not enough oversight, which left them feeling unsupported and led them to seek guidance from unaccredited sources. Similar findings were mentioned in research authored by Unruh (2024). Others mentioned that they simply taught what was given to them, with most

decisions made by team leads or administration. Most teachers felt that they could manage their classrooms independently. With the right balance of guidance and self-governance, they felt comfortable and supported in their classrooms.

The concept of self-organization or flocking can be observed within an educational organization. While the group of teachers may not physically resemble a flock of birds, there were real connections between individuals. This research focuses on the conditions existing within the individual rather than the group. This study suggests that conditions at this level allows individuals to assess their environment, determine proximity, and make decisions. For instance, a teacher does not need to be physically close to an individual to create a beneficial connection. A group may find their collaborative opportunities ineffective and seek new collaboration methods. They may realize the need to create opportunities for students, improve instruction, enhance team collegiality, and more. These are seen as goals that provide direction to individuals. In the right environment, individuals with a common goal may form a self-organizing group, which will exist until the goal is achieved. If the goal is broad, the group may continue to exist until no further actions are necessary.

Additionally, drawing from the seminal work of Maguire and McKelvey (1999), the discussion on emergent behavior underscores the interconnectedness of group dynamics and environmental conditions. However, it is imperative to recognize the inherent limitations of this analysis as we transition to examining the constraints and challenges inherent in the study's methodology and scope. Understanding these limitations is essential for contextualizing the findings and informing future research endeavors.

Limitations

While offering valuable insights into the dynamics of teacher self-organization in various school environments, this dissertation acknowledges several limitations inherent in its research design and methodology. These limitations, crucial for understanding the context and scope of the findings, include selection bias due to voluntary participation, limited representativeness across diverse school systems, methodological constraints tied to the theoretical framework, and uneven representation across different school districts. Addressing these limitations is essential for comprehensively understanding the study's outcomes and implications.

Selection Bias

The methodology, relying on voluntary participation, introduces a selection bias. With a significant portion of surveyed teachers opting out of follow-up interviews, the study potentially overrepresents those with positive job experiences, overshadowing the diverse challenges within educational environments.

Limited Representativeness

The study's narrow interview scope limits its ability to represent experiences across varied school systems. Schools with significant cultural challenges need to be more represented, restricting the generalizability of findings and the ability to draw broad conclusions about environmental conditions in education.

Methodological Constraints

This study on the role of self-organizing teacher groups in mitigating teacher isolation balances methodological strengths with limitations. Its concentrated approach, mixed methodologies, and comprehensive analysis enhance its reliability and application. However, the study faces constraints from its dependence on complexity theory and qualitative assessments. It

lacks the empirical rigor of quantitative methods, which impacts its ability to establish definitive patterns or causality. This juxtaposition of innovative methods against inherent limitations offers a nuanced view of the study's contributions and areas needing improvement, particularly in interpreting and generalizing findings within educational research.

One of the most significant strengths of this study lies in its mixed-methods approach, which integrates quantitative and qualitative data to provide a more comprehensive understanding of the research problem. This methodology allows for a nuanced exploration of the conditions that foster self-organizing teacher groups and how these groups relate to teacher isolation. By quantitatively assessing the presence and impact of self-organizing conditions and qualitatively exploring teachers' perceptions and experiences within these groups, the study captures both the measurable outcomes and the subjective realities of teacher collaboration. This dual approach validates the findings across different data types and enriches the study's conclusions with a depth of insight that neither method alone could achieve.

The study's strength stems from its application of complexity theory. It analyzes teacher self-organization within complex adaptive systems, thus offering a nuanced understanding of teacher collaboration and isolation. This theoretical alignment facilitates a comprehensive exploration of the unpredictable dynamics within teacher groups, challenging traditional educational narratives and fostering a holistic perspective on teacher communities' development and their impact on combating isolation.

Employing a mixed-methods approach, the research combines a statewide survey with in-depth interviews, enhancing the findings' generalizability and providing detailed insights into teacher experiences. This methodological design ensures a close alignment with complexity theory, enriching the analysis and grounding the conclusions in a robust empirical foundation.

The study's cross-sectional design limits its capacity to establish causality or track changes over time, pointing to the value of longitudinal research for a deeper understanding of the long-term effects of self-organizing teacher groups. Interpretive biases in qualitative analysis, stemming from the researcher's preconceptions, pose additional challenges despite efforts to mitigate such biases through reflexivity and peer debriefing.

As this study progresses, it is natural to face concerns about its generalizability. This is particularly true when considering the specific contexts from which our data were derived. Therefore, it is necessary to contemplate the implications of the findings and how they can be applied beyond the educational settings. The next section explores the unique contributions of the research, explaining how it shapes our understanding of teacher self-organization and provides insights into improving educational practices.

Contributions

This study can contribute to the large body of educational research in a few ways: 1) the use of complexity theory in education, 2) the use of flocking theory in education, 3) utilizing the hypothesizing specific conditions for self-organizing (emergent) behavior within education, and 4) determining the possible influence of the emergent behavior on isolation within schools.

First, the use of complexity theory within social sciences is complex. Using complexity theory as a lens was difficult because it removes the ability to show causality. Without a cause, how can you change results? What actions can a leader take within a school to create the necessary change to produce successful results? Interestingly, complexity theory does not intend to attribute a reason but instead should be used as a lens to make determinations based on the system's complexity. Complexity theory helps provide context around specific actions within a

complex system. Complexity theory does not prevent someone from making a change. It gives an observer a frame of reference to understand the interactions after implementing a nudge.

Flocking theory explains how simple rules can create complex behavior in a group. It uses three simple rules to understand how individuals interact within a group, leading to emergent behavior such as flocks. This study applies these rules to a group of teachers, helping to explain the interactions they experience within a school setting. While teachers do not form a perfect flock, the theory provides valuable insight into interactions across a school or district.

This study interprets the conditions for teachers to form self-organizing groups, drawing on critical components for school success. The new conditions and components establish a straightforward set of cultural requirements that, if met, may facilitate teacher self-organization. These conditions are supported by empirical research on school success and have been extensively researched in empirical studies.

The study aims to determine how the conditions for self-organization within a school affect the level of isolation experienced by teachers. It presents quantitative and qualitative data demonstrating the conditions within a school, the extent of isolation teachers feel, and the corresponding isolation levels. The next section explains possible future research concerning self-organizing teacher groups within the educational environment.

Future Research

The study concentrated on teachers in an educational environment. It aimed to ascertain whether the anticipated conditions for self-organization existed within a school setting and how teachers perceived these conditions. The observations were analyzed to establish whether these conditions resulted in the formation of self-organizing teacher groups and whether these groups experienced reduced levels of isolation.

Including all stakeholders may provide greater insight into the conditions for self-organization and isolation levels and how they are understood within an educational setting. Involving administration will lead to a better understanding of the mechanisms used to determine school structure, collaboration events, scheduling, and more. Providing context to actions may help researchers describe the presence of conditions, the flexibility of components, and how all stakeholders can contribute to educational culture rather than simply reacting to it.

Expanding the number of participants in the study could improve the interpretation of the findings. Future studies should extend beyond Oklahoma and encompass multiple states. A nationwide study is needed to examine the presence of self-organizing conditions. Future studies of school culture should utilize complexity theory as the framework for observing interactions. Schools are complex systems and should be studied as such, avoiding the reliance on Newtonian perspectives that seek to attribute a cause to every effect. While future research is an important point to consider, another area of concern for self-organizing teacher groups and the implications for isolation is policy. Understanding how ideas discussed in this dissertation can be applied and implemented with regards to policy is important for state and local administration.

Policy Implications

The results of this study can influence how school leaders develop their school culture. Based on the conditions for self-organization, leaders can seek a balanced approach to school improvement by implementing a wide range of collaborative events, allowing teachers autonomous ventures, encouraging self-improvement, setting goals, and more. While most administrators may attempt these endeavors through collaborative events, the authors would encourage them to try interdependence and independence, separate from goal-setting. Once this distinction is made, teachers may feel better about their culture. For example, if teachers feel the

drive to improve their craft independently and separate from their teams, they may be able to contribute back to the team instead of joining without knowledge. If teachers were encouraged to set their own goals instead of following only district goals, they may understand the importance of goal-setting. Teachers who feel autonomous enough to pursue new lines of thought may need to share their information with the team. Each of these components combines to build a condition, and these conditions combine to build an opportunity for self-organizing teacher groups. While the groups may not be traditional, teachers' connections will be felt across the school. Administrators should weigh each action against the conditions before implementation. A system that checks for cultural integration may last long into the future.

Practical Applications

Leadership can leverage the conditions for self-organization within their school to create a more conducive culture. However, this process may take considerable time, as the culture needs to evolve to establish the necessary conditions. While leadership can implement the conditions for self-organization within an established collaborative event, doing so will not immediately eliminate the need for mandated collaboration if mandated cooperation is the event's starting point.

For leaders to foster the conditions for self-organization within an existing event, they must set a timeframe to transition out of the group. Before transitioning, the leader's focus should be on cultivating a collaborative culture rooted in trust. Participants should be encouraged to take ownership of the group's ideas outside of meetings, learn independently, and build confidence in their ability to implement group-related material. To achieve the group's objectives, members should set personal goals that align with the group's goals. Each member should be encouraged

to share when the group reconvenes. This cyclical process can lead to establishing positive feedback loops.

Leaders can support self-organization by creating the right conditions for teacher groups within the environment. Although this process may take time, leaders can capture opportunities to make changes. For instance, teachers should be encouraged to make decisions that align with their goals and enhance student achievement (autonomy). Leaders should help teachers build their confidence in their abilities, improve their skills, and provide constructive feedback when appropriate (efficacy). Teachers should also be encouraged to seek the professional development they need to succeed. It is essential to treat teachers with respect and as professionals. Leaders should establish trust with them and encourage the team to do the same. Creating a team that amplifies positive traits and eliminates negative ones can create positive feedback loops, fostering student achievement and reducing isolation. Leaders establish goals, help teachers align with them, and encourage teachers to create their own. It is essential to be involved in their progress towards achieving their goals and provide feedback whenever possible.

Conclusion

This study investigates self-organizing teacher groups as a treatment for teacher isolation, all through the sophisticated lens of complexity theory. At its core, the research underscores the natural emergence of these groups within the educational environment, influenced by a combination of interdependence, independence, and collective pursuit of goals.

Empirical evidence from this study draws attention to how specific components—collaboration, trust, autonomy, efficacy, and a shared vision—act as the foundation for self-organizing groups. These conditions, deeply rooted in the non-linear and interconnected nature of school ecosystems, facilitate the spontaneous formation of teacher collaboration. Through a

blend of quantitative and qualitative inquiries, the study describes the nuanced dynamics that propel or impede the formation and sustainability of such groups.

The narrative derived from teacher interviews adds clarity to the statistical data, offering a deeper insight into the lived experiences of educators navigating the complexities of their environments. These personal accounts highlight the pivotal role of self-organized groups in forging connections among teachers, thereby mitigating the feelings of isolation that are all too common in the profession.

What materializes from this research is not simply a correlation between conducive conditions for self-organization and the mitigation of teacher isolation but a dynamic, complex interaction. This interaction underscores the power of the conditions for self-organizing groups to transform school cultures and enhance teacher well-being in unpredictable yet profoundly positive ways.

The implications of this study extend a call to action for educational leaders and policymakers: to cultivate school environments that honor the principles of self-organization. Emphasizing independence, interdependence, and shared objectives can lay the groundwork for the natural emergence of teacher groups. This strategic shift could significantly reduce teacher isolation and, by extension, create a more vibrant, interconnected, and innovative educational culture.

Ultimately, this research offers a fresh perspective on the challenges and opportunities within education, showcasing how embracing complexity can lead to meaningful insight and self-sustaining changes in how teachers connect, collaborate, and thrive in their professional ecosystems.

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Appendix A: Survey Questions

Q1 I frequently collaborate with teachers without school leadership being present.

Q2 The administrators in this school encourage me to identify and set career-related goals.

Q3 Teachers in my school determine their peer collaboration event's location, time, and method.

Q4 The scheduling of time in my classroom is under my control; I can focus on my selected objectives.

Q5 Teachers in my school trust each other.

Q6 The group sets individual and group goals when meeting without school leadership.

Q7 I collaborate well with other teachers when we meet without school leadership.

Q8 I feel competent in preparing and presenting information to my peers.

Q9 Collaboration events are coordinated and interdependent.

Q10 Teachers trust each other when collaborating without school leadership.

Q11 I feel isolated from others in this school.

Q12 Group members make meaningful adjustments post-collaboration.

Q13 Teachers in my school determine the subjects for collaborative events.

Q14 I feel competent in communicating assessment results to stakeholders.

Q15 When collaborating without school leadership, teachers I meet feel they can develop and implement the outcomes of the collaborative event.

Q16 Even in difficult situations, teachers in my school can depend on each other.

Q17 People are around me but not with me.

Q18 I feel competent in implementing collaboration topics post-collaboration.

Q19 Teachers I meet when collaborating without school leadership are confident and can perform the duties of their role.

Q20 I accomplish career-related goals I have identified and set with my peers.

Q21 Those around me do not share my interests and ideas

Q22 The purpose of teacher collaboration is to improve instruction to increase student achievement.

Q23 I routinely identify and set career-related goals with my peers.

Q24 The group collaborates well when we meet without school leadership.

Appendix B: Interview Questions/Guide

Introduction:
Tell them that I am the principal investigator (PI), and that their personal information will be stripped from study.

Ask them to state your name, district, school, and grades taught. Ask them to tell me how long you have been in education and how long you have taught at your current school/district.

Explain the process for the interview. Tell them the interview is being recorded as an audio file so I can create a Zoom transcript; the recording won't serve any other purpose.

Ask if they have any questions before we begin.

Directions: Explain the purpose of the interview and any relevant terminology (e.g., collaboration, autonomy, contrived, etc.). Before proceeding, ask the interviewee if they need clarification on any part of the interview topic.

1. How would you describe the overall environment of your school (i.e., is it collaborative, isolating, or a mix of both)? Which areas of your school best exemplify a collaborative atmosphere, such as hallways, departments, school buildings, or the school district?
2. Can you describe the types of collaboration you engage in during a typical school year (e.g., PD, PLC, Dept. meetings, after-work events, hallway chatter, before or after school, buddy groups, etc.)? Do you have ample opportunities to work with your peers? Is collaboration with the administration possible? Is collaboration voluntary, mandatory, or both? Please provide examples.
3. Do you have enough opportunities to work independently? Can you decide about your classroom, students, materials, and teaching methods? Please explain your responses.
4. Do you believe you, your school, your department, and your peers can set realistic goals through collaboration? Can you successfully achieve these goals once they have been set? Please explain your answers.
5. Do you have ample opportunities to collaborate with your peers outside of mandatory events? Please describe a time when you collaborated with your peers without being asked to do so by a superior. Did your group form around a common idea? Did the group remain together after completing the task? What types of issues did your group address? Please provide detailed explanations for your answers.
6. Do these environmental components exist within your school:
    a. Trust
    b. Collaboration
    c. Autonomy
    d. Efficacy
    e. Goal-setting

Survey Question Follow-up:
Directions: I will ask you four questions from the survey to gather more context. You'll answer using a Likert Scale result, but you are not required to give the same answer you did when completing the survey. I'm not connecting your interview with your survey. If you know your

answer, please give it to me again. After you have answered, I'm asking you to describe why you answered the way you did. I will not ask any follow-up questions unless you need help answering the question.

- Q11: I feel isolated from others in this school.
- Q15: When collaborating without school leadership, teachers I meet feel they can develop and implement the outcomes of that collaborative event.
- Q17: People are around me but not with me.
- Q21: Those around me do not share my interests and ideas

Answers:
Strongly agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Strongly disagree

Appendix C: Consent to Participate

You are invited to participate in research about self-organizing teacher groups and their effect on teacher isolation.

If you choose to participate, you will be asked to complete a brief 10-minute online survey. Participants in the survey could be randomly selected for monetary compensation.

There are no physical risks to participating in this research.

Data collected: You will be asked to complete an online survey as part of this research. The organization hosting the data collection platform has its own privacy and security policies for keeping your information confidential. There is a risk that the external organization, which is not part of the research team, may gain access to or retain your data or IP address, which could be used to re-identify you. No assurance can be made regarding their use of the data you provide for purposes other than this research. This may create risks associated with your employer.

Collection of demographic or geographic location data that could lead to deductive re-identification: You will be asked to provide demographic information that describes you. We may gather information about your geographic location in this research. Different combinations of personal and geographic information may make it possible for your identity to be guessed by someone who was given or gained access to our research records. To minimize the risk of deductive re-identification, we will not combine identifying variables and analyze and report results for small groups of people with specific demographic characteristics.

You may experience these benefits: no known benefits for completing the online survey other than possible compensation (below).

If you participate in the survey, you may receive this compensation: a $15 Visa gift card. A random participant will be selected to win a $15 gift card. The selection will be made when survey collection is halted.

Your participation is voluntary, and your responses will be: confidential. We will not share your data or use it in future research. Even if you choose to participate now, you may stop participating at any time and for any reason.

If you have questions about this research, please contact Michael Wheelus, michael.wheelus@ou.edu or Dr. Timothy Ford, tgford@ou.edu.

You can also contact the University of Oklahoma – Norman Campus Institutional Review Board at 405-325-8110 or irb@ou.edu with questions, concerns or complaints about your child's rights as a research participant, or if you don't want to talk to the researcher. Please print this document for your records.

By providing information to the researcher(s), I am agreeing to participate in this research, and you are stating that you are 18 years of age or older.

(If no- cannot participate)

- ○ Yes (1)
- ○ No (2)

Appendix D: Consent to an Interview

Participation Would you be willing to participate in a 30-60 minute interview regarding the topic of this survey? You will be rewarded a $15 gift card for your participation.

- ○ Yes (1)
- ○ No (2)

Email for Interviews If you are willing to be interviewed, please provide your email for scheduling.

_____

Appendix E: Demographic Questions

School Name

What is the name of the school where you teach?

_____

District Name

Which district do you teach in?

_____

Subjects Taught

List the subjects you teach (e.g., math, language arts, social studies, etc.)

_____

Grades Taught

List the grades you teach (e.g., 2nd, 9th, 11th, etc.)

_____

Appendix F: A-Priori Codes

Apriority code	Sub Codes	Theme	Definition
Professional Isolation	lack of PLC involvement limited mentorship absence of collaborative culture loneliness lack of time contractual time emotional isolation lack of recognition not valued rural challenges remote learning segregated workspaces on an island	Nature and Causes of Isolation	Professional isolation refers to the lack of connection and support from colleagues and mentors in a workplace, leading to feelings of loneliness and undervalue.
Teaching Skills and Teacher Efficacy	time management prioritization goal setting task delegation lesson planning efficiency curriculum alignment and development adaptive instruction self-efficacy in teaching, impact on student achievement, confidence in classroom managemen	Teachers believe in oneself	Teaching skills and efficacy refer to the combined abilities of managing educational tasks and the confidence in effectively fostering student achievement and classroom management.
Professional and Personal	decision-making autonomy confidence in instructional strategies proactive problem-solving curriculum design instructional methods selection resource choice professional development decisions work-life balance management autonomy in curriculum design instructional innovation professional judgment	Dimensions of Teacher Autonomy	Personal and professional autonomy in teaching is the capacity to make independent decisions regarding instructional strategies, curriculum design, and resource selection. It involves confidence in proactive problem-solving, instructional innovation, and professional judgment, alongside managing work-life balance and professional development.
Teacher trust	peer support collaborative teaching professional learning communities Student engagement strategies teacher-student rapport classroom climate support administrative teacher involvement in decision-making open communication transparent decision-making leadership integrity responsive leadership school climate teacher morale organizational health	Trust in Educational Relationships	Teacher trust refers to the confidence in the collaborative and supportive dynamics among educators, students, and administrators, crucial for a positive school environment and organizational integrity.
Self-organizing groups	strong and weak ties connections emergence complexity theory flocking theory groups in nature crowds a flow of people Balance	Nontraditional groupings	Self-organizing groups form spontaneously from local interactions and diverse connections, displaying emergent behavior and dynamic patterns without centralized control, as observed in nature and human societies.
Community and collaboration	teacher teams close friends long-term teaching buddies horizontal and vertical collaboration before and after school passing periods discussion student behavior discussions professional learning communities our program generational gap alternative certifications versus emergency certification versus traditional certification	Brining people together	Community and collaboration in education encompass the joint efforts of teacher teams and professional learning communities to share insights, coordinate across different educational levels, and address diverse challenges, fostering a cohesive and supportive educational environment.

Institutional Review Board Letter

The UNIVERSITY of OKLAHOMA

Institutional Review Board for the Protection of Human Subjects

Approval of Initial Submission – Exempt from IRB Review – AP01

Date: November 03, 2023 **IRB#:** 16532

Principal Investigator: Michael Glen Wheelus

Approval Date: 11/03/2023

Exempt Category: 2

Study Title: Can Self-organizing Teacher Groups Reduce Teacher Isolation?

On behalf of the Institutional Review Board (IRB), I have reviewed the above-referenced research study and determined that it meets the criteria for exemption from IRB review. To view the documents approved for this submission, open this study from the *My Studies* option, go to *Submission History*, go to *Completed Submissions* tab and then click the *Details* icon.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46.
- Request approval from the IRB prior to implementing any/all modifications as changes could affect the exempt status determination.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- Notify the IRB at the completion of the project.

If you have questions about this notification or using iRIS, contact the IRB @ 405-325-8110 or irb@ou.edu.

Cordially,

Lara Mayeux

Lara Mayeux, Ph.D.
Chair, Institutional Review Board