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Answering the Call: Harnessing Internal Boundary Spanning Infrastructure to Organize for Rural District Improvement

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ANSWERING THE CALL: HARNESSING INTERNAL BOUNDARY SPANNING INFRASTRUCTURE TO ORGANIZE FOR RURAL DISTRICT IMPROVEMENT

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ABSTRACT

Despite the number of students and the growing diversity of the students served by rural districts, a lack of research exists on rural district systems to support the continuous improvement of schools. The lack of understanding around systems for rural district improvement stands to exacerbate long-standing inequities for rural communities. Using a three-article format and a qualitative case study approach, this dissertation contributes to what is understood about rural district systems for continuous improvement of schools. The first article examines how a rural district organized for the continuous improvement of its schools. The second article uses an improvement science approach to study the role of internal boundary infrastructure, generalized from Research Practice Partnerships, in the continuous improvement of the rural district's schools. The third article uses an improvement science approach to examine how the rural district leveraged internal boundary infrastructure to create place-based knowledge. The findings from this three-part study make a significant contribution to the research on rural district improvement. Findings from the first study suggest that the rural district engaged in key actions that allowed them to organize for continuous improvement of schools. First, they selected a model that situated the district's role in the continuous improvement of its schools. Second, the district enacted mutually reinforcing boundary infrastructure and spiraled improvement cycles. Findings from the second study suggest that internal boundary infrastructure fostered key conditions for rural district improvement including power sharing, coherence, and elevating relationships. Findings from the third study suggest that the rural district leveraged internal boundary infrastructure to create an integrated approach to continuous improvement that clarified actions for each level of the district and facilitated the creation of place-based

knowledge. These findings significantly advance the understanding of rural district infrastructure for continuous school improvement and have implications for local, state, and federal policy.

Keywords: rural district improvement, boundary infrastructure, improvement science

DEDICATION

To my parents, Ann and Parker Ward, for instilling in me a belief in hard work and a commitment to the greater good. To my husband Bill and my son Shamus, whose constant cheers from the sidelines have been my greatest source of strength as I pursue my goals.

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Finally, I want to acknowledge the field of education – my passion and my calling – for playing a role in society that I cannot look away from and feel compelled to contribute to.

[1] Pseudonym used

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CHAPTER 1

INTRODUCTION

In the spring of 2019, I was called by a familiar rural district to help them gain insight into their district systems – what was working, what wasn't working, what should be improved? I had worked with this district, Walnut Grove[2], in several capacities over the years. I served as an assistant principal at one of the district elementary schools for two years. Coming from an urban context, I remember being struck by the orderly learning environment, the parent support, and even the school building itself. I remember it all struck me as sweet. I remember feeling happy to be there. And I remember thinking that the school was a diamond in the rough – that great things could happen there. It was a good feeling.

Several years later, I was serving at the state level on the school and district turnaround team. I had a caseload of underperforming districts across the state of Colorado. It was my role to understand each district's aspirations and the barriers that prevented them from achieving their aspirations and to help them put systems in place to improve outcomes for students. Each year, our caseloads shifted a bit as some districts improved and others declined and became eligible for support. When my team and I received the list of new districts and Walnut Grove was on the list, I requested to have them on my caseload. I remember telling my team, "They're a diamond in the rough. I know great things can happen there."

During my first year as a consultant in 2016, Walnut Grove requested that I conduct grant-funded diagnostic reviews of two of their schools. I was happy to maintain my engagement with the district and the people there. I was aware that my familiarity with the district might influence my perceptions. I was also aware that my relationships could help me get to the bottom

[2] Pseudonyms are used for all names and locations per IRB requirements.

of what was preventing the district from reaching its goals. I knew the people, I knew the schools, I knew the context. And it was complex. While an outsider might benefit from having no preconceived notions, as an insider I understood the tensions, the complexities, the dynamics. And I trusted in my ability to remain objective while at the same time understanding the context. That year I completed the two diagnostic reviews and did some initial grant-funded planning with principals and central administrators. It's always hard to conduct diagnostic reviews and then walk away from a school or district I have learned so much about, but it was even more difficult in Walnut Grove. I knew great things could happen there. I wanted to help.

This brings me back to the call I received from Walnut Grove in 2019. And 2019 is when the work related to this dissertation in practice began, although formalized Plan, Do, Study Act (PDSA) cycles were not used until the 2022-2023 school year. I conducted a review of the district's systems, the results of which district administration and I used to apply for a grant to fund a multi-year partnership in which I would support the district in implementing systems for continuous improvement. In February 2021, the grant was approved, and we had the funding to begin the work. We knew we needed to design systems for continuous improvement. COVID had brought things to a bit of a halt, but we felt teachers and administrators would be open to collaboration after a year and a half of isolation. And so, the planning began.

The Systems Review

The systems review conducted in 2019 engaged all stakeholder groups in identifying the strengths and weaknesses of district systems through focus groups, interviews, and surveys. The review determined that Walnut Grove lacked systems for continuous improvement, collaborative structures, and shared accountability (see Table 1-1). A more troubling finding was related to the degree to which failure was normalized across the district. The systems review provides a

baseline of the conditions in Walnut Grove prior to this study. It helped us gain a shared understanding of the current state of district systems and it provided us with insights about how end users were perceiving district systems – how the systems were shaping their work.

Table 1-1

Key Findings from Systems Review

Systems for Continuous Improvement
The district lacks a systematic approach to identifying and monitoring strategies that drive academic improvement. While the district may introduce new strategies for improvement, the expected outcomes for these strategies are not necessarily identified at the outset, leading to difficulties in determining whether critical changes have taken place. Moving forward, it will be imperative that the district use data to identify necessary systemic interventions, and then identify critical changes in instructional practices, the training or activities necessary to bring about those changes, and the timeframe for completing those activities. Implementation and impact on student data should be monitored in an ongoing way, with an emphasis on subgroup data in alignment with the district's vision for equity.
Collaborative Structures
Grade-level teams should work toward collaboratively set student achievement goals, including goals for subgroups of students. Progress toward goals should be monitored as an ongoing part of the collaborative planning process. Collaborative structures should strike a critical balance between meeting individual student needs, meeting the needs of student subgroups, and strengthening Tier One instruction for all students.
Shared Accountability
Because collaboratively established and explicit improvement goals focused on closing achievement gaps among subgroups have not yet been identified, a sense of shared accountability for achieving defined outcomes for specific subgroups of students does not exist.
Normalization of Failure
As the district articulates a compelling vision for equity and designs systems to promote shared accountability for each and every student, it will be important for the district to actively support those staff members who are willing to show the courage to challenge the biases of colleagues related to student potential. Equally as important will be the commitment of the Board and district leaders in challenging the normalization of failure.

Ready, Fire, Aim (or Pre-PDSA)

During the 2021-2022 school year, district administration and I set out to address the key findings from the systems review. Our focus would be on designing district systems for the continuous improvement of schools. As discussed in Article 1, the first action we took was to

determine a theory of action that would guide district interactions with schools and situate the district within the continuous improvement process. The theory of action placed decisions about improvement strategies at the school level, with central administration pushing back as necessary when strategies were a mismatch for the school's needs. Clarifying this was the starting point for the design of collaborative structures. With the theory of action about the district's role in place, we were able to design basic routines and systems focused on data-driven continuous improvement. We knew the routines and systems would need to be collaborative, foster shared accountability, and chip away at the normalization of failure within the district. We hypothesized that if we provided structures for school-level teams that included one or two teachers to collaboratively analyze their school's data, identify the school's most significant challenges based on the data, and create concrete plans to address the challenges, we would start down the path of shared accountability and improvement. We hypothesized that if these decisions were made collaboratively and brought back to the school staff by the team for feedback, all staff would be aware of the priorities and the plans to address them. All staff would understand their role in implementing the plan. Our goals were to increase awareness and improve shared accountability.

We also wanted to drive collaboration at the teacher-team level. Our vision was that in alignment with school-level goals, teacher teams would examine data for their grade levels, set goals, and monitor student performance toward those goals. This, we hypothesized, would foster a sense of shared accountability. It could also begin to challenge the normalization of failure, as teachers had ongoing opportunities to observe the growth made by students. We created a teacher improvement team protocol that reflected our vision. We asked principals to schedule weekly times for teams to meet and to train teams on how to engage with the protocol. Principals

agreed to attend the first few collaborative meetings with teachers to support teams in goal setting and using the protocol.

While we did not have concrete process measures or driver measures to evaluate and guide the implementation of our plan, we did have some thoughts about what we were looking for. We were looking for authentic engagement of implementation team members during quarterly implementation team meetings. We were looking for data-driven decision-making at the school and teacher levels. We were looking for schoolwide awareness of school goals and plans for improvement. Ultimately, our aim was to increase the number of students performing at grade level by 10% at each school. While we knew we wanted to be able to gauge the effectiveness of our structures using student data, we realized this would be difficult given the timing: testing had been on hold the previous year due to COVID, and this was the first year students were back to school in-person following the pandemic. We dove in, eager to observe and adjust as we needed to as we learned more about how our systems were working.

Problem of Practice

The problem of practice I address in this study focuses on district systems for continuous improvement. Specifically, Walnut Grove School District lacks the systems and structures to effectively support the continuous improvement of its schools. The lack of systems and structures to support the continuous improvement of schools contributes to student performance that is flat and below the state average. The lack of systems and structures contributes to a lack of shared accountability across the district and the normalization of failure.

As discussed further in the following articles, Walnut Grove School District has experienced achievement and growth rates that are flat and consistently below state average across content areas and subgroups, culminating in college and career indicators that are well

below state expectations (Schoolview, 2023). The district serves 56% students from poverty, 27% multilingual learners, and 74% minority students (Schoolview, 2023). Significant achievement gaps exist between minority and non-minority students, students eligible for free and reduced lunch and those who are not eligible, and multilingual learners and non-multilingual learners in both math and language arts (Schoolview, 2023). Walnut Grove is designated as a rural district by the Colorado Department of Education (CDE, 2023).

Research Overview and Research Questions

The purpose of my dissertation is to understand how a rural district organized for the continuous improvement of its schools. My study uses a qualitative case study approach and a three-article dissertation format. This case study was bounded in a single rural district in Colorado from 2021 to 2023 (Yin, 2018). My first article addresses the research question: How did a rural district organize for the continuous improvement of its schools? My second article addresses the research question: What role does boundary infrastructure play in rural district systems for the continuous improvement of schools? My third article addresses the research question: How did a rural district leverage boundary infrastructure to create place-based knowledge?

My chosen focus on district-level infrastructure acknowledges that the role of a school district is to organize and design infrastructure to support improved practice at the school and classroom levels (Spillane et al., 2018). Because little research exists on the specific interactions between central administration and schools that promote evidence use and contextualization in rural settings (Blad, 2019), my research makes a significant contribution to what is known about rural district infrastructure for the improvement of schools.

Improvement Science Approach

My study enacts an improvement science approach to address a problem of practice in a rural school district. Improvement science is a discipline grounded in the belief that problems in the social sector are the result of flawed systems that impact how employees engage in their work (Bryk et al., 2017). "Improvement science addresses this reality by focusing on the specific tasks people do; the processes and tools they use; and how prevailing policies, organizational structures, and norms affect this" (Bryk et al., 2017, p. 8). This notion that problems of practice must be examined within the systems producing them (Hinnant-Crawford, 2020) has implications for the careful evaluation of school and district infrastructure. This type of systems thinking, however, is typically not the approach taken by schools or districts when engaging in improvement efforts (Bryk et al., 2017).

Hinnant-Crawford (2020) describes improvement science as a disciplined method of defining user-centered problems of practice and developing practical solutions through the systemic study and rapid, iterative tests of change. Improvement science leverages a disciplined approach to problem-solving (Bryk et al., 2017; Hinnant-Crawford, 2020). First, a problem of practice is identified and defined (Bryk et al., 2017; Hinnant-Crawford, 2020). Next, improvement science tools are used to determine drivers and change ideas (Bryk et al., 2017; Hinnant-Crawford, 2020). A theory of action or logic model is then used to create a shared understanding of the change idea including the context in which the problem is occurring, assets within the system, and expected outputs and outcomes (Bryk et al., 2017; Hinnant-Crawford, 2020). Once a change idea is adopted and researched, improvement science leverages multiple measures to be used as rapid iterations of the change idea are implemented to ensure a change is leading to improvement (Hinnant-Crawford, 2020). The goal is to identify practices that bring

about improvement, and then to create standard operating procedures that enable those practices to fully take hold within the system (Bryk et al., 2017; Hinnant-Crawford, 2020).

Farmer et al. (2022) assert that the generation of place-based knowledge in rural schools should leverage an improvement science framework focused on the evaluation of practices and processes. Andreoli et al. (2019) concur, citing a plan-do-study-act approach to school improvement as a particularly good fit for rural schools. Throughout my study, I tested change ideas through iterative cycles with the goal of creating infrastructure that effectively shapes standard operating procedures. An improvement science approach is of particular benefit given the systemic nature of my problem of practice and its focus on infrastructure.

Plan, Do, Study, Act Cycles

Using the systems review from 2019, the district team and I developed a shared understanding of the problem as well as the system producing it (Hinnant-Crawford, 2020). Walnut Grove School District spent the 2021-2022 school year implementing basic collaborative improvement structures at the teacher team, school and district levels. This involved schools identifying problems of practice with an emphasis on school-level ownership of the problems in order to bolster commitment to solving the identified problems. As the initial implementation of improvement cycles took place, district leadership and I observed how schools engaged in the cycles, including how they accessed, understood, and acted upon evidence-based practices. We noticed that most schools would benefit from support in identifying, implementing, and adapting practices to bring about improved student outcomes. This informed our planning for the 2022-2023 school year. As we entered the 2022-2023 school year, we began to engage in the work using a more structured approach: the PDSA cycle (Appendix A).

The Plan Phase of the PDSA Cycle

The *plan* phase of the PDSA cycle focuses on the identification of an aim statement, articulation of a theory regarding what needs to be changed, generation of change ideas, and identification of processes for data collection throughout the cycle (Hinnant-Crawford, 2020). In the *plan* stage, creating a shared understanding of the problem and potential solutions is critical (Hinnant-Crawford, 2020). After observing the impacts of our initial implementation of district systems, we stepped back from the work to reflect and consider next steps for the 2022-2023 school year. What we noticed was that teachers and schools struggled to access, understand, and act upon research-based practices.

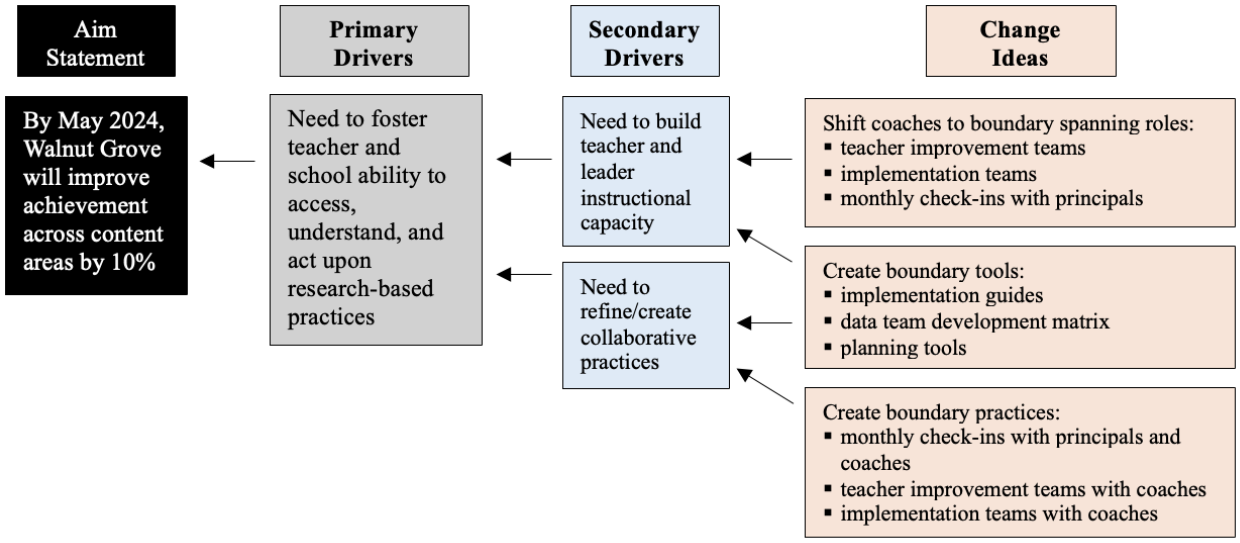
In preparation for the 2022-2023 school year, I began to review research on district infrastructuring (Penuel, 2019). Penuel defines infrastructuring as creating systems that shape how educators interact with research, data, and each other (Penuel, 2019). As I was researching, I read an article by Spillane (2018) about boundary infrastructure. Spillane (2018) described different kinds of boundary infrastructure and the ways boundary infrastructure allowed Research Practice Partnerships (RPPs) to engage collaboratively to create place-based knowledge. I was struck by the similarities between the desired outcomes of RPPs and the challenges in Walnut Grove. Infrastructure plays a key role in the work of RPPs by shaping how educators interact with data, research, and each other to create place-based knowledge (Farrell et al., 2022; Penuel, 2019). Boundary infrastructure allows for shared engagement with the evidence base for diverse team members by helping create shared language, practices, and understandings (Farrell et al., 2022). These were things we believed we needed.

I shared my new learning with the team in Walnut Grove. We began to look at our existing infrastructure to determine what kind of boundary spanning infrastructure was already in place and how we could create additional boundary infrastructure. Figure 1-1 shows a driver

diagram that depicts the aim statement, drivers, and change ideas. We hypothesized that by leveraging expertise from within the district and creating shared tools and practices, we could engage in informed innovation and effective adaptation of instructional practices.

Figure 1-1

Driver Diagram



The Do Phase of the Plan Do Study Act Cycle

As shown in Figure 1-1, the change ideas that align with our drivers were to implement boundary infrastructure to build teacher and school capacity to access, understand, and act upon evidence-based practices. The *do* phase of the PDSA cycle focused on implementing our change ideas, documenting progress through the collection of process and driver measures (Appendix B), and making timely adjustments based on available process and driver data using iterative cycles (Hinnant-Crawford, 2020). Based on data from our driver and process measures, we made adjustments and refinements to our continuous improvement systems and embedded supports as needed to foster the ability of teachers and leaders to access, understand, and act upon research-based practices.

Process measures are used to evaluate fidelity of implementation of an intervention using observation protocols, surveys, or interviews (Hinnant-Crawford, 2020). Process measures are used with more frequency than other measures and allow a team to determine whether implementation is on- or off-track (Hinnant-Crawford, 2020). Process measures focus on how the change is working (Spaulding et al., 2021). We used completed teacher improvement team protocols and note-catchers from monthly meetings with principals as process measures. These were examined monthly to determine necessary adjustments to our infrastructure and to evaluate our progress.

Driver measures are used to evaluate whether an intervention is having an impact (Hinnant-Crawford, 2020). Driver measure data is collected less frequently than process measures (Hinnant-Crawford, 2020) and focuses on the degree to which primary drivers are impacting the aim statement (Bryk, 2017). Driver measures focus on whether the change is working (Spaulding et al., 2021). Because driver measures are collected less frequently than process measures, they tend to be more in-depth than process measures (Hinnant-Crawford, 2020). We used changes in teacher improvement team practices as measured by team self-evaluations using the data team implementation guide, and the completed districtwide improvement tool as driver measures. These were examined in November, February, and May to determine necessary adjustments and evaluate progress toward our aim statement.

The Study Phase of the Plan Do Study Act Cycle

During the study phase of the PDSA cycle, data that has been collected is analyzed to determine whether improvement has occurred (Hinnant-Crawford, 2020). New learnings from the study phase may inform adjustments to the improvement science approach, including adjustments of drivers and change ideas (Hinnant-Crawford, 2020). As an improver, my

dissertation allowed me to gain a deep understanding of the impact of change ideas in Walnut Grove to inform future actions.

Dissertation Structure. To better understand the systems for continuous improvement in Walnut Grove and the impact of the change idea that was implemented, my dissertation examines rural district infrastructure from multiple angles. Using a three-article dissertation format, I examine how district infrastructure was initially organized, the role of boundary infrastructure, and the impact of boundary infrastructure on place-based knowledge creation in Walnut Grove School District.

Article One. To gain an in depth understanding of the organizational structures in Walnut Grove School District, I used an exploratory case study methodology (Yin, 2018). My first article addresses the research question: How did a rural district organize for the continuous improvement of its schools? I used a combination of document analysis, observations, and semi-structured interviews (Merriam, 1998). I used inductive and deductive coding to analyze themes (Miles et al., 2020). My findings suggest that Walnut Grove School District organized for the improvement of its schools by adopting a clear theory of action or model to define improvement-focused interactions with its schools, enacting boundary infrastructure, and engaging in spiraled improvement cycles.

Article Two. I used an exploratory case study methodology (Yin, 2018) to gain an in-depth understanding of the role of boundary infrastructure (Farrell et al., 2022) in Walnut Grove's systems to support the continuous improvement of its schools. My second article addresses the research question: What role does boundary spanning infrastructure play in rural district systems for the continuous improvement of schools? For this study, I used a combination of document analysis, observations, and semi-structured interviews (Merriam, 1998). I used

inductive and deductive coding to analyze themes (Miles et al., 2020). The findings suggest that in Walnut Grove, boundary spanning infrastructure fostered key conditions for rural district improvement, including elevating relationships, fostering power sharing, and strengthening coherence.

Article Three. To better understand the impact of boundary infrastructure on the creation of place-based knowledge in Walnut Grove School District, I used an exploratory case study methodology (Yin, 2018). My third article addresses the research question: How did a rural district leverage boundary infrastructure to create place-based knowledge? I used a combination of document analysis, observations, and interviews (Merriam, 1998). I applied a theoretical framework that enacts Frank et al.'s (2011) Initial Levels of Teacher Implementation and Hargreaves' (1999) Actions Taken by Knowledge-Creating Schools as a framework to gauge the creation of place-based knowledge at the teacher and school levels. I used deductive coding (Miles et al., 2020) based on my theoretical framework and inductive coding to identify emerging themes (Miles et al., 2020). My findings suggest that Walnut Grove School District leveraged internal boundary infrastructure to create place-based knowledge by providing a cohesive, integrated framework for improvement at the classroom, school, and district levels in a manner that provided opportunities for instructional leadership development and bolstered strategic alignment.

The Act Phase of the Plan Do Study Act Cycle

The *act* phase of the PDSA cycle potentially marks the end of one cycle and the beginning of the next (Hinnant-Crawford, 2020). Based on the interpretation of data collected during the *do* phase and studied during the *study* phase, informed action is taken (Hinnant-Crawford, 2020). Generally, a team will "adopt, adapt, expand, abandon, or test again under

other conditions" (Hinnant-Crawford, 2020, p. 170). Each article in my three-article dissertation discusses implications based on the findings and recommended actions. In my concluding chapter, I make recommendations for local, state, and federal policy.

Conclusion

Despite the number of students served in rural districts, there is a lack of research on rural district systems to support the improvement of schools (Blad, 2019). My study seeks to identify rural district infrastructure to support the continuous improvement of schools in order to allow rural districts to better address issues of equity and resource scarcity. Using an improvement science approach, my study describes how Walnut Grove School District organized for the improvement of its schools, the role that boundary infrastructure played in improvement efforts, and the impact of boundary infrastructure on place-based knowledge creation. A deeper understanding of rural district infrastructure is critical as rural districts face increasingly complex challenges. A deeper understanding of rural district infrastructure is of particular value in Colorado, where 146 of 178 districts in the state are considered rural (CDE, 2023).

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CHAPTER 2

RURAL DISTRICT SYSTEMS FOR IMPROVEMENT: A CALL TO ACTION

Abstract

A strong need exists to better understand how rural districts might organize to not only improve outcomes for students but to do so rapidly and in a way that proves sustainable. Using an exploratory case-study approach, I conducted a two-year study of how a rural district organized around the continuous improvement of its schools. My findings suggest that a rural district may organize for the improvement of its schools by adopting a clear theory of action or model to define improvement-focused interactions with its schools, enacting boundary infrastructure, and engaging in spiraled improvement cycles.

Introduction

While a wealth of research exists on school improvement, little research exists on the role of school districts in the improvement of their schools (Mania-Singer, 2017). Even less research exists on the ways in which a rural district might organize for the continuous improvement of schools (Clark & Wildy, 2011). Rural districts, especially those serving large numbers of marginalized students, face myriad challenges that impact their ability to improve, including a lack of resources, fewer highly qualified candidates for teaching positions, and difficulty retaining school leaders (Klar et al., 2020). For this reason, a strong need exists to better understand how rural district systems may be designed to not only improve outcomes for students but to do so rapidly and in a way that proves sustainable. In this article, I report the findings of a two-year study of a rural school district engaged in designing and implementing

systems focused on bringing about rapid improvement in its schools to answer the question: How can a rural district organize for continuous improvement of its schools?

Literature Review

In this section, I will examine the concept of infrastructuring, and then shift to research about important considerations when creating rural district infrastructure for improvement of schools. This includes a review of what is known about rural district improvement, what is known about rural district and school leadership for improvement, and current research about models for central administrative organization for improvement of schools.

Infrastructuring

Infrastructuring refers to the ongoing co-construction of tools, processes, conditions, and activities that support district and school priorities and goals (Penuel, 2019). Penuel (2019) and Spillane et al. (2018) define the term *infrastructuring* as the design or redesign of "routines of schools and districts that influence what takes place in classrooms" (Penuel, 2019, p. 659). In other words, district infrastructure refers to organizational structures, processes, and protocols that shape instructional practice and move a school and district toward organizational goals. Well-designed infrastructure supports continuous improvement efforts in several ways. It bolsters overall system coherence by connecting components of the work (Penuel, 2019; Spillane et al., 2018). Infrastructure also supports sense-making by bringing components of improvement work together in a cohesive way for those engaged in the implementation of new or novel practices (Penuel, 2019; Spillane et al., 2018). By creating coherence and sense-making, infrastructure shapes the implementation of innovations and helps ensure they have the desired outcomes (Penuel, 2019; Spillane et al., 2018). Of equal importance, well-designed infrastructure has the potential to challenge practices that perpetuate inequitable outcomes in under-resourced

systems that serve high numbers of marginalized students (Penuel, 2019). In this section, I will describe the relationship between infrastructuring and equity, examine the general process of infrastructuring, and discuss the type of infrastructure that is of critical importance for rural district improvement.

Infrastructuring and Equity

While infrastructuring is important as it relates to the implementation of school and district innovations, its purpose is more far-reaching. As Penuel (2019) describes:

> Infrastructuring aims at much more than sustaining any single innovation…These include strengthening capabilities of people and the system as a whole; supporting greater instructional coherence; tightening the coupling between local policies and practice; and challenging practices in classrooms, schools, and districts that reproduce inequities of opportunity for specific groups of students (p. 664).

This conceptualization of infrastructuring is notable because it pairs the overarching purpose of creating systemic coherence with the equally important purpose of counteracting systemic practices that contribute to inequitable outcomes for student subgroups.

Infrastructuring has a particularly important role to play in under-resourced, underperforming systems struggling to achieve equitable outcomes for diverse groups of students, including rural systems (Penuel, 2019). Penuel (2019) asserts that such schools and districts face particular challenges to the effective implementation of innovative practices due to lack of access to resources, and this results in the need for even greater attention to the intentional design of infrastructure in such settings. Penuel (2019) goes on to assert that "to promote equitable implementation, it is necessary to adopt a more proactive stance toward infrastructure redesign, allocating more and targeted resources to schools and teachers than

might be provided to schools with more privileged students" (p. 671). This is important given the nature of rural districts as under-resourced and increasingly diverse (Brenner, 2022). In cases where schools and districts face challenging issues of equity, infrastructure plays a key role in addressing complex and enduring problems of practice (Penuel, 2019). Well-designed infrastructure serves to disrupt practices that contribute to inequitable outcomes while fostering conditions in which promising practices may be effectively implemented, scaled and sustained (Penuel, 2019).

Infrastructure Design

The creation of place-based knowledge refers to the responsive adaptation of instructional practices and interventions to better align with the needs, values, and available resources that exist within a community (Farmer et al., 2022). One of the hallmarks of rural education is the need for place-based knowledge creation (Gruenwald, 2003; McHenry-Sorber & Budge, 2018). The design of infrastructure in education systems elevates place-based knowledge creation by intentionally shaping how educators interact with data, research, and each other (Penuel, 2019). Some components of infrastructure that directly impact classroom teaching include assessment, professional development, and high-leverage teaching practices (Penuel, 2019). Effective infrastructure allows for coherence and coordination among such components (Penuel, 2019). Spillane et al. (2018) suggest that infrastructure should bolster the following three elements within communities of practice: "*regular engagement* in a *common domain* using *shared practices*" (p. 539). This means district infrastructure should emphasize collaborative structures that allow teachers to reflect about the instructional practices they are implementing in response to common problems of practice.

Penuel's (2019) research suggests that effective infrastructure surrounding school or district innovation may take at least four years to develop, requiring timely and often unpredictable adaptations as district staff interfaces with new or redesigned infrastructure. This "idea of learning about systems by directly pushing up against them and learning how and when they push back" is essential in the iterative process of infrastructure design (Penuel, 2019, p. 671). Thus, organizational learning about effective infrastructure takes place as a result of both successes and failures of infrastructure to create cohesive approaches to complex work (Penuel, 2019). As Penuel (2019) describes, "Something can be infrastructure only in relation to a particular set of work practices" (p. 661). It is when infrastructure fails to perform as intended that the relationships among components are better understood and may be redesigned to promote cohesion (Penuel, 2019). This aspect of infrastructuring is critical in that it seeks to create well-coordinated and effective standard operating procedures across an educational system. This requires that infrastructuring take place both prior to and in response to the implementation of innovations (Penuel, 2019).

Rural District Infrastructure

Infrastructure to support the needs of teachers at varying levels of implementation of an innovation in implementing and adapting the innovation to local conditions is of particular importance in rural districts (Farmer et al., 2022). Farmer et al. (2022) assert that rather than working from evidence-based practices established through national randomized trials, teachers in rural settings address issues of equity by adapting practices, in essence shifting from an evidence-based practice approach to a practice-based evidence approach. Farmer et al. (2022) describe this practice-based evidence approach as one in which the ongoing collection of local data informs and guides responsive adjustments to teacher practice. "Rural schools need to know

how to support the success of diverse learners with the resources and personnel they have and with strategies that are responsive to community needs, interests, values, and opportunities" (Farmer et al., 2022, p. 293). Rural schools and districts must become adept at aligning resources and practices with the strengths and needs of the students in their classrooms (Farmer et al., 2022). Frank et al. (2011) echo this assertion, stating,

> The complexity arises from multiple sources: variability in student needs, which can influence decisions about what and how to teach; conflicts among organizational demands that arise from policies enacted at different levels of the organization; varying levels of coherence among curriculum, pedagogy, and assessments; and teachers' unique educational trajectories, which expose them to varying educational approaches. As a result, teaching is complex because teachers must both adapt practices to local contexts and coordinate with each other as they do so (p. 139).

This speaks directly to the needs of rural districts, who must adapt evidence-based interventions to the local realities of their schools (Hesbol et al., 2020). Because this need is so profound in rural settings, rural district infrastructure must be intentionally designed to support this type of coordination.

Rural District Improvement

Historically, rural schools that successfully navigate ambitious improvement efforts consistently accomplish a critical shift at the outset: they stop viewing themselves as bureaucratic organizations and begin viewing themselves as communities with a shared history, "shared identity, connectedness, trust, belonging, and mutual dependence" (Scribner et al., 1999, p. 135). This has implications for rural district infrastructure for continuous improvement. Specifically, rural district infrastructure should allow districts to leverage connectedness and

mutual dependence in service of shared goals. Barley and Beesley (2007) contend that "within the various aspects contributing to teacher effectiveness, smaller rural schools capitalize on the closer relationships among smaller faculties and the teachers' connectedness to the community and personal investment in the school" (Barley & Beesley, 2007) as one way to support continuous improvement. Through a lens of rural district infrastructuring, this means that infrastructure should emphasize relationships. Fostering a caring community with high levels of trust was a precursor to and result of participatory practices implemented in rural schools that made substantial gains in student performance (Andreoli & Klar, 2020; Barley & Beesley, 2007; Chance & Segura, 2009; McHenry-Sorber & Budge, 2018; Sutherland et al., 2023). Thus, rural district infrastructure should foster and build upon levels of trust that exist within the district and recognize the importance that trust plays in rural district improvement. A leadership approach to improvement that embraces relationships and shared values makes sense to various stakeholder groups in a rural setting, allowing community members to engage in supporting improvement efforts more actively (Chance & Segura, 2009). Because rural communities benefit from dense social ties, shared values, and knowledge of community resources, the shift from school as a bureaucracy to school as a community readily serves the school improvement process (Chance & Segura, 2009). In summary, a collaborative approach that rallies school communities to engage in strategies to realize a shared mission and vision through ongoing collaborative structures is necessary for rural district improvement of schools.

Rural District Leadership for Improvement

While ensuring rural district leadership is equipped to bring about improvement in schools is inextricably linked to ensuring students in rural communities have access to equitable educational opportunities (Klar et al., 2020), a lack of understanding exists about effective contemporary superintendent practices (McHenry-Sorber & Budge, 2018). In fact, McHenry-

Sorber and Budge (2018) describe the role as “a practice in need of a theory” (p. 1). McHenry-Sorber and Budge (2018) go on to contend that the current critical place-conscious construct for understanding the rural superintendency fails to effectively consider such factors as heterogeneity and the rapid contextual changes faced by rural districts and that the critical leadership practices of rural superintendents have yet to be identified. Successful rural district improvement efforts have been linked to a culture of shared ownership (Andreoli & Klar, 2020; Barley & Beesley, 2007; Chance & Segura, 2009; Sutherland et al., 2023). Shared ownership infuses school improvement efforts with a shared sense of direction and shared purpose (Chance & Segura, 2009). Creating a sense of shared ownership also requires that leaders involve school staff and the community in shared goal-setting and problem-solving (Barley & Beesley, 2007; Chance & Segura, 2009).

Rural leadership at the school level is perhaps better understood. Several school leadership behaviors are strongly associated with improved student performance (Klar et al., 2020). These include building teacher leadership capacity, implementation of evidence-based practices, data-informed decision-making, and fostering a strong culture focused on the teaching-learning cycle (Klar et al., 2020). Preston and Barnes (2018) add an emphasis on collaboration, relationships, and instructional leadership to the list of school leadership behaviors that are related school success. Klar et al. (2020) note that rural districts must often hire school leaders with fewer qualifications. Given this fact, effective district systems may be a tool that can help guide novice school leaders in improving their schools. Despite the importance of rural district systems, scant research exists regarding the kinds of rural district systems that are associated with the improvement of schools, or how rural districts might organize to bring about school-level improvement (Clark & Wildy, 2011).

District Role in the Improvement of Schools

Collaboration is often viewed through the lens of a partnership between two or more organizations in which the expertise of each organization is leveraged to bring about a new service or product (Harmon, 2018). In the case of district systems for the improvement of schools, varying forms of collaboration between central administration and schools exist, each characterized by the balance of school autonomy and district decision-making. McAdams & Katzir (2013) conceptualize three models, or theories of action, related to the role of a district in the improvement of its schools. The first model, performance/empowerment is a model characterized by a balance of school-level autonomy to make instructional decisions related to improvement and operations and school-level responsibility for improved results, with the district serving strictly in a support role, providing tools and resources to support the school's plans for improvement (McAdams & Katzir, 2013). The second model, managed instruction, is a model in which the district serves as the decision-maker for instruction, operations, and resource allocation (McAdams & Katzir, 2013). The third model, managed performance/empowerment, strives to blend the performance/empowerment and managed instruction models by identifying instructional practices to be implemented at the school level in alignment with improvement needs while allowing for creativity at the school level to adapt and adjust the identified instructional practices to fit the context of the school (McAdams & Katzir, 2013). While these models were identified through a study of urban districts, the models are relevant for rural district improvement.

Mania-Singer's (2017) study of the district's role in school-level improvement finds that to bring about dramatic improvement in schools, a district must have infrastructure that promotes two-way communication between schools and districts. Mania-Singer (2017) found that a lack of two-way communication deprived schools, particularly low-performing schools, of influencing

how resources were allocated. Mania-Singer's (2017) study suggests that lower-performing schools tend to have less opportunity to influence resource allocation than higher-performing schools. This means that the negative impacts of lack of two-way communication are felt to a higher degree by the schools in need of the most nuanced understanding by central administrators around current performance. The lack of ability to influence resource allocation has the potential to hinder the improvement efforts of a district's lowest-performing schools by siloing the central office (Mania-Singer, 2017). Mania-Singer (2017) asserts that school improvement efforts over the past several decades have placed disproportionate emphasis at the school level rather than seeking to better understand the role of the district in school improvement efforts. The lack of understanding about how a district might organize for the improvement of schools impedes improvement, with a disproportionate disadvantage for a district's lowest-performing schools (Mania-Singer, 2017).

Conclusion

While little is known about rural district infrastructure for school improvement and how rural districts organize around improvement work, the body of research reviewed for this literature review makes several things clear. Rural district infrastructure for continuous improvement of schools should foster two-way communication between the central administration and schools (Mania Singer, 2017). Rural district infrastructure should leverage the leadership practices that are known to have a positive impact in rural settings while tending to what is known about rural district culture (Sutherland et al., 2023). Rural district infrastructure should intentionally challenge practices that lead to inequitable outcomes for various groups of students (Brenner, 2022). And rural district infrastructure should shape the kinds of interactions necessary for teachers to access knowledge about relevant innovations, adapt the implementation

of the innovation to learner needs, and access additional information that allows for further contextualization of the innovation (Frank et al., 2011). Given that infrastructure shapes how people interact with data, research, and each other (Penuel, 2019), it is critical to consider current reality and desired outcomes when designing, implementing, and adjusting rural district infrastructure.

Methods

This article is an organizational theory study. It is part of a broader three-part study that examines the ways in which a rural district organized for continuous improvement, the role that boundary spanning infrastructure played in the district's continuous improvement efforts, and how the district leveraged internal boundary spanning infrastructure to create place-based knowledge. This qualitative exploratory case study was bounded in a single rural district in Colorado from 2021 to 2023 (Yin, 2018), and presesnts how Walnut Grove School District[3] organized for the continuous improvement of its schools. The research addresses a single research question: How did a rural district organize for the continuous improvement of its schools?

Site Selection

I conducted my research in the Walnut Grove School District. Walnut Grove's designation as a rural district, student demographic, and ongoing work on implementing district systems for the continuous improvement of schools made it an ideal research site for my study. Walnut Grove is a district that meets the Colorado definition of *rural* per the Colorado Department of Education's (CDE) Rural and Small Rural Designation list (2023). Colorado uses overall district enrollment, which must be fewer than 6,500 students, the geographic size of the

[3] Pseudonyms are used for all names and locations per IRB requirements.

district (which is not further defined), and distance from an urban center (which is not further defined) to determine whether a district is identified as rural (CDE, 2021). Walnut Grove enrolls 2,332 students (Schoolview, 2023) in its five schools (three elementary schools, one middle school, and one high school). Central administration consists of a superintendent, chief operations officer, and chief academic officer. The district has four district-wide instructional coaches. The district serves 74% minority students, 56% students from poverty, and 27% multilingual learners (Schoolview, 2023).

Participant Selection

For participant selection, I used purposive sampling (Creswell & Poth, 2018; Yin, 2018). Purposive sampling is a preferred method of sampling in qualitative research when the purpose of the case is to elicit deep understanding (Ishak & Bakar, 2014). To identify participants, I collaborated with the Chief Academic Officer to identify participants with deep knowledge of the work being done related to the research question. This led to the identification of two district principals for interviews due to their sustained engagement with the subject matter. Participants also included all four district coaches as focus group members due to their roles as boundary spanners, their extensive understanding of district-wide processes, and their involvement across all five district schools. In collaboration with the Chief Academic Officer and Superintendent, I identified two schools that were effectively implementing the data team protocols. I used convenience sampling to identify data teams for observation at the two schools. Each data team was comprised of 2-4 teachers, an instructional coach, and an administrator. I also served as a participant observer (Hinnant-Crawford, 2020) for the observations of four implementation teams. Each implementation team was comprised of school leadership, 2-3 teachers, an

instructional coach, and a central administrator. Participants provided written consent prior to inclusion in the study.

Data Collection

To study rural district infrastructure to support the continuous improvement of schools I collected documentary data, focus group data, interview data, and observational data (see Table 1). I chose semi-structured, role-specific interviews and focus groups as data sources due to their ability to elicit insights into participants' perceptions, experiences, and other understandings that can be missed through other data collection methods (Weiss, 1994). I conducted a focus group of all four district coaches and semi-structured interviews with two out of the five district principals, as well as the Chief Academic Officer. To ensure consistency, I used a semi-structured interview tool (Appendix C) to guide interviews and focus groups. Principal interviews and the coach's focus group were recorded using Zoom, while the interview with the Chief Academic Officer was conducted in person with the conversation scripted. Given my ongoing involvement with the district, I had access to all participants. Interviews and focus groups lasted approximately two hours each. I had all Zoom recordings transcribed by a paid service. I cleaned and deidentified all transcripts.

Table 2-1

Data Collection

Data Source	Data Collected	Purpose
Artifacts and documents	Initial diagnostic review document Implementation team job description 40 completed teacher improvement team protocols 5 completed school improvement cycle tools 1 completed district improvement cycle tool 6 implementation guides 1 data team development matrix 3 Implementation Round-up Agendas Materials from 9 trainings Notes from 16 district meetings	Establish a chronology of infrastructure design; establish themes related to infrastructure design

Focus groups and interviews	All four district coaches 2 principals Chief Academic Officer	Understand perceptions of how the district organized for improvement, and impacts of district organization from different perspectives; establish themes related to infrastructure design
Observations	Four implementation teams Two teacher improvement teams	Understand how processes were working in authentic settings; establish themes related to infrastructure design

Observational data serves as an important tool for researchers to understand how processes are implemented in authentic environments (Creswell & Poth, 2018). I used convenience sampling to observe two school-level data teams. Each observation lasted about 50 minutes. I took detailed descriptive and reflective notes during the observations and supplemented the notes with post-observation annotations to capture initial impressions and provide additional context. I also observed four school-level implementation teams. I served as a participant observer (Hinnant-Crawford, 2020), facilitating a structured process for data analysis during my observations. I observed implementation teams at the central office, with each implementation team meeting lasting approximately two hours.

In qualitative research, document analysis plays an important role in understanding the context, behaviors, and issues associated with a research topic (Merriam, 1998; Yin, 2018). Documentation has multiple strengths as data due to its stability, its ability to illustrate activity over broad periods of time, and its specificity (Yin, 2018). In my study, I used document analysis to identify and isolate the key actions taken by the district in designing and implementing district systems for continuous improvement at the rural study site. I collected an initial report outlining district needs prior to the intervention along with meeting notes, co-constructed tools and job descriptions, completed data team protocols, completed school and district improvement tools, training materials, and meeting agendas. The report outlining findings from an initial diagnostic review of the district served as a means to clarify the district's starting point; it described the

degree to which systems to support continuous improvement were in place during the pre-implementation phase. Meeting agendas and minutes included implementation round-up agendas, monthly check-ins attended by the Chief Academic Officer, coaches, and principals, and additional meetings with coaches and central administrative staff. I served as a participant-observer during these meetings (Yin, 2018). Co-constructed tools included implementation guides, data team protocols, school and district improvement cycle tools, a data team development matrix, and an implementation team member job description, all of which are artifacts of implementation. I also reviewed materials from trainings that occurred over the course of the study. Principals served as gatekeepers for their school's completed data team protocols, and three schools collected and shared their completed protocols with me. I had access to all other completed tools through a shared Google Drive with permission of the district.

Data Analysis

First, I gathered relevant documents, focus group transcripts, interview transcripts, and observation notes. I began my data analysis with a document analysis. I used the initial document analysis (Yin, 2018) to identify, isolate, and create an initial chronology of key actions taken by the district and to gain clarity about the evolution of systems. To do this, I gathered documents spanning the past two years that were relevant to the research question. Using hard copies of the documents, I first sorted documents sequentially from the earliest documents to the most recent documents. I looked for changes over time as well as recurring ideas and themes and used inductive descriptive coding to help identify patterns in the data related to my research question (Miles et al., 2019).

I then engaged in inductive descriptive coding as I analyzed focus group data, interview data, and observational data (Merriam, 1998). This allowed me to identify themes by identifying

recurring ideas across data sets (Merriam, 1998). From my descriptive codes, I began to organize themes into higher-level themes and sub-themes. Each theme or sub-theme was intentionally conceptualized to synthesize multiple data sets (Merriam, 1998).

Next, I performed my first round of deductive coding using the high-level themes identified during the preliminary descriptive inductive coding (Merriam, 1998). I simultaneously made note of additional codes, and these were then incorporated into my existing themes or used to identify a new theme. I created a codebook that guided multiple rounds of coding and revised my codes and subcodes to best reflect how the district had organized. For each round of coding, I made necessary revisions to my codebook. When I was satisfied that my codes best represented the context, behaviors, and issues associated with my case, I created a matrix that allowed me to catalog evidence of codes and subcodes (Merriam, 1998).

The primary purpose of qualitative research is to understand and accurately describe the phenomenon being studied (Merriam, 1998). For this reason, the identification of codes and themes is critical to identifying findings (Merriam, 1998). I based my findings on codes and themes that communicate the most salient features of the case while also providing the highest leverage for addressing the research question (Merriam, 1998).

Trustworthiness

Merriam (1998) elevates the idea that research in applied fields such as education should be action oriented. This requires taking a disciplined approach to the analysis of data to help ensure credible interpretation (Merriam, 1998). Because the primary purpose of a case study is to understand the context, behaviors, and issues associated with a case, it is critical that researchers take steps to check and challenge their emerging understandings of data and findings. I took several steps to address trustworthiness in my study. First, I engaged in long-term engagement

with my case (Merriam, 1998). My documents span two years of work focused on designing and implementing systems to support the improvement of schools in Walnut Grove School District. Prior to data collection, an Institutional Review Board (IRB) informed my consent procedures and data management practices. IRB approval is evidence that my study adheres to the highest ethical standards of conduct for research. I conducted member checks during the data analysis process (Creswell, 2007) to help ensure the validity of codes and findings. I engaged with Clemson faculty advisors who helped shape my methods to ensure the integrity of my study, including research design, data collection methods, and analysis methods. Finally, I engaged in rigorous positionality reflections throughout the process to minimize researcher bias and improve the credibility of my findings.

Findings

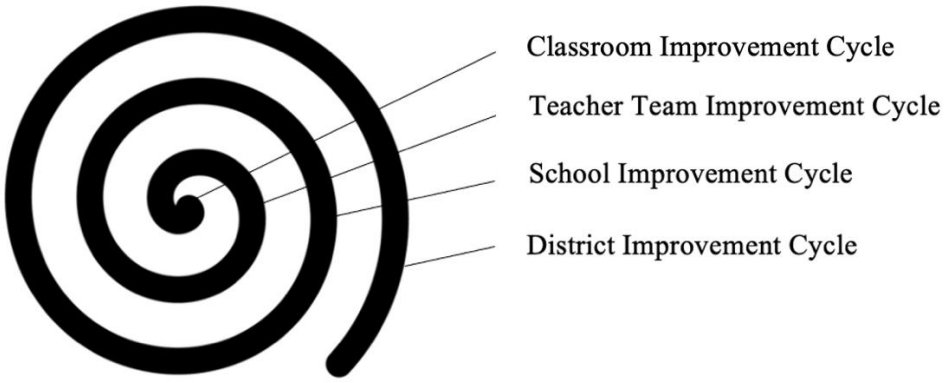
Qualitative data from document analysis, interviews, and observations were used to answer my research question, "How can a rural district organize for continuous improvement of its schools?" Three major findings are identified. First, the organizational structures resulted in what I will characterize as spiraled improvement cycles, with teacher/classroom improvement cycles in the center and additional cycles at the teacher team, school, and district levels, all of which informed one another. Second, a clearly defined role of the district in school improvement was critical in the initial design of rural district systems. Third, the district implemented infrastructure that sought to bring together members of multiple communities of practice to engage in problem-solving and sense-making. Collectively, these findings show how this rural district organized for the continuous improvement of its schools.

Spiraled Improvement Cycles as Infrastructure

The district organized for continuous improvement through spiraled improvement cycles. Figure 2-1 shows how improvement cycles emanate from short cycles at the classroom level and expand out to longer improvement cycles at the teacher team, school, and district levels.

Figure 2-1

Spiraled Improvement Cycles



Each spiral consists of the same improvement-minded practices: identifying success criteria, determining the degree to which success criteria were met, identifying changes in practice that aligned with success criteria, and monitoring and adjusting throughout the next cycle. Table 2-2 shows that what differentiated the spiraled cycles was the frequency of each cycle within the school year and the communities of practice that participated in the cycle.

Table 2-2

Levels, Frequencies, Communities of Practice and Improvement Routines for Spiraled Improvement Cycles

Level	Frequency	Communities of Practice	Improvement Routine
Classroom	Daily, every class period	Individual classroom teacher	Identify success criteria, identify instructional strategies, measure effectiveness of instructional strategies, determine necessary adjustments

Teacher Team	Weekly	Team of grade level or department teachers, instructional coaches	Identify success criteria, identify instructional strategies, measure effectiveness of instructional strategies, determine necessary adjustments
School	Quarterly	Classroom teachers (2-3), instructional coaches, school leadership, central administrative team	Identify success criteria, identify instructional strategies, measure effectiveness of instructional strategies, determine necessary adjustments
District	Twice a year	Central administrative team, instructional coaches	Identify success criteria, identify instructional strategies, measure effectiveness of instructional strategies, determine necessary adjustments

Classroom Improvement Cycle

The classroom improvement cycle was the shortest improvement cycle that was implemented and supported through district systems. This cycle represented, "the teaching-learning cycle we expect to see in classrooms during each lesson." The vision for this was that during each class period, classroom teachers would define success criteria, identify practices aligned with success criteria, and monitor and adjust based on student learning. This was confirmed in an interview with the CAO. Student performance outcomes at the classroom level then informed the work of grade level and department teams, as the data team protocol asked teachers to examine classroom trends before attending weekly data team meetings as a way to inform instructional next steps (see Figure 2-2). A coach described it this way: “The expectation is they come with the top part of the protocol filled out, done. It’s the standard, the short-term goal, the information they have. Then we spend our time talking about, ok, so here’s our problem. What can we...what’s the strategies that we can do about it?” This quote speaks to the ways in which student outcomes at the lesson level inform the next level of the spiral, teacher teams.

Figure 2-2

Data Team Protocol Step A

Step A – Presenting Teacher(s): Prior to the meeting, please complete the following chart for one class.

Students who did not meet success criteria	Students who approached success criteria	Students who met or exceeded success criteria
_____% of class	_____% of class	_____% of class

Teacher Team Improvement Cycles

The next level of the spiral, teacher team improvement cycles, was informed by student performance outcomes at the classroom level. Teacher team improvement cycles were week-long or two-week cycles. The goal of the teacher team improvement cycles was to scaffold the capacity of classroom teachers to effectively engage in the teaching-learning cycle that was implemented at the classroom level. A coach described, "I thought that was excellent to show this is what your instruction in your classroom looks like, and these are what data teams do, too...I felt like that was a great opportunity to open maybe some eyes to see and help people make those connections."

At the elementary level, teacher team improvement cycles took different forms depending on the school. At one elementary school, I observed teacher team improvement cycles focused on a single prioritized subject school-wide (i.e. writing, math, reading). In this case, the subject of focus was determined at the beginning of the year and based on student data. In the other

elementary school, I observed teacher team improvement cycles focused on two subjects that alternated each week. At this school, teacher team improvement cycles essentially became two-week cycles. At the secondary level, teacher team improvement cycles were organized by content area and spanned multiple grade levels. Secondary teams met weekly or bi-weekly. In year two, district coaches served as participating members of all teacher teams.

During teacher team improvement cycles, teams used the same approach that was expected of individual classroom teachers. Teams defined success criteria, identified changes in practice aligned with success criteria, and monitored and adjusted based on student learning. Figure 2-3 shows the district's Data Team Development Matrix. The Data Team Matrix provides a rationale for each area of focus and a description of what each area of focus looks like and sounds like. This matrix guided the ongoing development of teacher team improvement cycles.

Figure 2-3

Data Team Development Matrix

Teacher Practice	Rationale for Focus	Look for/Listen for
Linking interim assessment data (iReady/ NWEA) with upcoming units	Sometimes we feel we are starting units without much data about student strengths and needs related to the standards we will be teaching. Interim assessment data may provide a solution to this problem. Analysis of interim assessment data with upcoming standards in mind allows teachers to plan for appropriate levels of support prior to beginning a unit, improving the likelihood of student mastery of standards.	▪ Data protocol is complete with prioritized areas of focus and data points ▪ Student strengths and needs on upcoming standards are identified using interim assessment data ▪ Time-bound goals are set for changes in relevant interim data
Defining success criteria	Establishing commonly understood success criteria is a critical first step for high-impact formative assessment practices. Success criteria explicitly describe what students will say, do, make, or write as a result of effective instruction. This allows teacher teams to look for clear evidence that shows whether students are on track for mastery of standards and evaluate the impact of their instructional strategies.	▪ Teachers describe what students need to say, do, make, or write to show they have met the success criteria ▪ Teachers identify visible learning samples that will reflect success criteria ▪ Teachers can articulate where to find evidence of success criteria in selected visible learning samples
Identifying changes in practice that align with the success criteria	Identifying the gap between student performance and success criteria is a critical first step in closing the gap. This teacher behavior is focuses on creating a hypothesis for why the gap is occurring so that we can target the gap with actionable, specific high-impact instructional strategies that are most likely to close it.	▪ Teachers articulate the gap between success criteria and student performance using visible learning samples ▪ Teachers create a hypothesis for why the gap exists ▪ Teachers identify teaching practices that address the hypothesis ▪ Teachers identify agreed upon visible learning samples
Monitoring and adjusting	The ability to make timely and informed adjustments to instruction based on student strengths and needs is critical to improving student performance. This teacher behavior establishes student performance as a tool to evaluate the effectiveness of instructional strategies. When implementation of an instructional strategy does not result the expected student learning, the strategy is adjusted. When implementation of an instructional strategy does result in student learning, that strategy is documented and used in future practice.	▪ Teachers bring agreed upon visible learning samples to data team meeting ▪ Teachers identify evidence of the success criteria in visible learning sample ▪ Teachers recognize the degree to which students have demonstrated mastery ▪ Teachers reflect and evaluate elements of instructional practice for effectiveness ▪ Teachers capture effective instructional practices to inform future work

In an elementary teacher team improvement cycle, two teachers examined classroom level data and discussed:

> Teacher 1: So, then the success criteria was that if they can identify it by color, they would master the target of the CER and the remainder. We let them try it on their own, and then we identified the holes.
>
> Teacher 2: Yes, we got close to the end and then did it together so we could fill the holes. So, then we did the math part together and then let them do the CER on their own. We wanted to guide them toward the prompt.
>
> Teacher 1: Okay, so evidence and reasoning is where we're really struggling in the CER.
>
> Teacher 2: I think we should say mathematical reasoning and focus on that for the next lesson.

This conversation shows how teacher teams defined success criteria, identified changes in practice aligned with success criteria, and monitored and adjusted based on student learning. Student performance outcomes at the teacher team level then informed the next level of the spiral, school level improvement cycles.

School Improvement Cycles

Informed by the work of teacher teams, school level improvement cycles were approximately 45 days long. The length of the cycle was designed to allow teams to have enough time to train teachers in a novel practice, evaluate the degree to which it was being implemented and determine the impact on student performance. Teams comprised of 2-3 teachers, school leaders, an instructional coach, and a member of the district's central administrative team engaged in a quarterly process that mirrored the processes used by teacher teams and individual teachers. Figure 2-4 shows the tool each school used to evaluate school-level progress toward goals. Teams reviewed their goals, discussed factors that were influencing performance on implementation goals and student achievement, brainstormed ideas to address areas of need, determined necessary changes to ensure teachers and students met their goals, and monitored and adjusted over the course of the next 45 days. A principal described, "In February, our team felt good about where we were, and those implementation benchmarks told us that we were there. They just guided us along. They allow us to be focused. They told us we were ready to move on with our plan."

Figure 2-4

School Improvement Cycle Tool

Strategy 1:		
CYCLE 1 IMPLEMENTATION BENCHMARK	CYCLE 2 IMPLEMENTATION BENCHMARK	CYCLE 3 IMPLEMENTATION BENCHMARK
CYCLE 1 ACTUAL PERFORMANCE	CYCLE 2 ACTUAL PERFORMANCE	CYCLE 3 ACTUAL PERFORMANCE
Interim Measure Data (iReady or NWEA)		
Name of Measure and Subtest	Winter Target	Winter Actual Performance
iReady Reading and Math		
Reflection on Cycle 1 (August – November 30):		
Plan/Adjustments for Cycle 2 (November 30 – February 28):		
Actions for Cycle 2 (November 30 – February 28)		Support Needed (Please Highlight)
		Coaching Training Implementation Guide Other:
		Coaching Training Implementation Guide Other:
		Coaching Training Implementation Guide Other:

District Improvement Cycles

The outermost cycle of the spiral occurred at the district level. District improvement cycles centered upon the availability of nationally normed local assessment data, which was available in January and May. Thus, district improvement cycles were the longest of the district cycles. District improvement cycle meetings were attended by the Superintendent, Chief Academic Officer, available central administrators, and often instructional coaches. District improvement cycles were guided by a similar tool to school level improvement cycles (see Figure 2-5), and the process mirrored the processes used in the other three cycles: evaluating progress toward goals, determining strategies to address goals, and adjusting as necessary. Discussions included shifts to the allocation of resources to ensure district-level implementation goals and student achievement goals were met. Conversations during the district improvement cycle meetings often focused back on the effectiveness of teacher/classroom improvement cycles, teacher team improvement cycles, and school improvement cycles. A central

administrator noted, “All the work at the schools eventually levels up to the district, and that’s what we see or look at when we look at our district data. It’s what’s happening at the schools.”

Figure 2-5

District Improvement Cycle Tool

District Strategy 1:		
CYCLE 1 IMPLEMENTATION BENCHMARK	CYCLE 2 IMPLEMENTATION BENCHMARK	
CYCLE 1 ACTUAL PERFORMANCE	CYCLE 2 ACTUAL PERFORMANCE	
Interim Measure Data (iReady or NWEA)		
Name of Measure and Subtest	Winter Target	Winter Actual Performance
Reflection on Cycle 1 (August – November 30):		
Plan/Adjustments for Cycle 2 (November 30 – February 28):		
Actions for Cycle 2 (November 30 – February 28)		Support Needed (Please Highlight)
		Implementation Guide Training System Design Support Other:
		Implementation Guide Training System Design Support Other:
		Implementation Guide Training System Design Support Other:

The improvement cycles described in this section show how Walnut Grove used a spiraled cycle approach to create an interconnected organizational infrastructure focused on improving instructional practice. Each cycle informed the next cycle in overall improvement: the classroom cycle informed the teacher team cycle, the teacher team cycles informed the school level cycle, and the school improvement cycles informed the district improvement cycle. All cycles were interconnected and followed a similar structure. Each spiral played a role in the creation of place-based knowledge in the district by identifying success criteria, determining the degree to which success criteria were met, identifying changes in practice that aligned with success criteria, and monitoring and adjusting throughout the next cycle.

Clarified Role of District as Starting Point for Infrastructuring

Before the design of district infrastructure, the district engaged in a systems review to determine strengths and next steps for improvement. The initial systems review of the district described the district's lack of an approach to supporting the continuous improvement of its schools:

> While the district utilizes the state-mandated processes to use data to inform improvement planning, there is not a systematic approach to identifying and monitoring strategies that drive academic improvement. While the district may introduce new strategies for improvement, the expected outcomes for these strategies are not necessarily identified at the outset, leading to difficulties in determining whether critical changes have taken place...There is a lack of clarity regarding the district's role in improvement.

Over the course of multiple meetings, the team studied McAdams & Katzir's (2013) models. The models served as a starting point for articulating the district's role in the improvement of school outcomes. The benefits and drawbacks of each of the three models as perceived by central administrators were recorded in meeting notes (see Table 2-3):

Table 2-3

Meeting Notes from District Model Meetings

Managed Instruction	Managed Performance/ Empowerment	Performance/Empowerment
+ we (central admin) will identify strategies + it will be the right magnitude + easier to allocate resources + district led	+ meet in the middle + buy-in from staff (teachers) + buy-in from leaders (principals) + we (central admin) can push back on strategies - challenging for resource allocation	+ buy-in from staff (teachers) + buy-in from leaders (principals) - no way to push back on strategies that don't fit - resource allocation

Note: This table depicts the advantages (+) and disadvantages (-) the central administrative team associated with each district model.

The district superintendent and chief academic officer were drawn to the performance/empowerment model based on their belief that lack of buy-in to improvement strategies by teachers generally leads to failed improvement efforts. All other cabinet-level leaders expressed a strong desire for the managed instruction model, with concerns expressed about the ability of schools to effectively identify and implement improvement strategies on their own. The discussion about which model to adopt required a total of three meetings at the end of which the team decided to "meet in the middle" and implement a managed performance/empowerment model with the caveat that the district could and would "push back" on schools when improvement strategies fell short or were not being implemented.

The team determined that the district would put “guard rails” on the selection of each school’s improvement strategy by having schools select strategies aligned to an established instructional framework created by the district. Given that the managed performance/ empowerment model seeks to support schools in effectively identifying improvement strategies that fit the context of the school (McAdams & Katzir, 2013), the team recognized a need to design systems and processes that would facilitate the involvement of central administrators in “pushing back” on the selection of strategies that were of an inappropriate magnitude or not aligned with the school’s data. In response to this, several processes were put into place to allow the district to influence the selection of strategies, including monthly check-ins between principals and central administrators to discuss strategy selection and implementation. Figure 2-6 shows the questions that guided monthly check-ins between the CAO, principals, and coaches.

These questions were designed to allow central administrators to “push back” on strategies that were not aligned with a school’s improvement needs.

Figure 2-6

Monthly Check-in as District Organizational Structure Aligned to Model

Monthly Principal Check-in Agenda
January 2021

Topic	Discussion	Next Steps
District-wide Data Tool ▪ Where were you with your November implementation benchmarks? ▪ What adjustments did you make? ▪ What are your February implementation benchmarks? ▪ What support do you need?	B met its implementation benchmarks and data targets. They are working on current implementation benchmarks.	Consider an implementation guide for teaching and reinforcing vocabulary. Otherwise, they have identified continued support from coaches during data teams as a needed support.
Data Team Development ▪ What is your area of focus? ▪ What is the rationale for that focus? ▪ What support do you need?	B used a tool that allows grade levels and classrooms to compare their data to the overall school level goal. First and fifth grades are not seeing the growth the other grade levels are. The data teams that are doing well are successfully identifying changes in instruction, and monitoring and adjusting (the last 2 data team practices on the Data Team Development Matrix). It might be worth focusing on those two data team practices schoolwide to address variability among teams.	We will have time at the January Principal’s Meeting to determine concrete actions and implementation benchmarks. It will be important to form partnerships with coaches to focus together on developing specific data team practices.

The selection of the managed performance/empowerment model began to drive district systems and organizational structures to support the ongoing improvement of schools. Despite this, issues continued with school selection of promising strategies that would bring about the dramatic improvement needed for students. For example, one school identified "turn and talk" as their approach to improvement. Another school focused only on coding informational text for two years without ever determining how the coding would be used to elevate rigor in discussions or writing.

The process described shows how Walnut Grove identified a model to help determine the kinds of interactions the district wanted to have with its schools. The model clarified the kinds of influence the district would have over the selection of improvement strategies at the school level, and what the role of the district would be in enacting school level improvement plans. The model

served as a critical starting point for the design of foundational infrastructure as Walnut Grove began to organize as a district for the continuous improvement of schools. Despite efforts to place "guard rails" on the selection of school level strategies, the selection of high-leverage strategies continued to be an issue.

Creating Infrastructure that Spans Multiple Communities of Practice: Boundary Spanning Infrastructure

The district organized for the improvement of its schools by implementing boundary spanning infrastructure. Boundary spanning infrastructure is defined as infrastructure (people, tools, processes) that brings together members of multiple communities of practice to engage in collaborative problem-solving in service of improvement strategies and goals (Farrell et al., 2022b).

Boundary Spanning Tools

Walnut Grove's improvement infrastructure began with the design of tools. The first boundary spanning tool on record is an implementation guide, as shown in Figure 2-7.

Figure 2-7

Sample Implementation Guide

	Basic	Effective	Advanced (Effective +)
Success Criteria	• Concretely describes what students must say, do, make or write to show they are progressing toward the learning goal • Communicated and visible to students	• Clear to all students • Directly connected to learning goal and standard • Evaluated to determine whether each student is progressing toward the learning goal	+Teachers create exemplars of student work that meets success criteria
Gradual Release of Responsibility	• Each element of gradual release focuses on student mastery of success criteria	• During focused instruction, teacher models new learning focused on success criteria by using I statements to demonstrate how the strategy, skill or task is used • During guided practice and collaborative learning, teacher provides scaffolds and prompts with a focus on student mastery of success criteria • During independent practice, teacher aggressively monitors student progress toward success criteria, giving feedback and/or pulling small groups as needed	+ Teacher uses information from strategic monitoring to determine next steps in structured teaching (focused instruction, guided practice, independent practice)
Strategic Monitoring	• Success criteria serves as monitoring focus. • Teacher checks independent work of every student by walking around the room • Teacher provides immediate, targeted feedback based on success criteria	• Teacher collects anecdotal data on student performance related to success criteria • Teacher cues students to revise answers (name the error, ask them to fix it, and tell them you'll be back)	+ In-the-moment adjustments are made to instruction based on student progress toward success criteria

Schools created implementation guides to define what classroom implementation of instructional strategies should look like at basic, developing, and advanced levels to improve student performance. A coach described, "I think it's one of the strongest tools we have. We all know what the expectation is around that goal or the practice that we're asking them to do. It defines what this has to look like, and it makes me know exactly how I need to perform and where I need to go next to be better." An implementation guide was a boundary tool because it allowed multiple communities of practice to engage with new practices in role-relevant ways. Teachers used an implementation guide to shape the implementation of an instructional practice in the classroom level. Principals used the same implementation guide to give focused instructional

feedback to teachers during observation cycles and to identify needs for professional development related to the instructional practice at the classroom level. Coaches used the same implementation guide to engage in coaching cycles for the purpose of moving teachers from basic implementation to advanced implementation. This description of how implementation guides were used in Walnut Grove shows that implementation guides were boundary tools that clarified for multiple communities of practice what new practices were likely to look like over time, thus, shaping instructional practices.

Boundary Spanning Practices

Boundary spanning practices evolved from traditional practices that involved members of a single community of practice in year one to practices intentionally designed to engage members of multiple communities of practice in year two. For instance, traditional grade-level data teams in year one evolved into student-centered coaching (Sweeney, 2020) of data teams in year two. This was confirmed by interviews and focus groups. Figure 2-8 shows the re-envisioned role of coaches as contributing members of the traditional data team who at the same time represented an additional community of practice, turning data teams into a boundary practice. A coach described the shift this way, "We're there to collaborate...we're not these experts coming in, we are walking the walk with them and walking in those trenches."

Figure 2-8

Student-Centered Coaching of Data Teams Training Slide

STUDENT-CENTERED COACHING OF DATA TEAMS

What it looks like in our system:

Coaches are contributing members of data teams.

Emphasis on monitoring student learning by examining student work and tracking changes in proficiency rates.

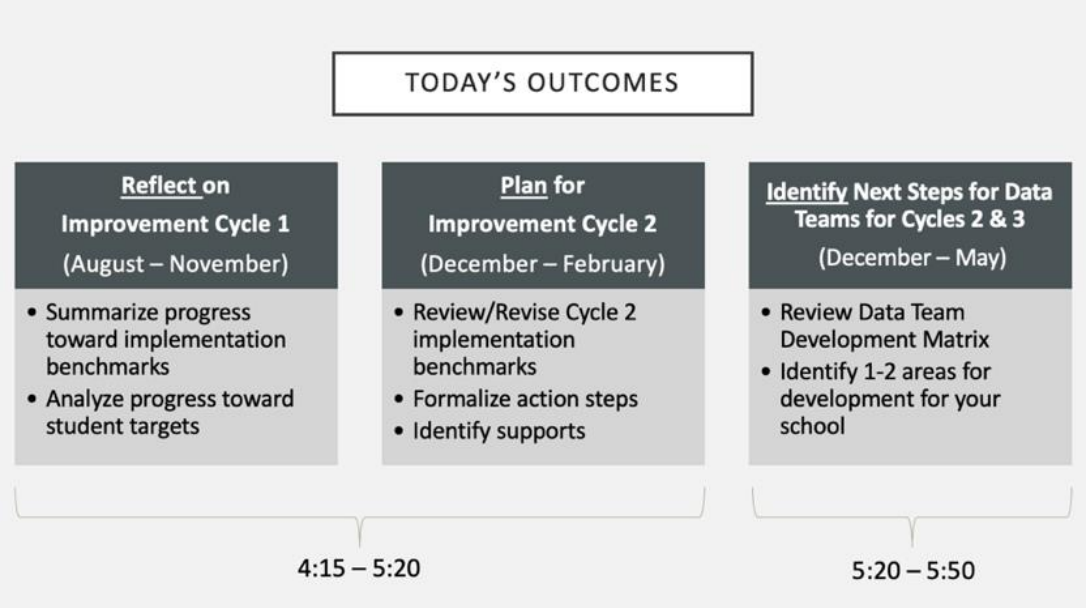
Emphasis on adjusting instruction based on student learning and success criteria.

Teachers may request follow up coaching, co-teaching, co-planning, or other support based on how students are progressing. (So data teams feed into coaching cycles.)

Monitoring of school level improvement efforts evolved from principals individually reflecting on the degree to which their improvement plans had been executed in year one to "Implementation Round-ups" in year two. Implementation Roundups brought together school implementation teams comprised of multiple communities of practice including the school principal, three teacher leaders, a coach, and a central administrator. When members of multiple communities of practice came together to evaluate school improvement at Implementation Roundups, this became a boundary practice. Figure 2-9 shows the agenda for an Implementation Round-up. The agenda focused on collaboratively examining implementation and student data to determine necessary adjustments to improvement plans, leading to the creation of place-based knowledge. A principal described the impact of this boundary spanning practice: "I see that our conversations in the last couple of years...they're at a deeper level now. They're not as superficial. I think it's added depth to what we're doing." This description of boundary practices shows how Walnut Grove shifted from siloed practices to practices specifically designed to bring together members of multiple communities of practice to focus deeply on improving instructional practice and creating place-based knowledge.

Figure 2-9

Implementation Round-up Agenda



Boundary Spanners

In year two, as boundary spanning tools and practices were leveraged, specific groups within the district began to be recognized as boundary spanners. This included two specific groups: district coaches and teachers on implementation teams. Coaches spanned boundaries through their work as data team members and implementation team members, and through their access to central administrators. Teachers who were implementation team members spanned school leaders, central administrators, and teachers. As one principal described,

> We'll brainstorm it, and then they [the implementation team] present it to the whole staff...they'll present the big topics of it and then present it to the staff for refining or for getting their feedback to then get it from their feedback to refine it so that it's this collective work.

The job description for implementation team members (Figure 2-10) highlights their role as both informing and communicating school-level strategy.

Figure 2-10

Implementation Team Member Job Description

LEAD IMPLEMENTATION TEAM MEMBER

Objective: The Lead Implementation Team Member is a teacher who plays a critical role in ensuring a school reaches student achievement goals by helping identify and reflect on the implementation of research-based instructional strategies and organizational structures. Lead Implementation Team Members will play a critical role in creating a culture of continuous learning and shared responsibility for all students by leveraging their instructional expertise, problem-solving skills, and influence.

In addition, the Lead Implementation Team Member:

- Attends leadership retreats in June and August (June 2021, August 2021, June 2022, August 2022, June 2023) to engage in beginning of year planning for and end of year reflection on rapid improvement cycles implemented throughout the year in support of improved instruction and student achievement for all students.
- Collaborates with school and district leaders to help align teacher supports to advance school-wide instructional priorities in support of improved instruction and student achievement for all students.
- Attends quarterly "Implementation Round-Ups" to engage in active monitoring of implementation data and student performance data and help identify next steps in action planning to reach student achievement goals.

Valued skills and dispositions:

- be committed to school-wide change
- be respected by colleagues
- possess leadership potential
- demonstrate effective interpersonal skills
- demonstrate comprehensive understanding of the teaching learning process, strategies to support student subgroups, culturally responsive pedagogy, and the district's Best First Instruction model
- demonstrate advanced data analysis skills
- demonstrate the ability and willingness to contribute to and communicate a collective vision for district-level and school-level work
- demonstrate the ability to think strategically while taking into consideration multiple points of view on a topic
- willingness and ability to contribute to the development of a well-designed plan of action for the school
- willingness and ability to inform district level systems development

The interactions of boundary spanners described here show that boundary spanners in Walnut Grove were able to access members of other communities of practice by engaging in boundary practices. The interactions were focused on improving instructional practices and creating place-based knowledge by identifying success criteria, determining the degree to which

success criteria were met, identifying changes in practice that aligned with success criteria, and monitoring and adjusting throughout the next cycle.

Conclusion

These findings show that Walnut Grove School District organized for the continuous improvement of its schools through the enactment of specific infrastructure. First, the district organized through interconnected, spiraled improvement cycles at the classroom, teacher team, school, and district levels. Second, the district organized by leveraging a model that clarified the role of the district in the improvement of its schools and building systems around that model. Third, Walnut Grove organized for the continuous improvement of its schools through the enactment of infrastructure that spanned multiple communities of practice in fostering instructional improvement.

Discussion and Implications

In this case study, a rural district organized for continuous improvement of its schools by implementing spiraled improvement cycles, creating infrastructure that spanned multiple communities of practice (boundary spanning infrastructure), and defining the role of the district in continuous improvement of schools. Given the limited research on how a rural district might organize for improvement of schools and the characteristics of rural systems that make them complex, this case shows that there are mechanisms that can be put into place in a rural district to systematize continuous improvement routines at all levels of the organization. Further, the findings from this case study suggest that while an articulated model of the district's role in the continuous improvement of schools is a starting point for infrastructuring, the use of spiraled improvement cycles and boundary infrastructure are complementary mechanisms in the enactment of rural district infrastructure for the continuous improvement of schools.

Clarified Role of District as a Starting Point

The findings from this study suggest that the adoption of a model that clarifies the role of a rural district in the improvement of schools served is an important starting point for the design of rural district infrastructure. Because well-defined infrastructure shapes interactions, having clarity about the role of the district in the continuous improvement of its schools prior to the enactment of infrastructure allowed for the infrastructure design to be targeted and intentional. The identification of a model to direct the design of infrastructure is an important consideration for rural districts wishing to enact infrastructure for the continuous improvement of schools.

The findings from this study also suggest that when designing rural district infrastructure, it is of the utmost importance to recognize strategic decision points and fortify the infrastructure surrounding those decision points through well-articulated processes designed to elevate and protect them. This finding supports Penuel's (2019) assertion that effective infrastructuring may take up to four years to complete and requires timely, often unpredictable adjustments. In this case study, the ability of the district to push back on schools about the selection of strategies was a critical element of the district theory of action and was recognized by central administrators as such. As implementation of the district's model played out, the infrastructure designed around the district's model was insufficient at elevating this critical point of collaboration between the district and schools. While the team felt strongly about the importance of the district pushing back when improvement strategies were deemed too narrow to bring about required change, the infrastructure did not include a clear, protected process for the district to push back. The lack of infrastructure to bolster this critical point of collaboration between district and schools led to schools choosing improvement strategies that had a low likelihood of bringing about the magnitude of performance required. When schools selected strategies that were not of the

appropriate magnitude to have a real impact on student data, there was not a specific structure, such as formal district approval of strategies, that required schools to revisit strategies and make revisions. For example, it would have strengthened the overall system to protect and isolate the elements in the system for the district to push back on schools. This was not done, and the result in several cases was that schools selected improvement strategies that were too narrowly focused to bring about required improvement in student performance. This speaks to the need to identify and fortify structures around critical decision points and points of collaboration in the design of rural district infrastructure.

Spiraled Improvement Cycles and Boundary Spanning Infrastructure as Complementary Organizational Structures

The findings from this study also indicate that boundary spanning infrastructure bolsters spiraled improvement cycles. As seen in Table 2-4, boundary spanning infrastructure undergirded every level of the spiraled improvement cycles.

Table 2-4

Boundary Spanning Infrastructure as Support of Spiraled Improvement Cycles

Level of Spiral	Boundary Practice	Boundary Tool	Boundary Spanners
Classroom		Implementation guides	
Teacher Team	Data teams	Data team protocol Data team development matrix	Teachers Coaches
School	Implementation roundups	School improvement cycle tool	Teachers Coaches School Leaders Central administrator
District	District improvement meetings	District improvement cycle tool	Central administrators Coaches

At the classroom level of the spiraled improvement cycles, implementation guides (boundary tools) informed the implementation of instructional practices. At the teacher team level of the spiraled improvement cycles, data teams became boundary practices with the inclusion of coaches as boundary spanners. Boundary tools (data protocols and a data team matrix) guided deep conversations about instruction. At the school level of the spiraled improvement cycle, implementation round-ups (boundary practice) brought together implementation teams (boundary spanners) to engage in reflection, adjustment, and planning through the use of a school improvement cycle tool (boundary tool). At the district level of the spiraled improvement cycle, central administrators and coaches (boundary spanners) convened twice each year (boundary practice) to engage in reflection, adjustment, and planning through the use of a district improvement cycle tool (boundary tool). At each level of the spiral, the focus was on identifying success criteria, identifying aligned instructional practices, and monitoring and adjusting. These behaviors match the behaviors necessary for the creation of place-based knowledge so desperately needed in rural districts to bring about improvement and equitable outcomes for all students. In fact, the findings from this case study suggest that spiraled improvement cycles supported by boundary infrastructure facilitate the creation of place-based knowledge at all levels of a rural district. Spiraled improvement cycles and boundary spanning infrastructure would appear to be complementary in the design of rural district systems for the continuous improvement of schools.

Future Research

As one of the first studies to look at how rural districts implement infrastructure, this study makes a significant contribution to the research on rural district infrastructure for the improvement of schools. This study sheds light on how complementary spiraled improvement

cycles and boundary spanning infrastructure may play a role in the creation of place-based knowledge at all levels of the organization. More research is needed to fully investigate the role of spiraled improvement cycles and boundary spanning infrastructure in rural district improvement. This study also illuminates how the use of a model regarding the district's role in the improvement of its schools supports the infrastructuring process. Further research is needed to gain insight into how districts might go about selecting a model that takes into account district context, goals, and resources.

Conclusion

For too long, research about the improvement of schools has neglected rural school districts, adding to inequities already experienced in rural settings. The failure to recognize the need to examine the mechanisms and structures that enable a rural district to effectively improve its schools has resulted in improvement efforts that are leader-dependent, unsustainable, or not contextually relevant. Enough is known about the culture, resource constraints, and policy inequities that are inherent to rural schools and communities to inform the design of rural district systems and infrastructure that will bring equitable outcomes for the students they serve in a sustainable, context-relevant manner. For the good of not only our rural students but our rural communities, it is critical that we continue to seek and find ways for rural districts to organize for school improvement. This is a call to action for all of us.

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CHAPTER 3

ANSWERING THE CALL: IMPLEMENTING INTERNAL BOUNDARY SPANNING INFRASTRUCTURE TO CREATE THE CONDITIONS FOR RURAL DISTRICT IMPROVEMENT

Abstract

This article is the second in a three-part series on rural district infrastructure to support the continuous improvement of schools. This qualitative exploratory case study was bounded in a single rural district in Colorado from 2021 to 2023 (Yin, 2018), and presesnts how Walnut Grove School District[4] organized for the continuous improvement of its schools. In this case study, I extend the concept of boundary spanning infrastructure from its traditional use in Research Practice Partnerships to use in a rural school district to organize for improvement of its schools. The findings suggest that boundary spanning infrastructure as an organizing structure for continuous improvement fosters key conditions for rural district improvement, including elevating relationships, fostering power sharing, and strengthening coherence.

Introduction

This article is part two of a three-part exploratory case study focused on how a rural district organized for the continuous improvement of its schools. Part one explored a single research question: How did a rural district organize for the continuous improvement of its schools? A finding from part one was that the district organized for continuous improvement of its schools by using boundary spanning infrastructure. Boundary spanning infrastructure allowed the district to engage multiple communities of practice in the continuous improvement process. Communities of practice included teachers, coaches, school leaders, and district leaders. This chapter builds on the finding that the district used boundary spanning infrastructure as a means

[4] Pseudonyms are used for all names and locations per IRB requirements.

of organizing for improvement and explores the research question: What role does boundary infrastructure play in rural district systems for continuous improvement of schools?

As discussed in part one, Walnut Grove selected a performance/empowerment model (McAdams & Katzir, 2013) as a starting point for district infrastructuring around school improvement. The performance/empowerment model is characterized by high levels of school autonomy to make instructional improvement decisions and high levels of school responsibility for realizing instructional improvement. In the performance/empowerment model, the district serves in a support role by providing tools and resources to facilitate the school's plan for improvement (McAdams & Katzir, 2013). The performance/empowerment model (McAdams & Katzir, 2013) requires the highest levels of trust and collaboration between staff and leaders (Hargreaves, 2016; Zuckerman et al., 2018, p. 3). The model also requires that leaders build a strong sense of coherence regarding school needs, the identified innovations, and the role of all staff (school and district) in the implementation of innovations (Zuckerman et al., 2018).

In this chapter, I will go into further detail regarding the nature of school improvement with an emphasis on the characteristics of rural district improvement that make it unique and complex. I will then describe how infrastructure from Research Practice Partnerships (RPPs) seeks to facilitate attributes of continuous improvement processes that the research says are critical to rural district improvement. I will discuss the findings and significance of a two-year case study of a rural Colorado district that seeks to illuminate the role that boundary infrastructure played in a rural district's systems for the continuous improvement of schools.

Literature Review

In this section, I will discuss the importance of sense-making, coherence, and social capital in rural district and school improvement. I will then describe how RPPs leverage

boundary work to foster sense-making and coherence across two communities of practice, university faculty and district staff. Next, I will discuss rural district infrastructure needs and show why infrastructure from RPPs lends itself particularly well to the rural district context. I will do this by describing how the capacities and infrastructure built through RPPs align with the capacities and infrastructure needed for rural district and school improvement. I will also describe the types of infrastructure leveraged within RPPs that may be replicated in rural districts in service of rural district and school improvement.

Rural Improvement: Sense-Making, Shared Leadership, Coherence, and Social Capital

Zuckerman et al.'s (2018) study of rural leadership suggests that in rural settings, schools and districts must engage in ongoing sense-making activities as innovations are moved into practice. In fact, one of the central roles of rural school and district leadership is to foster sense-making as a means of mediating local values and external demands (Zuckerman et al., 2018). Sense-making in rural settings requires the implementation of systems that enable collaboration, facilitate new learning (Scribner et al., 1999; Zuckerman et al., 2018), and develop social capital (Spillane, 2015). Sense-making is often facilitated in rural settings through shared leadership (Mette, 2018) that leverages the flattened, interconnected organizational structures inherent to many rural districts (Wargo et al., 2022). In fact, Mette's (2018) study of rural turnaround efforts found that by increasing buy-in and support from staff as well as the community, sense-making through shared leadership is a significant factor in successful rural school turnaround.

Coherence, built upon shared understandings and sense-making, is another critical factor for rural improvement (Harmon, 2018; Zuckerman et al., 2018). Honig and Hatch (2004) define coherence as the process of maneuvering through often competing external policy demands and a school's mission, vision, goals, and strategies. Coherence relies heavily on such practices as

ongoing two-way communication and collaborative goal setting (Honig & Hatch, 2004; Zuckerman et al., 2018). In rural settings, coherence is also important in fostering alignment, as Zuckerman et al. (2018) describe:

> While coherence emphasizes shared understandings, alignment describes the organizational mechanisms and processes that cross boundaries (e.g., between district and schools, or between classrooms) and allow these understandings to emerge. Such mechanisms and processes include routines for collective goal setting, systemic processes for curriculum revision, creating shared instructional practices, and developing meaningful assessments (Lawson et al., 2017). In turn, these features contribute to the work of aligning instructional systems. (p. 4).

This means that by leveraging organizational structures and routines that bring members of various communities of practice together to engage in critical improvement behaviors, shared understanding evolves and, in turn, actively contributes to the continued alignment of organizational structures and resources. This is important because schools are situated within the broader organizational structure of districts (Spillane, 2015). Zuckerman et al. (2018) assert that a district's ability to implement disruptive innovations in schools is heavily reliant upon coherence across levels of the organization.

To effectively leverage resources from the district, high levels of social capital must exist between school personnel and district personnel (Spillane, 2015). In Harmon's (2017) study of rural improvement, high levels of collaboration and social capital were found to help facilitate access to scarce resources common to rural districts. Spillane et al. (2015) define social capital as "real or potential resources for action attained through relationships" (p. 74). In this context, trust and expertise are "resources" that can be leveraged toward improved outcomes for students

(Spillane et al., 2015, p. 71). Social capital, according to Spillane et al. (2015), evolves over time; it is not a "social given" (p. 72). In rural schools and districts, dense social networks are associated with increased exchange of instructional knowledge, while less dense networks are associated with pockets of success and an inability to diffuse place-based knowledge in a way that allows a school or district to take such knowledge to scale (Woodland & Mazur, 2019). A relationship exists between the level of social capital that exists in a school and improved student outcomes (Spillane et al., 2015).

Rural District Infrastructure

The degree to which research-based practices are implemented in classrooms and schools is directly influenced by opportunities for practitioners to access, understand, and act upon such practices (Farrell et al., 2022; Frank et al., 2011). Thus, infrastructure that intentionally shapes how practitioners access, understand, and act upon research-based practices plays a key role in organizational learning and the creation of place-based knowledge (Farmer et al., 2022; Farrell et al., 2022). In rural districts, infrastructure to support the needs of teachers at varying levels of implementation of an innovation in implementing and adapting the innovation to local conditions is of particular importance (Farmer et al., 2022). Farmer et al. (2022) assert that rather than working from evidence-based practices established through national randomized trials, teachers in rural settings address issues of equity by adapting interventions, in essence shifting from an evidence-based practice approach to a practice-based evidence approach. Farmer et al. (2022) describe this practice-based evidence approach as one in which the ongoing collection of local data informs and guides responsive adjustments to teacher practice. "Rural schools need to know how to support the success of diverse learners with the resources and personnel they have and with strategies that are responsive to community needs, interests, values,

and opportunities" (Farmer et al., 2022, p. 293). Rural schools and districts must become adept at aligning resources and practices with the strengths and needs of the students in their classrooms (Farmer et al., 2022). Frank et al. (2011) echo this assertion, stating:

> The complexity arises from multiple sources: variability in student needs, which can influence decisions about what and how to teach; conflicts among organizational demands that arise from policies enacted at different levels of the organization; varying levels of coherence among curriculum, pedagogy, and assessments; and teachers' unique educational trajectories, which expose them to varying educational approaches. As a result, teaching is complex because teachers must adapt practices to local contexts and coordinate with each other as they do so (p. 139).

This speaks directly to the needs of rural districts, who must adapt evidence-based interventions to the local realities of their schools. Because this need is so profound in rural settings, rural district infrastructure must be intentionally designed to support this type of coordination.

Other studies have implications for the design of rural infrastructure. Klar et al. (2024) describe two important prerequisites for teacher learning in rural settings: structures that provide access, and conditions that foster trust. Spillane et al. (2018) found that access to staff perceived as having instructional expertise influences the degree to which teachers engage in advice-seeking behaviors related to instructional practices. These assertions have strong implications for the ways in which formal structures are designed to organize teachers for collaborative problem-solving, planning, and data analysis. This need for formalized structures in rural settings was clarified in a study by Woodland and Mazur (2019) that examined how rural school and district infrastructure influences knowledge sharing, with a focus on Professional Learning Communities. Data from Woodland and Mazur's study (2019) suggests that rural teachers engage

in significantly fewer hours of instructional dialogue with other teachers than urban or suburban teachers. The overreliance on informal structures is due to a faulty assumption that because rural schools tend to be smaller and are perceived as "tight knit," teacher collaboration happens naturally (Woodland & Mazur, 2019). Teachers who are not supported by infrastructure that enables the exchange of instructional knowledge are at risk of being less effective in the classroom (Woodland & Mazur, 2019). The overreliance on informal structures by rural districts points to a need for thoughtfully designed, formal structures to support teacher collaboration and learning.

Boundary Work as a Mechanism for Sense Making and Coherence

Coherence through ongoing sense-making is critical to rural school improvement work (Zuckerman et al., 2018). The ongoing development of shared understandings is also central to the work of RPPs (Coburn & Penuel, 2016; Klar et al., 2024; Wargo et al., 2021). An RPP in the education field is a specific type of partnership that works across university and district boundaries to identify and implement research-based solutions to address collaboratively defined problems of practice (Coburn & Penuel, 2016; Klar et al., 2024; Wargo et al., 2021). Boundary work, or "communicating across traditional group boundaries" (Wargo et al., 2021, p. 3) is a practice that is central to collective sense-making in traditional RPPs. In a traditional RPP, boundary work involves bringing together researchers from the university side of the partnership and practitioners from the district side of the partnership (Coburn & Penuel, 2016). Boundary work in RPPs facilitates the structured sharing of diverse perspectives, expertise, and resources from both sides of the partnership in service of addressing the problem of practice (Coburn & Penuel, 2016). Boundary work often leads to the adjustment of roles and responsibilities as a collective understanding of context, process, and outcomes occurs and authority is shared

(Coburn & Penuel, 2016; Wargo et al., 2021; Wilcox & Zuckerman, 2019). Thus, it is through boundary work that organizational learning occurs on each side of the partnership, and that collective sense-making that spans the partnership occurs (Farrell et al., 2022). To foster collective sense-making through boundary work, RPPs use specific structures that will help ensure the flow of expertise, diverse perspectives, and resources between partner organizations (Coburn & Penuel, 2016; Farrell et al., 2022). The concept of boundary work inherent to RPPs and the structures that support it have implications for sense-making and coherence-building critical to rural district improvement and associated infrastructure.

Commonalities in Capacities and Infrastructure between RPPs and Rural Districts

When using the infrastructure that supports effective RPPs as a lens for the design of rural district infrastructure, it is critical to note the common objectives of RPPs and rural districts with regard to implementing and adapting evidence-based practice. It is also important to understand how RPPs effectively meet such objectives. RPPs seek to support the implementation and adaptation of evidence-based practices (Farrell et al., 2022). This is done through the intentional design of interventions aligned with local problems of practice (Farrell et al., 2022). The RPP approach requires the design or redesign of infrastructure to support collaborative interaction with research (Farrell et al., 2022). The desired outcome of this collaborative interaction is to identify evidence-based practices with a high likelihood of addressing issues of equity, to implement and adapt practices effectively, and to scale practices deemed most effective (Farrell et al., 2022). This mirrors the desired outcomes described by Farmer et al. (2022), who assert that rather than working from evidence-based practices established through national randomized trials, teachers in rural settings address issues of equity by adapting interventions, in essence shifting from an evidence-based practice approach to a practice-based

evidence approach. Thus, the infrastructure that allows RPPs to effectively meet the objective of creating place-based knowledge lends itself well to rural districts also working toward this objective.

Critical to the work of creating place-based knowledge is what Farrell et al. (2022) term "absorptive capacity" (p. 200). Absorptive capacity, according to Farrell et al. (2022), is "an organization's ability to recognize the value of new information, assimilate it, and apply it" (p. 200). Through the enactment of specific RPP infrastructure, absorptive capacity allows members of an organization to convert research to place-based knowledge (Farrell et al., 2022). The capacity to leverage collaborative structures and infrastructure to convert research to place-based knowledge is also distinctly identified by Farmer et al. (2022) in their reference to the critical need for rural districts to take a practice-based evidence approach to addressing issues of equity by adapting interventions to local realities. Thus, the type of capacity and related infrastructure necessary for rural districts to improve their schools is precisely the type of capacity and infrastructure that RPPs seek to develop in partner organizations.

Boundary Spanning Infrastructure

RPPs and their associated infrastructure have demonstrated success in supporting the infusion, integration, and transfer of new knowledge to address enduring and complex issues of equity in districts and schools (Farrell et al., 2022; Frank et al., 2011). Infrastructure plays a key role in the work of RPPs by shaping the ways in which educators interact with data, research, and each other to create place-based knowledge (Farrell et al., 2022; Penuel, 2019). Boundary infrastructure plays a key role in the ability of RPP teams, comprised of district personnel and a university partner, to make use of the evidence base and address locally identified problems of practice (Farrell et al., 2022). Boundary infrastructure allows for shared engagement with the

evidence base for team members by helping create shared language, practices, and understandings (Farrell et al., 2022). Farrell et al. (2022) discuss boundary tools and boundary practices as key boundary infrastructure that support districts in making use of the evidence base. Spillane et al. (2018) go on to describe the additional role of boundary spanners.

Boundary tools. Boundary tools are tools that help to coordinate the work of different groups in an RPP (Farrell et al., 2022). Each group in the RPP benefits from the use of boundary tools in different ways that are relevant to that group's role in implementing the evidence-based practice that has been identified (Farrell et al., 2022). Examples of boundary tools include rubrics, improvement science tools, and protocols for collaboration. In a traditional RPP, boundary tools span across organizations. In my study, boundary tools will span across communities of practice within the district.

Boundary practices. Boundary practices are collaborative structures that facilitate the exchange of ideas among team members with varying roles and perspectives (Farrell et al., 2022). The purpose of boundary practices is to provide opportunities for team members with diverse backgrounds "to make sense of data and evidence, pose questions to one another, and deliberate possible courses of action" (Farrell et al., 2022, p. 199). Boundary practices may also allow for the negotiation and clarification of roles in implementing an innovation (Farrell et al., 2022). In a traditional RPP, boundary practices span across organizations. In my study, boundary practices will span across communities of practice within the district.

Boundary spanners. Boundary spanners are people in an organization whose roles allow them to span multiple communities of practice (Spillane et al., 2018; Wargo et al., 2021). In working across groups, boundary spanners serve as intermediaries, negotiating understanding between groups and helping build cohesion (Spillane et al., 2018). In a traditional RPP, boundary

spanners span across organizations. In my study, boundary spanners will span across communities of practice within the district.

Conclusion

Infrastructure design that recognizes the important roles of boundary tools, boundary practices, and boundary spanners plays a key role in promoting sense-making and coherence among all parties working together for the improvement of instruction in a district or school (Farrell et al., 2022; Spillane et al., 2018) while recognizing the importance of social capital in rural districts. Given the common objectives of RPPs and rural districts with regard to using and adapting evidence-based practice, and the proven effectiveness of boundary infrastructure in service of these objectives, the design and enactment of boundary infrastructure has promise as rural district infrastructure to support critical partnerships between a district and its schools.

Methods

In this section, I will describe the methods for case selection and describe the context of the district that was selected for this case study. I will describe how participants for focus groups, semi-structured interviews, and observations were selected. I will describe how I collected and analyzed data from a document review, focus groups, semi-structured interviews, and observations.

Research Question

This article is part of a broader three-part study exploring how a rural district organized for the continuous improvement of its schools. The initial case study found that the rural district organized for the continuous improvement of its schools through the implementation of boundary spanning infrastructure. This exploratory case study (Yin, 2018) builds upon that

finding by addressing a single research question: What role does boundary spanning infrastructure play in rural district systems for the continuous improvement of schools?

Case Selection

This qualitative exploratory case study was bounded in a single rural district in Colorado from 2021 to 2023 (Yin, 2018), and presesnts how the district organized for the continuous improvement of its schools. This study was conducted in Walnut Grove School District, a district designated as rural by the Colorado Department of Education (CDE, 2023). I was motivated to select Walnut Grove School District as my research site due to my ongoing collaboration with the district, their commitment to improving outcomes for all students, their rural designation, and the many equity issues faced by the district. Walnut Grove serves 2,332 students across five schools. The district has faced challenges with achievement and growth rates, with performance consistently below the state average across content areas and subgroups. Notably, the district serves a diverse student population, with 56% of students from poverty, 27% multilingual learners, and 74% minority students (Schoolview, 2023). The majority of Walnut Grove's students (68%) are Hispanic, with significant achievement gaps in math and language arts among subgroups between Hispanic and non-Hispanic students (Schoolview, 2023).

Participant Selection

I used purposeful sampling to select participants who were most able to contribute to an in-depth understanding of concepts related to the research question (Creswell & Poth, 2018; Yin, 2018). Given my ongoing work with the district, I had insight into which district employees were most deeply involved in the work over the course of several years. I also consulted with the Chief Academic Officer to check my perceptions related to participant sampling. Using the purposeful sampling strategy, I identified the two district principals as interviewees based on

their ongoing engagement with the work being studied. I also identified four district coaches as focus group participants based on their role as boundary spanners and their insights into district-wide processes and outcomes due to their involvement with all five district schools. In consultation with the Chief Academic Officer and Superintendent, I identified two schools that were using the data team protocols as intended and then identified data teams based on availability. Data teams consisted of 2-4 teachers, an instructional coach, and in one case an administrator. I also observed four implementation teams as a participant observer (Creswell & Poth, 2018). Implementation teams were comprised of school leadership, 2-3 teachers, an instructional coach, and a central administrator. I observed four of the district's five implementation teams based on their level of engagement in the process. Participants provided written consent.

Data Collection

I studied the role of rural district boundary infrastructure in the continuous improvement of schools through document analysis, a focus group, interviews, and observations. I chose semi-structured, role-specific interviews and focus groups as a source of data based on the ability of this type of data to support a deep understanding of participants' perceptions, experiences, histories, and other insights that might not be attainable through other data collection methods (Weiss, 1994). I conducted a focus group with four district coaches, semi-structured interviews with two of the five district principals selected through purposeful sampling (Creswell & Poth, 2018), and the Chief Academic Officer. I used a protocol to guide all interviews and focus groups. I used Zoom to conduct principal interviews and focus groups. I conducted the interview with the Chief Academic Officer in person and scripted the conversation. Participants were fully informed about the research question. I had access to participants due to ongoing engagement

with the district. Interviews and focus groups typically lasted two hours. I used a paid service to transcribe all principal interviews and focus group discussions and then cleaned and de-identified transcripts manually.

Observational data allows researchers to understand processes as they unfold in real-world settings (Creswell & Poth, 2018). I observed four school-level implementation teams to gain insights into the role of boundary infrastructure in rural improvement using purposeful sampling (Creswell & Poth, 2018). I served as a participant observer during these observations. Specifically, while observing, I also facilitated a process using established protocols to analyze school-level practices and their impact on student performance. Observations took place at the central office and lasted approximately two hours each. I also observed two school-level data teams. Observations of data teams took place in schools and lasted approximately 50 minutes each. I took descriptive and reflective notes during observations, with additional annotations added post-observation to capture initial impressions and contextual details.

In qualitative research, documentary evidence complements other sources of data to provide a more complete understanding of the phenomenon being studied (Yin, 2018). I collected data team protocols that had been filled out by teacher teams from three schools to gain a more complete understanding of the role of boundary spanning infrastructure in rural school improvement. I also reviewed meeting agendas and minutes including implementation round-up agendas, monthly check-ins attended by the Chief Academic Officer, coaches, and principals, and additional meetings with coaches and central administrative staff. I served as a participant observer during these meetings (Yin, 2018). I reviewed co-constructed tools including implementation guides, data team protocols, school and district improvement cycle tools, a data team development matrix, and an implementation team member job description, all of which are

artifacts of implementation. I also reviewed materials from training that occurred over the course of the study. Principals served as gatekeepers for their school's completed data team protocols, and three schools collected and shared their completed protocols with me. I had access to all other completed tools through a shared Google Drive with the permission of the district.

Analysis

First, I gathered relevant documents, focus group transcripts, and interview transcripts, and interview notes. For each data set, I took descriptive notes focused on my research question. This included jotting notes about anything I found interesting, important, relevant, or thought-provoking (Merriam, 1998). Taking notes on each data set allowed me to identify themes across data sets by identifying recurring ideas (Merriam, 1998). From my notes, I began to organize themes into higher-level themes and sub-themes. Each theme or sub-theme was intentionally conceptualized to synthesize multiple units of data from each data set (Merriam, 1998). In some cases, I referred to existing literature to gain clarity about themes.

Merriam (1998) suggests using the following criteria to select units of data for coding: a unit of data should be related to the research question being explored, and a unit of data should be the shortest bit of data that is interpretable on its own. I used these criteria to engage in my first round of deductive coding (Miles et al., 2020) using MAXQDA. For my first round of coding, I tested the themes and sub-themes using deductive coding while simultaneously using inductive coding to add themes and sub-themes to my notes. Once I finished my first round of coding, I used deductive coding for the additional codes I had identified (Miles et al., 2020). Some of the additional themes became sub-themes for the themes I had identified in the first-round coding. Others became stand-alone themes. This cycle of deductive coding, adding themes to my notes using inductive coding, reorganizing themes and sub-themes, and identifying units

of data for newly identified themes continued until I was unable to identify additional themes or sub-themes (Miles et al., 2020). Through the multiple rounds of coding, I clarified definitions of each theme to ensure each theme was "mutually exclusive" of the others (Merriam, 1998, Chapter 9). This means that all of my units of data aligned with one theme only rather than potentially aligning with multiple themes (Merriam, 1998). I used MAXQDA to sort units of data by code and subcode.

My next step was to determine the importance of each theme to my research question in order to identify findings. In qualitative research, "conveying an understanding of the case is the paramount consideration in analyzing the data" (Merriam, 1998, Chapter 9). Merriam (1998) identifies possible criteria for identifying findings. First, the frequency with which a theme is discussed or the number of data sources that reference the theme can be used to determine its importance (Merriam, 1998). A second criterion for determining importance is that the theme is critical in "conveying an understanding of the case" (Merriam, 1998, Chapter 9). This means that themes identified as findings communicate the most salient elements of the case that has been studied. Another criterion for determining importance is leverage (Merriam, 1998). Leverage refers to identifying themes that have a significant influence on the problem being researched. Finally, a researcher should be left with minimal unused themes (Merriam, 1998). I used these four criteria to identify the themes that became my findings. First, evidence for each finding came from at least two data sources, and each finding represents the highest frequency themes identified through coding. Second, the findings are the most critical elements in understanding the context, behaviors, and issues associated with my case (Merriam, 1998). Third, each finding represents an idea likely to have a significant influence on the problem being researched. And

finally, I made every effort to minimize the amount of unused data relevant to the research question in the themes identified as findings.

Findings

The analysis of documents, interview/focus group transcripts, and observational notes resulted in three significant findings to answer the single research question: What role does boundary spanning infrastructure play in rural district systems for the continuous improvement of schools? First, boundary spanning infrastructure emphasized relationships within continuous improvement routines. Next, boundary spanning infrastructure resulted in power sharing by elevating teacher voices, resulting in the increased credibility of the continuous improvement process. Finally, boundary spanning infrastructure strengthened the coherence of systems for continuous improvement.

Emphasizes Relationships within Continuous Improvement Routines

One finding from interviews and focus groups was that boundary spanning infrastructure elevated and emphasized relationships within continuous improvement routines. When discussing this aspect of boundary infrastructure, participants mostly referred to their relationships with coaches, who served as primary boundary spanners in the district. Principals engaged with coaches through boundary practices including implementation team meetings, monthly check-ins, and in some cases weekly meetings. Specifically, participants characterized boundary spanning relationships within the continuous improvement process in two key ways: boundary spanning relationships as supportive, and boundary spanning relationships as protective.

Boundary Spanning Relationships as Supportive

Participants discussed how relationships were “huge if trying to make change.” Specifically, in teacher improvement teams, teachers were not “willing to do uncomfortable work with a stranger” and benefitted from coaches making “supportive, organic connections.” When those connections were in place to support staff in working through the challenges of looking at student data and adjusting instruction, staff were “super open to it.” Participants communicated that supportive relationships with coaches allowed for greater honesty, openness, transparency, and willingness to look at instructional practices with a critical lens and discuss the impact of instruction on student performance.

Principals also identified boundary spanners, specifically coaches, as supportive of their work as school leaders, saying, "I could be vulnerable with them. I can't always." One principal described how her relationship with coaches provided support:

> It was okay for me to be like, "It's not working and I don't know why," or to celebrate and also be excited...and not feel like I was being too boastful. There was just this level of comfort and vulnerability that I appreciated this year very much.

This example describes how boundary spanning infrastructure leveraged supportive relationships as a mechanism for driving change. Boundary spanning practices provided a space for open dialogue and reflective practice. Relationships with boundary spanners fostered a culture of openness and reflection within the context of continuous improvement.

Boundary Spanning Relationships as Protective

Boundary spanning relationships were also characterized by both principals as having protective value. Both principals described feeling they “had allies” and had “people that could speak to what I was doing and justify what I was doing.” This was especially important as principals and their teams made high-stakes decisions to improve student performance. One

principal describes how she perceives the boundary spanning work she does with coaches as protective:

> I have the two people that every week have been alongside of me, who were at the implementation meeting sitting with me and my teachers...who are a part of every conversation...I feel like, "Okay, I know without a doubt, these two coaches have my back because they've been with me every week. They were a part of the implementation meeting when we had it back in August. They know my goals, they set my goals with me." It's like protection, I have a protective layer with me.

This sentiment, that boundary spanners and specifically coaches were allies and advocates, was shared by both principals.

This example shows how principals perceived boundary spanning relationships as providing protection and political cover. The political cover allowed principals to make school improvement decisions without fear of consequences or criticism. Thus, boundary spanning relationships enabled principals to navigate the tensions between district-level policy and school-level goals.

Fosters Power Sharing

Boundary spanning infrastructure was found to play a role in fostering power sharing. Power sharing through the enactment of boundary spanning infrastructure elevated the voices of teachers. In turn, it was perceived by participants that by elevating teacher voice, the credibility of the continuous improvement process was strengthened.

Observations of implementation teams consistently showed examples of power sharing from principals to teachers on the implementation team. Consider this account of an

implementation team meeting during which Shelly, a teacher on the team, is the first to identify a potential school-level priority, which is then adopted as the priority by the implementation team:

> The team records the trends they see in their data. They all step back and examine the trends. Shelly suggests they focus on vocabulary (without prompting). "If we are going to improve comprehension, we have to address vocabulary." The team pauses and considers this thought. Principal agrees. "Yes, it looks like vocab is important for us to address and monitor if we're at 43%." Team discusses other options. Maybe the focus should be comprehension. All agree vocabulary is the issue. Team goes on to map out mid-year and end-of-year goals around vocabulary.

Observation notes consistently describe implementation team members providing “the daily piece of what’s going on and how it’s working.” In this way, implementation team members contributed their perspectives and authentically engaged in shaping the school improvement efforts of each school.

Figure 3-1 shows the implementation team member job description. The implementation team member job description was used to communicate the expectations, commitments, and skills of teachers who wished to be on their school’s implementation team.

Figure 3-1

Implementation Team Member Job Description

LEAD IMPLEMENTATION TEAM MEMBER

Objective: The Lead Implementation Team Member is a teacher who plays a critical role in ensuring a school reaches student achievement goals by helping identify and reflect on the implementation of research-based instructional strategies and organizational structures. Lead Implementation Team Members will play a critical role in creating a culture of continuous learning and shared responsibility for all students by leveraging their instructional expertise, problem-solving skills, and influence.

In addition, the Lead Implementation Team Member:

- Attends leadership retreats in June and August (June 2021, August 2021, June 2022, August 2022, June 2023) to engage in beginning of year planning for and end of year reflection on rapid improvement cycles implemented throughout the year in support of improved instruction and student achievement for all students.
- Collaborates with school and district leaders to help align teacher supports to advance school-wide instructional priorities in support of improved instruction and student achievement for all students.
- Attends quarterly "Implementation Round-Ups" to engage in active monitoring of implementation data and student performance data and help identify next steps in action planning to reach student achievement goals.

Valued skills and dispositions:

- be committed to school-wide change
- be respected by colleagues
- possess leadership potential
- demonstrate effective interpersonal skills
- demonstrate comprehensive understanding of the teaching learning process, strategies to support student subgroups, culturally responsive pedagogy, and the district's Best First Instruction model
- demonstrate advanced data analysis skills
- demonstrate the ability and willingness to contribute to and communicate a collective vision for district-level and school-level work
- demonstrate the ability to think strategically while taking into consideration multiple points of view on a topic
- willingness and ability to contribute to the development of a well-designed plan of action for the school
- willingness and ability to inform district level systems development

The job description shows that implementation team members were expected to have a willingness and ability to identify barriers to full implementation of school-level strategies, analyze misconceptions of staff, and evaluate the effectiveness of training provided in support of improvement strategies and additional training needed. Further, teachers on implementation teams were expected to help communicate a clear vision for district-level and school-level improvement.

Principals and coaches perceived that the power sharing promoted by boundary spanning infrastructure resulted in the continuous improvement process being viewed as a process that could be trusted by teachers. The impact of the power sharing observed within implementation teams was described by a coach:

> They [implementation teams] have two big roles. They're distributed leadership. They're giving the messaging, the credibility to the implementation because they've been part of the decision-making, part of the conversation. I think they're part of the extension of the AP and the principal. I think they have increased insight and that helps strengthen the implementation. What they bring helps fortify the whole implementation.

This suggests that leadership extended to teachers on the implementation team gave credibility to the decisions made by the implementation team. It can be inferred that the coach was referring to credibility as perceived by teachers who were not members of the implementation team. Decisions made by the implementation team included school-level priorities, mid-year and end-of-year student performance goals, and professional development needed for teachers to be able to meet the goals.

These examples show that boundary spanning infrastructure allowed for the distribution of power across multiple communities of practice in Walnut Grove. The boundary spanning practice of implementation teams serves as a particularly strong example of how boundary spanning practices elevated teacher voice, enabling the valuable insights of those working with directly with students in classrooms to inform strategic school-level decisions. By elevating the voices of teachers, participants perceived that power sharing contributed to increased credibility regarding the continuous improvement process by teachers who were not on the implementation team.

Strengthens Coherence: How the Parts Fit Together

A third finding was that boundary infrastructure strengthened the coherence of rural district systems for continuous improvement. Coherence was fostered in three ways. First, boundary infrastructure strengthened coherence by creating transparency around roles and school-level priorities. Second, boundary infrastructure strengthened coherence by breaking down silos. Third, boundary infrastructure strengthened coherence by contributing to the alignment of school goals, strategies, support, and monitoring.

Creates Transparency

All participants communicated that boundary tools contributed to transparency across the district. When they discussed transparency, they referred to transparency around the roles of boundary spanners, and transparency around school-level goals and prioritized instructional strategies.

Roles of Boundary Spanners. Boundary spanning tools were created to articulate and clarify the roles of boundary spanners in the district. For example, a job description for implementation team members was created to recruit and identify teachers to participate in implementation teams (Figure 1). This was critical because, in the past, members of similar teams had been viewed by other teachers as "the favorites" or "the chosen ones" or "the ones who always agree." With the introduction of the boundary tool that clarified what implementation team members would be doing, people stopped "being offended." Teachers began to understand that the purpose was to "bring different perspectives as to what staff were experiencing and what the needs were."

In addition to the implementation team job description, instructional coaches created their own implementation guide about their role as coaches. This guide was shared with all district

staff to address "preconceived notions or preconceived definitions" of the role of coaches. This was particularly important as coaches shifted to becoming boundary spanners who were contributing members of teacher team improvement cycles. The coaches' implementation guide also allowed coaches to "monitor" their own success. As one coach described, "I can go in and review the implementation guide and say yes, I did that today...success criteria is basically what it is." Coaches perceived that the implementation guide "defines the sandbox" of their work and communicated to other communities of practice, "This is what we're supposed to do. It makes it transparent."

This example shows that clarifying the roles of boundary spanners using a boundary tool created a sense of transparency for all communities of practice about the role of boundary spanners and showed how the work of boundary spanners fit into the overall work of the district. The clarity regarding roles strengthened coherence by allowing all communities of practice to understand the purpose of boundary spanning roles and how boundary spanners played an integral role in the district's approach to continuous improvement.

School Level Goals and Prioritized Instructional Practices. All participants discussed how boundary spanning infrastructure fostered coherence by creating transparency around school-level goals and prioritized instructional practices. This was due in large part to how school goals and prioritized instructional practices were identified by the implementation team boundary practice, solidified with staff following implementation team meetings, and captured in the implementation guide boundary tool. Figure 3-2 shows an implementation guide that describes levels of teacher improvement team practices.

Figure 3-2

Teacher Improvement Team Implementation Guide

	Basic	Effective	Advanced (Effective +)
Articulating Grade-Level Expectations	▪ Teachers select a standard and a specific skill at grade level ▪ Teachers list characteristics of student work related to standard ▪ Teachers select 2 work samples aligned to standard	▪ Teachers select a priority standard and specific skill at grade level ▪ Teachers articulate key grade level expectations based on depth of knowledge at which the standard is written ▪ Teachers identify 2 work samples that are aligned to standard and meet criteria	+ Teachers articulate expectations for approached and does not meet
Identifying the Gap using Work Samples	▪ Teachers are able to recognize students who did not meet, are approaching, or have met/exceeded standards by examining student work samples	▪ Teachers use areas of weakness to identify the gap clearly and precisely between grade-level expectations and current performance for students who did not meet, are approaching, or have met/exceeded standards by examining work samples	+ Teachers identify strengths for each group of students
Planning and Implementing Instruction	▪ Team collaboratively plans for instruction based on data related to current performance or grade level expectations ▪ Monitoring system is identified	▪ Team collaboratively plans for whole group and small group instruction based on data related to current performance and grade level expectations ▪ Small groups are identified based on level of performance ▪ Team members articulate their monitoring system for student performance	+ Small groups are identified based on common misconceptions, not solely on level of performance + Individuals adjust their instruction in the moment
Identifying Promising Practices	▪ Team uses changes in student data to evaluate the effectiveness of instructional practices	▪ Team clearly articulates the connection between changes in data and instructional decisions made to determine specifically what led to changes in student performance	+ Team documents promising practices for the following year to inform Tier 1 instruction

All participants described how implementation guides contributed to high levels of clarity regarding prioritized instructional practices that classrooms were expected to implement. Participants consistently discussed how implementation guides contributed to transparency in this area by describing what specific instructional practices would look like at a basic, effective, and advanced level of implementation. As one principal described, "Nobody here can say, 'I don't know what we're focused on this year.' Instead, they're like, 'I know exactly what we're doing.' I think it makes the responsibility feel like everybody's, not just the implementation

team.” This quote exemplifies the sentiment of all participants that implementation guides clarified for all communities of practice the focus of the schools and district.

Boundary infrastructure in Walnut Grove also contributed to clarity around goals and prioritized instructional practices by creating a shared understanding. The shared understanding fostered a sense of collective responsibility and shared vision for instructional practice, contributing to cohesion around continuous improvement efforts.

Breaks Down Silos

Boundary infrastructure also played a significant role in strengthening coherence around continuous improvement by breaking down silos that existed among different communities of practice within the district. This included silos among teachers, school leaders, coaches, and central administrators. Breaking down silos led to stronger, more collaborative relationships among communities of practice. The silo that existed between teachers and coaches was addressed when coaches became members of teacher team improvement cycles as boundary spanners. As one coach described, “People [teachers] seek me out as opposed to...I used to call it trolling. I would go around and troll and hope I would snag someone. But now people reach out and want to think together or want to consider possibilities.” This implies that by becoming boundary spanners as contributing members of teacher team improvement cycles, coaches came to be seen as collaborators. When asked who they generally network with during the course of their work, coaches named data teams, building leaders, central administrators, and classified employees. Coaches also viewed themselves as "feedback loops" and a "connective force" because of the number of communities of practice they worked with on a regular basis as primary boundary spanners in the district. As one coach put it, "We are the conduit between the effectiveness of the systems and the learning piece of it. We connect."

Implementation team members also broke down silos as boundary spanners through their interactions at implementation team meetings with central administrators, principals, and coaches. Implementation team members then served as boundary spanners between the implementation team and teachers. Participants described how teachers on implementation teams "bring that lens of the day-to-day practice," and challenge principals and central administrators to consider that what they "perceive may not be reality" by sharing "the daily piece...what's going on and how it's working." It can be inferred that this broke down silos between teachers and leaders in the district, leading to a greater understanding of how district and school systems were shaping the interactions between teachers and students. A principal described the impact she saw, saying, "It provides a safer system in general because there's conversation. It's happening between our silos, whereas before it was just silos. That's been a big step forward this year."

The perception that boundary spanning infrastructure helped to break down silos was expressed by all participants. Boundary tools also broke down silos in the district by providing a shared vision for instruction and the continuous improvement process. Specifically, implementation guides and the data team development matrix provided clear guidelines for all communities of practice about the implementation of practices in the district.

The use of boundary infrastructure described here shows that boundary spanners strengthened coherence by breaking down silos in Walnut Grove. Boundary practices facilitated collaboration among all communities of practice in the district. Stronger collaboration among communities of practice in the district led to a deeper understanding of how district and school systems were shaping the work of teachers.

Contributes to Alignment

Boundary infrastructure also strengthened coherence by contributing to the alignment of school goals, strategies, support, and monitoring. Participants cited implementation guides as the primary boundary spanning tool contributing to alignment. Implementation guides brought coherence to the implementation of prioritized instructional strategies by allowing multiple communities of practice to support implementation in different but coordinated ways. Table 3-1 shows how implementation guides were used in unique and relevant ways by each community of practice in the district.

Table 3-1

Implementation Guide Use by Each Community of Practice

Teachers	Coaches	School Leaders	District Leaders
Reference for implementation of practices; planning	Focus for improvement teams; planning; coaching	Monitoring implementation; training; giving feedback to teachers	Resource allocation, including training

Individual teachers and teacher teams used their school's implementation guide as a reference as they began implementation of the school's prioritized instructional practice. Coaches used the school's implementation guide in their work with teacher team improvement cycles and as a source of coaching points for teacher development. Principals monitored the implementation of instructional strategies and gave feedback to teachers based on implementation guides. Central administrators used a school's implementation guide as a reference for resource allocation, including training.

A principal described how her school’s implementation guide supported teacher “reflection” and “guides our feedback, our observations.” She goes on to describe how coaches then followed up using the same tool:

> We keep pulling that [implementation guide] out...to do a check on where we are...It puts them [teachers] in charge of their own learning...if you're not feeling like you're going to make it by February, are we utilizing coaches? Are we asking for feedback?

This quote demonstrates how implementation guides were used to clarify practices, for individual monitoring by teachers, to identify the need for support, and for monitoring by schools.

The use of boundary infrastructure described here shows that boundary infrastructure strengthened coherence by contributing to alignment in Walnut Grove. Boundary tools contributed to alignment by clarifying the connections between goals, strategies, supports, and monitoring and by helping to coordinate the work of multiple communities of practice in service of shared goals.

Conclusion

These findings show that boundary infrastructure played multiple roles in district systems for the continuous improvement of schools in Walnut Grove School District. First, boundary infrastructure leveraged supportive relationships as a mechanism for change and protective relationships as a way for school leaders to navigate the tensions between district-level policy and school-level goals. Second, boundary spanning infrastructure fostered power sharing by elevating teacher voice within the district's continuous improvement processes, leading to increased credibility of the process. Finally, boundary infrastructure strengthened coherence by improving transparency, breaking down silos, and fostering alignment.

Discussion and Implications

The findings from this case study represent part two of a three-part study about rural district systems that support the continuous improvement of schools. In this case study, a rural

district organized for continuous improvement of its schools through the implementation of boundary spanning infrastructure. The findings from this study address the research question: What role does boundary spanning infrastructure play in rural district systems for the continuous improvement of schools? In this case study, the implementation of boundary infrastructure in Walnut Grove School District played a role in emphasizing relationships within continuous improvement routines, fostering power sharing across communities of practice, and strengthening the coherence of district systems for the continuous improvement of schools. Given the limited research on rural district infrastructuring in general and the use of boundary spanning infrastructure for rural district improvement more specifically, this case study makes a significant contribution to the research on rural district infrastructure for the improvement of schools. In this section, I will discuss the connections between boundary infrastructure and rural district improvement, discuss the practical implications of the connections, and make recommendations for future research.

Boundary Spanning Infrastructure: Creating the Conditions for Rural Improvement

Existing research (e.g., Harmon, 2018; Sutherland et al., 2023; Zuckerman et al., 2018) has established that relationships, power sharing, and coherence are critical conditions for rural district and school improvement. What is less understood are the organizational structures that leverage and foster these conditions within the context of rural district improvement. In this article, I extend the concept of boundary infrastructure from its traditional use in RPPs to use in a rural school district to organize for the improvement of its schools. The findings from this study suggest that the conditions for rural district improvement are created through the design of rural systems that emphasize boundary spanning infrastructure.

Boundary Tools

The intent of boundary tools in traditional RPPs is to coordinate the work of different communities of practice by providing common tools that are used in different but relevant ways by each community of practice (e.g., Farrell et al., 2022; Penuel, 2019). In Walnut Grove School District, boundary tools were found to contribute significantly to the rural continuous improvement condition of coherence. Boundary tools served two important purposes in relation to coherence: creating transparency around roles and prioritized instructional strategies, and coordinating efforts. Transparency related to roles allowed all communities of practice to understand how the work of boundary spanners fit into the overall work of the district. The shared understanding of goals and prioritized instructional practices fostered a sense of collective responsibility and a shared vision for instructional practice. Additionally, through strengthened coherence, the district was able to align goals, strategies, supports, and monitoring. This suggests that boundary tools played a role in the coordination of efforts across communities of practice in Walnut Grove, maximizing the impact of each community of practice and contributing to strengthened coherence of continuous improvement efforts.

Boundary Practices

The intent of boundary practices in a traditional RPP is to provide a structure for diverse perspectives to be shared by bringing together members of different communities of practice (e.g., Farrell et al., 2022). In Walnut Grove School District, boundary practices were found to contribute significantly to each condition for rural district improvement. Boundary practices contributed to both supportive and protective relationships by providing structured time and space for regular conversations focused on continuous improvement. Boundary practices contributed to power sharing by providing opportunities for teacher voice to be elevated within the continuous improvement process. Boundary practices contributed to coherence by breaking

down silos among communities of practice through ongoing dialogue focused on the identification, implementation, and monitoring of improvement efforts. This suggests that in Walnut Grove, structured boundary practices served as a conduit for bridging social capital in rural district improvement, promoting a sense of shared ownership and investment in improvement efforts across communities of practice and enhancing the credibility of the continuous improvement process.

Boundary Spanners

Boundary spanners are those whose roles allow them to span multiple communities of practice (e.g., Spillane et al., 2018; Wargo et al., 2021). In Walnut Grove School District, the primary boundary spanners cited were district coaches and teachers on the implementation team. Boundary spanners were found to contribute significantly to each condition for rural district improvement. Of note, boundary spanners in Walnut Grove leveraged boundary tools and boundary practices to contribute to the development of relationships, power sharing, and coherence. Boundary spanners contributed to supportive relationships through ongoing, open reflection about instructional practices with other communities of practice. Boundary spanners contributed to protective relationships with principals by serving as allies in the identification, implementation, and monitoring of instructional practices. Boundary spanners also contributed to protective relationships by serving as advocates and supporting sense-making by central administrators regarding school-level strategy selection and implementation. Boundary spanners contributed to power sharing through their willingness and ability to contribute their unique perspectives and actively inform strategic decisions at the school. Boundary spanners contributed to coherence by breaking down silos through ongoing collaboration and networking with other communities of practice. This suggests that the work of boundary spanners

contributed to the ability of schools and teachers to navigate school-level goals and district expectations while contributing to a deeper understanding of how district systems were shaping the work of teachers.

Practical Implications

Table 3-2 shows which type of boundary spanning infrastructure played a role in each condition for rural district improvement in Walnut Grove. The connection between each element of boundary spanning infrastructure and condition for rural improvement has several important implications for practice.

Table 3-2

Type of Boundary Infrastructure Associated with Conditions for Rural District Improvement

Boundary Spanning Infrastructure	Relationships	Power Sharing	Coherence
Boundary tools			x
Boundary practices	x	x	x
Boundary spanners	x	x	x

The first practical implication of this research focuses on boundary spanners. Boundary spanners played a significant role in developing relationships, in power sharing, and in strengthening coherence. This suggests that boundary spanners influence each condition for rural district improvement. Due to this, schools and districts must be selective about who will serve in boundary spanning roles. Schools and districts should consider the willingness and ability of potential boundary spanners to build relationships, serve as advocates, support sense-making across communities of practice, and engage in ongoing collaboration and networking. Primary boundary spanners should be provided training and opportunities for facilitated reflection to foster their skills and abilities to effectively work across communities of practice. They should

recognize the importance of their role in fostering the conditions for rural district improvement as well as in the general continuous improvement process.

A second practical implication focuses on boundary practices. In Walnut Grove, boundary practices influenced each condition for rural district improvement and were a conduit for bridging social capital. Further, boundary spanners leveraged boundary practices to impact each condition of rural district improvement through their work. Thus, it was mainly through the work of boundary spanners leveraging boundary practices that the conditions for rural district improvement were developed. This suggests that careful consideration should be given to the design and facilitation of boundary practices. Boundary practices should be designed to intentionally bridge specific communities of practice at specific times based on district context for the purpose of supporting information flow, sense-making, and shared ownership.

A final implication focuses on boundary tools. In Walnut Grove, boundary tools were associated only with coherence, and within coherence, they were most closely associated with alignment. The fact that boundary tools were associated with one condition for rural district improvement versus three should not detract from the importance of boundary tools. In fact, some might argue that alignment is its own condition for rural district improvement rather than being a sub-category of coherence. Alignment in rural districts is important because it helps to bolster effective resource allocation, clarity, and accountability. It helps create a shared vision for not only instructional practice but for the work of continuous improvement. Boundary tools should be intentionally designed to provide focus and transparency while helping coordinate the work of each community of practice as they come together to collectively engage in the continuous improvement process.

Future Research

While this research makes a significant contribution to the existing research on rural district improvement, further research is recommended to better understand the role of boundary spanning infrastructure in rural district improvement of schools. First, further research is needed about the necessary skills and dispositions of primary boundary spanners. Further research is also recommended regarding teacher perspectives on the role of boundary infrastructure in the continuous improvement process. Finally, while this study examined the role of boundary infrastructure in fostering a specific set of conditions for rural district improvement, it is also important to study the impact of boundary infrastructure on place-based knowledge creation, and ultimately on improved student performance.

Conclusion

This article makes a significant contribution to the research on rural district infrastructure for the improvement of schools. By extending the concept of boundary infrastructure from its traditional use in RPPs to use in a rural school district to organize for improvement of its schools, this study concludes that the conditions for rural district improvement, including relationships, power sharing, and coherence may be facilitated through the design of infrastructure that intentionally spans multiple communities of practice. Creating the conditions for rural district improvement is an important step in improving outcomes for students in rural settings, but more work must be done to determine how the conditions and the infrastructure that foster the conditions allow schools and districts to take the next step of creating place-based knowledge.

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CHAPTER 4

THE CASE FOR ESSA'S TIER IV: RURAL INTERNAL BOUNDARY INFRASTRUCTURE AS A LEVER FOR THE CREATION OF PLACE-BASED KNOWLEDGE

This article is part three of a three-part exploratory case study focused on how a rural district organized for the continuous improvement of its schools. Part one explored a single research question: How did a rural district organize for the continuous improvement of its schools? In this study, I found that the rural district organized for continuous improvement of its schools by using boundary spanning infrastructure. Part two built upon this finding to explore the research question: What role does boundary infrastructure play in rural district systems for continuous improvement of schools? In this study, I found that in Walnut Grove School District[5], boundary infrastructure fostered the conditions for rural district improvement, including relationships, power sharing, and coherence. My third article examines boundary infrastructure as it relates to implementing and adjusting practices from the Every Student Succeeds Act's (ESSA) tiered evidence base. I explore a single research question: How did a rural district leverage internal boundary infrastructure to create place-based knowledge? Using an exploratory case study design, I collected data over a three-month period, including observations, interviews, and documents to examine how boundary infrastructure was leveraged at the classroom, school, and district levels. The resulting analysis indicates boundary infrastructure was leveraged to foster coordinated, defined roles for the creation of place-based knowledge at each level of the system.

Review of Research

[5] Pseudonyms are used for all names and locations per IRB requirements.

In this section, I give an overview of ESSA's tiered supports. Next, I outline some of the unintended consequences of ESSA's tiered evidence base requirements. I then discuss the impact of ESSA's tiered evidence base requirements on rural districts by outlining how place-neutral implementation by states results in disadvantages for rural districts. I describe the opportunity Tier IV presents for rural districts to engage in place-based knowledge creation. Finally, I give an overview of boundary infrastructure and describe how it connects with the creation of place-based knowledge.

ESSA Tiered Evidence Base

In 2015, ESSA was signed into law as the reauthorization of the Elementary and Secondary Education Act (ESEA). This marked a transition from the previously legislated No Child Left Behind (NCLB) Act that had been the law of the land in education since 2002 (Congressional Research Service, 2022). While hallmarks of NCLB included state testing, school and district accountability, and an emphasis on standards, it was perceived by some as holding schools accountable for poverty and other far-reaching societal challenges (McGuinn, 2016). ESSA redefines the federal role in education and gives power back to states to evaluate school performance and intervene when schools are underperforming (McGuinn, 2016). This shift has resulted in "hope that increased state flexibility will return schools to local control and unleash innovation" (McGuinn, 2016, p. 406). In fact, a key underpinning of ESSA is the support of place-based practices that leverage the existing evidence base in a way that encourages informed innovation (US Department of Education, n.d.).

ESSA leverages the implementation of evidence-based practices through the design of a tiered framework. This framework categorizes practices and programs into tiers based on criteria including study design, outcomes, and sample sizes, forming the bedrock of ESSA's evidence-

based approach (REL Midwest, 2019). As shown below in Table 4-1, Tier I: Strong Evidence includes practices and programs that have undergone rigorous experimental study, backed by substantial sample sizes of 350 or more. Tier II: Moderate Evidence is comprised of practices and programs subjected to rigorous quasi-experimental investigations, again with comparable sample sizes. Tier III: Promising Evidence encompasses practices and programs with correlational evidence.

While ESSA emphasizes the implementation of practices and programs that meet threshold criteria for evaluation from Tiers I-III (Congressional Research Service, 2022), it also conveys an expectation that federal funding will be leveraged to "support and grow local innovations – including evidence-based and place-based interventions developed by local leaders and educators" (US Department of Education, n.d., para. 9) as a means of advancing equity at the local, state, and national levels. This expectation is reflected in ESSA's Tier IV. Tier IV: Demonstrates a Rationale) is reserved for practices and programs with well-structured logic models grounded in sound research but lacking the extensive empirical evidence to allow for placement in Tiers I through III (REL Midwest, 2019). It is the lever for place-based knowledge creation.

Table 4-1

ESSA Tiers of Evidence

Criteria for the ESSA Tiers of Evidence			
Tier I: Strong Evidence	**Tier II: Moderate Evidence**	**Tier III: Promising Evidence**	**Tier IV: Demonstrates a Rationale**
▪ Well-designed and implemented experimental study ▪ Significant favorable effect on relevant outcome	▪ Well-designed and implemented quasi-experimental design or randomized controlled trial with high attrition	▪ Well-designed and implemented correlational study or well designed and implemented randomized controlled trial or quasi-experimental	▪ Well-designed logic model ▪ An effort to study the effects currently or soon to be underway ▪ Based on rigorous research

▪ No overriding negative effects from causal studies ▪ Large, multisite sample ▪ Overlaps with student population and setting	▪ Significant favorable effect on relevant outcome ▪ No overriding negative effects from causal studies ▪ Large, multisite sample ▪ Overlaps with student population	design without a large/multi-site sample ▪ Statistical controls for selection bias ▪ Significant favorable effect on relevant outcome ▪ No overriding negative effects from causal studies

Note. A large sample is 350 or more students. A multisite sample is more than one school. Multiple studies can be combined to meet the large and multisite sample requirements as long as all studies meet the other requirements and examine the effects of an intervention on the same outcome domain. Adapted from AIR (2019).

Policymaker Perceptions Versus Realities of Schools

ESSA's tiered evidence base is predicated on the theory that schools, districts and states will experience better student outcomes if they implement practices that have been demonstrated by replicable research to be effective in multiple settings, such as those in ESSA's Tiers I-III (Yoshizawa, 2020). This has led many State Education Agencies (SEA) to impose requirements that schools and districts adopt programs and practices from ESSA's Tiers I-III to qualify for federal grant funding. While at face value this may stand to reason, the requirements enacted by many SEAs reflect a misconception by policymakers related to the roles of educators and ways in which they use research for various purposes (Farrell et al., 2022a). Farrell and colleagues conducted several studies examining how districts use research (e.g., 2022a, 2022b). The researchers describe the requirements as derived from a narrow view of leadership and school improvement by policymakers, noting:

> Overall, ESSA presents normative views of educational improvement as anchored in the adoption of programs and interventions and leadership practice as focused on making

> decisions about resource adoption. In this view, leaders are solitary actors engaged in principally cognitive acts of reviewing evidence and drawing conclusions from causal impact studies to make decisions over programs (Farrell et al., 2022a., p. 2).

Here, the researchers clarify the disconnect between the perceptions of policymakers and the reality of school and district practice.

While an impact study may indeed support the selection and adoption of programs, district leaders identified a variety of key job responsibilities in which other types of research were of greater value (Farrell et al., 2022a). These job responsibilities include planning professional development, providing instructional leadership and personal leadership development, and the design of policies and programs (Farrell et al., 2022a). District leaders preferred for research that is "actionable, relevant, and connected to daily practice (which) may, at times, stand in contrast to characteristics of research valued by the policy and research communities" (Farrell et al., 2022a, p. 13). Respondents named books, policy reports, frameworks, and peer-reviewed journal articles as the kinds of research that are most useful for district leaders (Farrell et al., 2022a). Most of these sources do not meet the criteria for the upper tiers of ESSA; rather, these sources would be considered Tier IV evidence. It is therefore critical that the evidence base acknowledged by policymakers reflect the actual context of the continuous improvement needs experienced by district leaders and schools.

The limited range of viable evidence for continuous improvement, as currently enacted by policymakers, has several important consequences. First, the narrow view places considerable limitations on what is to be considered quality research to guide continuous improvement efforts in districts and schools. Based on this view, evidence that Demonstrates a Strong Rationale (Tier IV) fails to meet ESSA requirements, resulting in the exclusion of countless research studies.

Second, it may limit guidance for district leadership beyond the adoption of programs and practices with impact studies. Third, it can prompt districts to prioritize "what counts" over "what's useful" (Farrell et al., 2022a, pp. 3-4). Districts may prioritize complying with ESSA requirements at the expense of factors like contextual fit. For districts, and specifically rural districts, to be able to maximize the use of ESSA's tiered evidence-base, policy enactment must strike a balance between considering the evidence base that backs a practice or program and the contextual fit of the practice or program for the schools and districts that will be using it.

Place-Neutral Expectations for Implementation of ESSA's Tiers

ESSA's tiered framework plays a key role in promoting evidence-based practices, yet it is crucial to acknowledge that practices with a record of success in non-rural educational settings may not necessarily translate to success in rural school systems. According to Showalter et al. (2019), "Many rural students are largely invisible to state policymakers because they live in states where education policy is dominated by highly visible urban problems" (p. 34). Rather than supporting a clear vision for rural education, education policy implementation in rural districts often consists of flexibilities that allow districts to work around detrimental policy structures that were created with urban and suburban systems in mind (Brown & Schafft, 2018). Rural scholars therefore assert the lack of coherence around rural education policy is more broadly damaging to rural communities because of the close connections between rural school systems and community development (e.g., Brenner, 2022; Brown & Schafft, 2018; Schafft, 2016).

Despite the number of students, schools, and districts impacted by the rural education policy context, rural education is often an afterthought for policymakers (Brown & Schafft, 2018). The lack of consideration given to the rural sector is particularly troubling given the

intersectionality of poverty and race experienced by many rural communities (Azano et al., 2022). Brenner (2022) speaks to the danger of "the assumption of place neutrality" in policy design (p. 37). Specifically, Brenner (2022) suggests critical policy analysis is necessary to determine whether consideration has been given to the capacity of rural districts to enact policy requirements, suggesting that the lens of neutrality is often damaging to rural systems.

Brenner's (2022) assertion of the assumption of place neutrality in the design and enactment of public policy is of particular importance in the analysis of ESSA. Elements of the federal policy, such as the Rural Education Initiative and the Rural Education Achievement Program, are intended to address ESSA's place-neutral stance (Brenner, 2018). Nonetheless, barriers to the effective implementation of ESSA continue to exist for rural districts (Blad, 2019). This is due in part to the place-neutral stance taken by SEAs requiring that federal grant funding only be used by districts for the implementation of practices and programs from the top three tiers of ESSA's evidence base (Brenner, 2018; 2022). ESSA therefore pushes for the implementation of metro-centric evidence-based practices in rural districts (Brenner, 2018).

The limitations imposed by SEAs around the use of federal grant funds for the implementation of evidence-based practices are a barrier for rural districts for several reasons. First, a known rural research gap exists around practices with strong effectiveness in rural settings, and practices and programs with strong evidence to support their effectiveness in an urban setting may prove to be a weak fit when implemented in a rural setting (Blad, 2019). Second, the vendor-centric approaches that comprise much of the upper tiers of ESSA (for more, see VanGronigen et al., 2022), which are implemented in large rural districts may not be feasible in small rural districts due to cost or other resource constraints (Blad, 2019). The metro-centric policy context in many states requiring districts to adopt practices and programs from ESSA's

top three tiers places rural districts at a significant disadvantage when competing for grant funding (Brenner, 2022). A better solution would be to allow rural districts to select evidence-based practices with strong contextual fit, and design infrastructure that effectively supports the creation of place-based knowledge.

The Promise of Tier IV for Place-Based Knowledge Creation

For rural districts, a feasible alternative to the use of impact studies lies in ESSA's Tier IV. Tier IV focuses on the use of practices and programs with a strong rationale to support the production of place-based knowledge by practitioners (Conaway, 2018). Tier IV was designed specifically to encourage innovation at the local level and ties directly to ESSA's key outcome of encouraging local innovation, with local voice, through the disciplined implementation and evaluation of evidence-based and place-based interventions (REL Midwest, 2019).

A study by Conaway (2018) examined how the Massachusetts Department of Education leveraged ESSA's Tier IV evidence-base to create a highly contextualized turnaround model for Massachusetts' schools. Massachusetts has documented positive results in turnaround schools engaged in disciplined implementation of the state's model (Conaway, 2018). In Conaway's (2018) discussion of Massachusetts' strategic use of Tier IV, she notes:

> Thanks to this iterative process of providing support, studying its impact, and making improvements, our turnaround model has become strong enough that more than half of our lowest-performing schools have exited turnaround status. Not only has this process allowed our state agency to get better at policy and program development but, over time, we've been able to gather enough evidence of the effectiveness of our turnaround model that it now meets the ESSA evidence requirement for implementation in our lowest-performing schools (p. 1).

This quote illustrates how disciplined implementation of Tier IV evidence may dramatically improve student outcomes while contributing to the evidence base. Conaway's findings also speak to the cyclical process of studying the impact of practices and making the adjustments necessary to ensure the intended impact is achieved (2018). The use of Tier IV evidence may therefore be a compelling option for rural districts. Nonetheless, the effective use of Tier IV requires rural districts to design infrastructure that effectively supports the creation of place-based knowledge through the infusion of new knowledge, adaptation based on local needs, and diffusion of effective adaptations (Farmer et al., 2022).

Boundary Spanning Infrastructure

In rural settings, the creation of place-based knowledge is critical to improvement, and infrastructure designed to support rural district improvement must foster the creation of place-based knowledge. As discussed in Article 2, boundary infrastructure from Research Practice Partnerships (RPPs) shapes how educators interact with data, research, and each other to create place-based knowledge (Farrell et al., 2022b; Penuel, 2019). By leveraging boundary infrastructure, RPPs have demonstrated success in supporting the infusion, adaptation, and diffusion of new knowledge to address enduring and complex issues of equity in districts and schools (Farrell et al., 2022b; Frank et al., 2011). Given the similarities between the outcomes facilitated through boundary infrastructure and the needs in Walnut Grove School District (for more, see Introduction and Article 1), this research generalizes the use of boundary infrastructure to the continuous improvement work in the district.

Conclusion

The place-neutral stance taken by states in the enactment of ESSA's tiered evidence base (Brenner, 2018; 2022) communicates a failure to acknowledge rural realities and needs. If rural

students are to receive equitable benefit from ESSA, it is critical to better understand rural district infrastructure that elevates an understanding of local realities and supports districts in creating place-based knowledge using practices that are a strong contextual fit from any of ESSA's tiered evidence-based practices. Research focused on district infrastructure that supports rural schools in creating place-based knowledge using evidence with a strong contextual fit is of particular importance in a state like Colorado, where over 80% of school districts are considered rural (CDE, 2021) and the SEA's grants require evidence-based practices from ESSA's top three tiers (CDE, 2023). Given the lack of research that examines rural-specific improvement from a systems perspective, it is necessary to create a framework through which the creation of place-based knowledge may be examined.

Theoretical Framework

Successful rural district improvement relies heavily on engagement and shared responsibility across all levels of the system (Andreoli & Klar, 2020; Barley & Beesley, 2007; Chance & Segura, 2009; Sutherland et al., 2023). In this study, I am investigating place-based knowledge creation in a rural district, which requires analytic framing that isolates and defines different levels of a system. As this scope of research has not previously been studied, I draw from two theories to fully investigate the dimensions of systems-based continuous improvement in a rural district (see Table 4-2).

Table 4-2

Place-Based Knowledge Creation: Classroom and School Levels

Classroom Level: Levels of Teacher Implementation
Novice: Awareness of the innovation
Intermediate: Exploration and initial adaptation of the innovation
High: Adaptation of the innovation for effectiveness in the local setting
School Level: Actions Taken by Knowledge-Creating Schools
Auditing working knowledge

Managing the process of creating new professional knowledge
Validating the professional knowledge created
Disseminating the professional knowledge created

Note: This framework enacts Hargreaves' (1999) Levels of Teacher Implementation and Frank et al.'s (2011) Actions Taken by Knowledge Creating Schools.

To frame my analysis of the classroom level work, I draw from Frank et al.'s (2011) levels of teacher implementation theory as a framework for place-based knowledge creation by educators. Frank et al. (2011) explain, "We develop a trajectory of knowledge adaptation and evolution, as abstract knowledge is introduced from outside the organization, adapted as it is implemented on the shop floor, and then articulated as it circulates throughout the organization" (p. 138). Thus, as new knowledge is infused into an organization, teachers will move from concrete application to adapted application by experimenting with the innovation and accessing others who are similarly working to make relevant adaptations and address unforeseen issues (Frank et al., 2011).

Frank et al. (2011) identified three levels of initial teacher implementation of new practices: novice implementation, intermediate implementation, and high implementation. Teachers demonstrating novice implementation of an innovation have awareness of the innovation and increase their use of the innovation as the result of additional professional learning and an understanding of how the innovation will impact student learning. For teachers demonstrating intermediate implementation of an innovation, sustained use of the innovation will come as the result of opportunities to explore the innovation (Frank et al., 2011). Teachers demonstrating high levels of implementation demonstrate a basic understanding of the adaptations that render the innovation effective in the local setting (Frank et al., 2011). As I am using a systems perspective in my research, I am applying Frank et al.'s (2011) framework to

classroom contexts. This systems-perspective is reflected in my data collection and analysis, where I attend to organizational units of analysis (classroom, school, district).

For school-level data collection and analysis, I use Hargreaves' (1999) theory of actions taken by knowledge-creating schools. Logic would suggest that educational outcomes will improve as the dissemination and use of evidence-based practices increases (Hargreaves, 1999), however, this notion of improvement through replication of the nation's most effective classroom practices has limitations. As Hargreaves (1999) notes, "practical ideas are context-bound" (p. 556). This speaks to the importance of ongoing knowledge creation that goes beyond just the implementation of best practices to the careful evaluation of practices to answer the question, "What works, for whom, and under what conditions?" (Hinnant-Crawford, 2020). Hargreaves (1999) reserves the term *knowledge-creating school* as one that "audits its professional working knowledge; manages the process of creating new professional knowledge; validates the professional knowledge created; and disseminates the created professional knowledge" (p. 124).

Hargreaves (1999) goes on to assert that teachers, not researchers, must be at the center of such knowledge creation and that federal and state policy should intentionally support schools in the act of knowledge creation and dissemination. Brown and Schafft (2016) bolster Hargreaves' assertion, noting the following:

> the experience of 'research-engaged' schools that take a strategic and concerted approach in this area appears to be positive, with studies suggesting that research engagement can shift school behaviors from a superficial 'hints and tips' model of improvement to a learning culture in which staff work together to understand what appears to work, when and why (p. 781).

Hargreaves (1999) and Brown and Shafft (2016) echo one another in their belief in bottom-up engagement with research in service of solving real problems as a path forward in educational improvement. Combined, these theories enable a multi-level analysis of how boundary infrastructure was leveraged in a rural district to create place-based knowledge.

Methods

This research is part of a broader three-part study that examines how a rural district organized for continuous improvement, the role that boundary spanning infrastructure played in the district's continuous improvement efforts, and how a rural district leveraged internal boundary infrastructure to create place-based knowledge. I use a single case study design (Yin, 2018) to investigate the research question: How does a rural district leverage internal boundary infrastructure to create place-based knowledge? A qualitative case study approach enables me to organize and interpret multiple data sources (Creswell & Poth, 2018) to understand the role of rural internal district boundary infrastructure (including boundary objects, boundary practices, and boundary spanners) in school improvement. I conducted semi-structured interviews and focus groups, a document analysis, and field-based observations, beginning March 2023 and ending November 2023. All data were coded using deductive coding based on my theoretical framework and inductive coding to identify additional themes. In the following sections, I discuss my methods of data collection, analysis, and validity in detail.

Setting

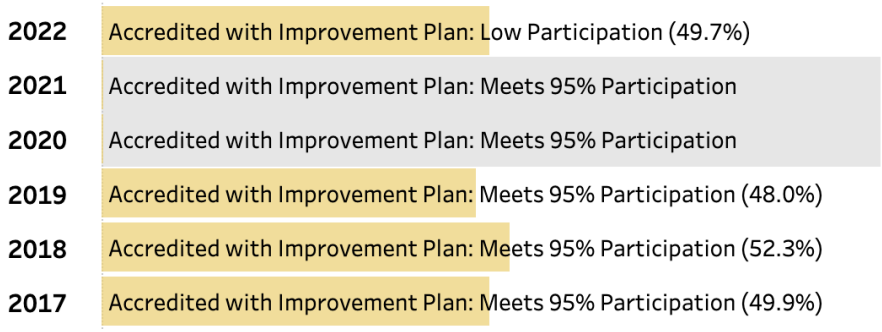
The bounded, single case study (Yin, 2018) was conducted in Walnut Grove School District, a rural district in Colorado. I purposefully selected Walnut Grove School District (Creswell & Poth, 2018) based on three criteria. First, I am engaged in an ongoing, multi-year project with them. Second, they demonstrate the need and desire to improve student outcomes

for all students. Third, their designation as rural by the Colorado Department of Education (CDE, 2023) and the demographic of students they serve raise multiple equity issues.

Walnut Grove enrolls 2,332 students (Schoolview, 2023). It is comprised of three elementary schools, a middle school, and a high school. As shown in Figure 4-1, Walnut Grove School District' performance is flat and consistently below state average across content areas and subgroups, culminating in college and career indicators that are well below state expectations as shown in Figure 4-1 (Schoolview, 2023).

Figure 4-1

Walnut Grove Official District Performance Framework Ratings 2017 - 2022

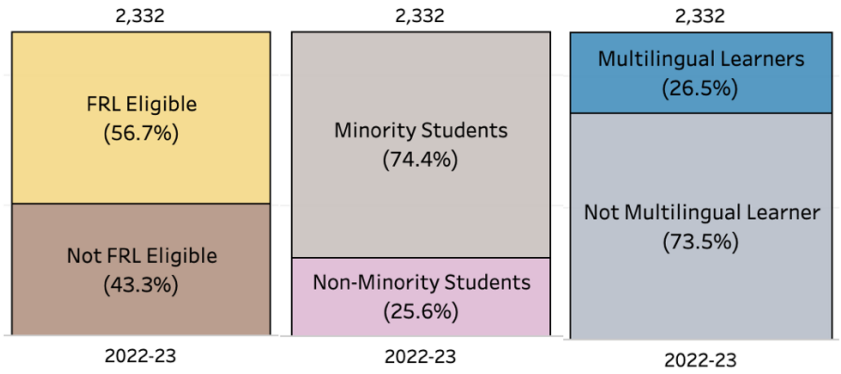


Note: Adapted from *[Walnut Grove] Final 2022 District Unified Improvement Planning Dashboard*, by Schoolview, 2023 (http://www.cde.state.co.us/district-school-dashboard). In the public domain.

The district serves 56% students from poverty, 27% English language learners, and 74% minority students (Schoolview, 2023), as shown in Figure 4-2. 68% of Walnut Grove's student population is Hispanic (Schoolview, 2023). Significant achievement gaps in math and language arts persist between minority and non-minority students, students eligible for free and reduced lunch and those not eligible, and English Language Learners and non-English Language Learners (Schoolview, 2023).

Figure 4-2

Walnut Grove 2022 - 2023 Student Demographics



Note: Adapted from *[Walnut Grove] Final 2023 District Unified Improvement Planning Dashboard*, by Schoolview, 2023 (http://www.cde.state.co.us/district-school-dashboard). In the public domain.

Data Sources

I used semi-structured interviews and focus groups, observations, and a document review to gain an in-depth understanding of how Walnut Grove leveraged internal boundary infrastructure to create place-based knowledge.

Semi-structured Interviews and Focus Groups

Semi-structured interviews and focus groups allowed me to better understand perceptions, experiences, and history through the lens of the interviewee at a level of depth that might not be captured through the collection of other data sources (Weiss, 1994). I conducted a focus group with all four district coaches. At the school principal level, I interviewed two principals of the five district principals using purposeful sampling (Creswell & Poth, 2018). My criteria for inclusion was that principals had engaged with boundary infrastructure at a high level and could speak to its implementation through a systems lens. On the district level, I interviewed the Chief Academic Officer. I used semi-structured protocols to guide interviews and focus groups (Creswell & Poth, 2018). Interviews and focus groups were held on a digital platform,

with the exception of the Chief Academic Officer interview, which was conducted in person and scripted. Participants were familiar with my research question, their role in the research, and how the data would be used. Interviews and focus groups lasted approximately two hours. I cleaned the transcripts by reviewing the recordings and making corrections manually. The semi-structured interviews and focus groups captured perception data about how district boundary infrastructure impacted the ways in which schools implemented and adapted instructional practices.

Observations

Observations allow a researcher to better understand a phenomenon as it occurs in the field (Creswell & Poth, 2018). I observed four of the district implementation teams and two school-level teacher improvement teams. Observations of four of the district's school-level implementation teams allowed me to better understand the nature of the conversations and interactions that were occurring with a focus on school-level implementation and adaptation of practices, using a convenience sampling approach (Creswell & Poth, 2018). I served as a participant observer (Creswell & Poth, 2018) during observations, as I was facilitating a process using an established protocol to support analysis of school-level practices and their impact on student performance. Observations of implementation teams lasted 90 minutes each. I also observed two school-level teacher improvement teams. Teacher improvement team observations lasted approximately 50 minutes each. I used a combination of descriptive and reflective notes (Creswell & Poth, 2018) during the observations, and added to notes after each observation to capture initial thoughts and additional context.

Document Analysis

In case study research, document analysis plays an important role in giving support to evidence from other data sources (Yin, 2018). I collected teacher improvement team protocols that had been filled out by grade-level teams from three schools to gain a more complete understanding of the role of boundary spanning infrastructure in rural school improvement at the teacher team level. I reviewed implementation team planning tools, the district-wide improvement tool, agendas and meeting notes from monthly check-ins attended by the Chief Academic Officer, coaches, and principals. I reviewed co-constructed tools including implementation guides. Principals served as gatekeepers for their school's completed teacher improvement team protocols, and three schools collected and shared their completed protocols with me. I had access to all other completed tools through a shared Google Drive with the permission of the district.

Data Analysis

First, I gathered relevant documents and observation notes, focus group transcripts, and interview transcripts. Next, I created a codebook based on my theoretical framework. While my theoretical framework provided initial codes for deductive coding at the classroom and school levels, I identified district level themes using inductive coding. Using MAXQDA, I engaged in my first round of deductive coding based on the themes from my code book while simultaneously jotting notes about additional themes. After the first round of coding, I examined the notes I had taken, organized additional themes into codes, and added them to my code book. Then I engaged in two more rounds of deductive coding using both the codes from my theoretical framework and the additional codes I had identified. I used MAXQDA to sort units of data by code and subcode, including frequency counts. I then organized my codes into themes, using a combination of sorting by unit of analysis (classroom, school, district) and data source

(interviews, observations, documents). For example, at the classroom level, I collected teacher improvement team protocols and observational data. This analytic process enabled me to understand how different types of boundary infrastructure were used at different levels of the system to create place-based knowledge.

Trustworthiness

Merriam (1998) elevates the idea that research in applied fields such as education should be action-oriented. This requires taking a disciplined approach to the analysis of data to help ensure credible interpretation (Merriam, 1998). Because the primary purpose of a case study is to understand the context, behaviors, and issues associated with a case, it is critical that researchers take steps to check and challenge their emerging understandings of data and findings. I took several steps to address trustworthiness in my study. First, I engaged in long-term engagement with my case (Merriam, 1998). My documents span three years of work focused on designing and implementing systems to support the improvement of schools in Walnut Grove School District. Prior to data collection, an Institutional Review Board (IRB) informed my consent procedures and data management practices. IRB approval is evidence that my study adheres to the highest ethical standards of conduct for research. I conducted member checks during the data analysis process (Creswell, 2007) to help ensure the validity of codes and findings. I engaged with Clemson faculty advisors who helped shape my methods to ensure the integrity of my study, including research design, data collection methods, and analysis methods. Finally, I engaged in rigorous positionality reflections throughout the process to minimize researcher bias and improve the credibility of my findings.

Findings

The analysis of documents, interview/focus group transcripts, and observational notes resulted in significant findings at the classroom, school, and district levels to answer the single research question: How did a rural district leverage internal boundary infrastructure to create place-based knowledge? At the classroom level, Walnut Grove leveraged internal boundary infrastructure to foster awareness, exploration, and adaptation of practices, including those from ESSA's Tier IV evidence base. At the school level, Walnut Grove leveraged internal boundary infrastructure to audit working knowledge, manage the infusion of new knowledge, validate professional knowledge that was created, and, to a lesser extent, disseminate professional knowledge that was validated. At the district level, Walnut Grove leveraged boundary infrastructure to foster strategic alignment and building capacity for instructional leadership.

Classroom Level

To create place-based knowledge at the classroom level, the district leveraged boundary spanning infrastructure to facilitate awareness, exploration, and adaptation of instructional practices, including practices from ESSA's Tier IV evidence base. Boundary infrastructure was essential, resulting in three major outcomes. First, boundary infrastructure facilitated shared awareness at the classroom-level for standards of new practices. Shared awareness promoted an understanding of the benefits, rationale, and connection to broader goals for the new practices. Second, boundary infrastructure facilitated a shift from centering educators in the implementation process to centering on student outcomes and responses. Finally, it elevated practical measures as indicators of student success, thereby facilitating the implementation of new practices. In the following sections, I discuss each of these three findings in detail.

Awareness

At the classroom-level level, boundary infrastructure facilitated awareness of instructional practices. Of note, it helped set a standard for the implementation of new practices. All participants discussed implementation guides (see Figure 4-3) as key tools in promoting understanding and initial adoption of instructional practices.

Figure 4-3

Implementation Guide

Implementation Guide: Student Collaboration

	Basic	Effective (Basic +)	Advanced (Effective +)
Development of Collaborative Work Habits	Modelling of effective group work behavior occurs prior to moving students into groups (see Group Work Rubric in Clock Watchers) Students generate agreements for how to work together	Modelling includes discussion prompts and strategies to allow students to take active lead in group work settings Ongoing focus lessons on group skills needed for successful collaboration based on teacher observation and monitoring of group work behavior	Students participate in modelling of behaviors and strategies Students rate strengths and needs of collaborative work habits to inform focus lessons Students monitor progress toward effective group work behaviors using agreements generated prior to group work
Strategic Group Design	Small groups size (4 or fewer students) helps to ensure pressure to perform	Heterogeneous groups are used, reflecting a balance of student personalities, abilities, leadership skills and academic strengths	Ongoing data is used to inform effectiveness of groupings and make adjustments as necessary
Alignment between Group Type and Learning Purpose	A variety of grouping arrangements is used	Grouping arrangements reflect the learning purpose (coaching/long-term grouping vs. flexible/short-term grouping vs. partners): ▪ Flexible/short-term grouping is used when focusing on skills (i.e. 4-2-1 strategy) ▪ Heterogeneous coaching groups are used to collaboratively process information over multiple class periods or the duration of a unit or project ▪ Coaching partners are used to support understanding by summarizing, quizzing, or clarifying	Students reflect on group work behaviors for different types of groups/can distinguish between behaviors necessary for various types of groups to function effectively
Group Work Structure	Task involves higher order thinking and discussion Task is engaging for students Pacing/time allowed may sometimes lead to down-time or off-task behavior Need for balance of individual and group accountability is recognized and processes to hold individuals accountable are being developed	Entire group is needed to successfully complete a task Pacing/time allowed for collaborative work decreases chances of students getting off-task Structures that balance individual and group accountability may include panels, pair-share, and Four Heads are Better than One Processes are in place to identify social loafing and hold individuals accountable	Groups build collective understanding of issues and concepts Students reflect on structures that contributed to group success

One principal reflected:

> We can't always pay for a program. We can't always have...these resources...We know from research what impacts achievement more than anything is [to] have good teaching. How do we keep rolling out those expectations? I think that's what the implementation guide does.

She went on to discuss how implementation guides define "at the very basic level what I would want every one of my teachers doing to see a change in student performance." The principal explained, "That's where we start. If we're talking numbers and operations, what's the minimum we want? Then we just go from there. In the classroom, what does it look like?" The principal's statements show how implementation guides were used to introduce new practices to staff in a way that communicated a standard for performance. The standard for performance started with the most basic level of implementation the school felt would lead to improved student achievement. There was not a standard of performance communicated through implementation guides below that which would bring about improved student achievement.

Second, boundary infrastructure raised awareness of the benefits of new practices and their connection to broader goals. This finding was particularly evident in the work of boundary spanners, who leveraged teacher improvement teams to expand awareness of the benefits and purposes of implementing the selected practices. One coach described a conversation with teachers, noting the questions they asked. "They'll say, 'Why do we do this...Is this something new? Is this how the other schools do it?'" This quote describes how boundary infrastructure supported an understanding of how classroom practice related to broader district-wide improvement.

Similarly, another coach discussed using teacher improvement team meetings to raise the awareness about how the work connects to the goals of the school and district. She shared, “You have the opportunity to amplify what they're doing and its interconnectedness to the school and district. It's really...raising their consciousness about what they're doing and how they're doing it.” In both examples, coaches acted as boundary spanners, and in turn leveraged teacher improvement team time to raise awareness of the benefits of the new practices.

Exploration: Shifting the Focus to Students

At the classroom level, boundary infrastructure facilitated the exploration of new instructional practices, including those from ESSA’s Tier IV evidence base. The exploration level of classroom implementation was marked by a shift to focus on student learning, rather than implementation. The teacher improvement team protocol proved to be a crucial tool to facilitate this shift. Consider this comment made by a teacher during a teacher improvement team meeting when her principal asked her how the protocol shifted her thinking:

> It's added an additional layer of intentionality...the success criteria part because then we’re thinking about what we’re looking for. It also has a backward planning element, so we are looking at how to get there and how does that match with what they [students] need...the protocol is clutch!

Here, the teacher’s statements reflect an understanding by the teacher of how the boundary tool shifted her thinking to what she was looking for in terms of student performance.

A coach shared similar perspectives, recalling a conversation at a teacher improvement team meeting, where “somebody at the table” said “we noticed that there's been a lot of growth in one of our ELA classes...We're wondering if it’s because...we're not providing those

instructional strategies that those students specifically need." The coach reflected, "I thought that was a shift to students, right?"

These examples reflect what I observed in teacher implementation team meetings. They suggest that boundary infrastructure promoted a more student-centered approach to implementing instructional practices by shifting teacher focus to the impact of instructional practices on students. Through the intentional design of boundary tools to shape the conversations of teachers in improvement team meetings, teachers made the critical shift from awareness of practices to exploration by beginning to evaluate the degree to which instructional strategies were meeting the needs of students.

Adaptation Through Use of Practical Measures

Boundary infrastructure also shaped adaption of instruction by leveraging the use of practical measures aligned with success criteria. Practical measures are defined by Bryk et al. (2017) as measures that are embedded in teaching and learning practices. Because they are embedded, they may be collected with frequency to determine whether practice or strategy is bringing about improvement (Bryk et al., 2017). Specifically, the boundary tools that guided the work of teacher improvement teams prompted teachers to articulate what success would look like for the given week, and to identify a work sample that reflected the success criteria. Figure 4-4 shows a completed teacher improvement team protocol. This boundary tool captures the use of measures that can be collected regularly and are meaningful at the classroom level to progress of students relative to success criteria. This tool also shows how teachers planned adaptations to practices focused on the development of number sense.

Figure 4-4

Teacher Improvement Team Protocol with Practical Measures

Data Protocol

Date 5/4/2023	
Evidence Outcome/Target	
- Use place value understanding and properties of operations to perform multi-digit arithmetic	
Success Criteria (What will you look for?)	
Identify pattern in factors	Identify patterns in products
Using vocabulary in explanation	Referencing idea of multiples of ten
Assessment/Evidence	
April Writing Prompt	
Name the Gap (Identify the Struggle)	
• Incorporation of targeted math vocabulary • Mathematical explanation of why	
Instructional Strategies	
• Math TALKS on base ten problems • Sentence stems	
Next Steps	
• anchor chart/vocab wall to aid in vocabulary	

Participants viewed the protocol positively. One principal explained:

> Every week, we're looking at a piece of data. Most often it's student work. It could be an assessment. It could be an exit slip...We're looking at pieces of data in our hands every Thursday, and we're all using the same protocol... Now we're not talking in terms of, "I think or I feel," but "Here's what the evidence tells me."

In other words, the intentional design of boundary infrastructure shaped the conversations in teacher improvement teams and increased consistency. Furthermore, practical measures became more commonly used to track student progress and guide adjustments to practices. This implies that boundary infrastructure played a role in teacher use of practical measures to collect frequent, actionable data and make timely, data-informed adjustments to instructional practices.

School Level

To create place-based knowledge at the school level, the district leveraged internal boundary infrastructure to provide structures through which leaders were able to audit working knowledge, manage the infusion of new knowledge, validate professional knowledge created, and disseminate validated professional knowledge. This applied to practices from all levels of ESSA's evidence base, including practices from Tier IV. Boundary infrastructure provided structures through which leaders were able to audit working knowledge by facilitating conversations that allowed school leaders to understand baseline working knowledge prior to the implementation of new practices. Boundary infrastructure provided structures to manage the infusion of new knowledge by allowing principals to introduce new knowledge and monitor the progress of new knowledge development. Boundary infrastructure provided structures through which leaders were able to validate new knowledge that had been created by elevating the impact of practices on student performance. To a lesser degree, boundary infrastructure allowed for the dissemination of validated practices within and across schools.

Auditing working knowledge

Boundary infrastructure provided structures through which leaders were able to audit the working knowledge of staff concerning an instructional strategy or practice, including those from ESSA's Tier IV evidence base. School-level leaders audited practices before a strategy was

implemented to identify baseline knowledge of staff. One principal shared how she used time with her implementation team to "remind me who has been through training and who has never been through it." Another principal described how she audited the working knowledge of her staff by auditing the working knowledge of several of her strongest teachers who are implementation team members. She recalled the following exchange with a teacher on her implementation team as they noticed that math performance was declining and determined that number sense was the issue:

> I said, “Where are we at now...” My teacher said, “I know the definition of number sense, but I really don’t know what it is and what it is not. We need to dive through that.” So, I said, “Okay, we’re going to do that.”

These examples show how the boundary practice of implementation teams and interactions with boundary spanners allowed building leaders to determine the starting points for the implementation of new practices by determining the skills and understandings of staff in key strategic areas. Using boundary infrastructure, schools were able to audit existing knowledge to identify challenges, determine professional development needs, and allocate resources effectively to grow the skills of staff in key strategies.

Manage the Infusion of New Professional Knowledge

A second school-level finding was that boundary infrastructure provided structures through which leaders were able to manage the infusion of new professional knowledge. Boundary infrastructure allowed for new knowledge to be created and monitored at the school level. All participants identified implementation guides (Figure 4-3) as important and useful tools in creating new staff-wide knowledge. One coach described implementation guides as, “a tool that provides them a target that isn’t moving. It gives them some safety as far as I’m here

and I’m trying to get there...and it’s going to improve student achievement.” Implementation guides were viewed by participants as “establishing the success criteria for teachers” and “a how-to manual” that allows teachers to “know what the expectation is around the practice that we’re asking them to do.” In other words, the implementation guides were valued as a tool to introduce new professional knowledge and instructional practices and guide teachers in the use of new practices.

Boundary infrastructure also provided structures through which leaders were able to audit the progress of strategy implementation by providing a process for "revisiting goals" and "getting a pulse about what's going on and how it's working." One principal described how she and her implementation team audited needs by looking at school-level data mid-year:

> When we first look at our data, we’re looking at school-wide, do we have weaknesses? Do we have a point where we need to change some strategies? What’s our low point school-wide...Also using our implementation benchmarks...it’s easy to see that we have these pockets of teachers that aren’t feeling really confident in this.

A district coach describes how auditing during implementation teams “allows district admin...or building admin to say, ‘I have a pocket of teachers that are really needing some additional PD, some additional support.’”

In addition to conversations during implementation teams, schools monitored the progress of working knowledge development by setting quarterly implementation benchmarks that described the changes in teacher practice they expected to see and evaluating the degree to which benchmarks were attained. These were recorded using the school-level planning tool (Figure 4-6), and the districtwide improvement tool (Figure 4-7). At monthly check-ins,

principals, the chief academic officer, and instructional coaches discussed progress toward implementation benchmarks (see Figure 4-5).

Figure 4-5

Monthly Principal Check-In Agenda

Monthly Principal Check-in Agenda
January 2023

Topic	Discussion	Next Steps
District-wide Data Tool ▪ Where were you with your November implementation benchmarks? ▪ What adjustments did you make? ▪ What are your February implementation benchmarks? ▪ What support do you need?	[redacted] intentionally kept implementation benchmarks the same as the previous spring due to the large number of new staff members that needed to become familiar with data team discussions and rapid improvement cycles. They are currently at 80% for teachers adjusting Tier 1 instruction per their first implementation benchmark. [redacted] made an implementation guide around best first instruction and their goal is to improve performance by one level on the implementation guide. Next year, they may split the first implementation cycle into two smaller cycles to get new staff on board and then begin moving forward.	For Strategy 2 reflect on implementation benchmark for first cycle. Add an implementation benchmark and action steps that focus on DEFINING SUCCESS CRITERIA from the DATA TEAM DEVELOPMENT MATRIX. [redacted] will link the Data Team Development Matrix to the District wide Improvement Cycle Tool [redacted] will share the Interim Data Team Protocol with [redacted] and [redacted]

Boundary practices and tools impacted the conversion of instructional practices to place-based knowledge by allowing school leaders to monitor the progress of newly implemented practices over time. In turn, the use of boundary infrastructure enabled school-level leaders to assess if practices were implemented effectively schoolwide.

Validating Professional Knowledge that is Created

Boundary infrastructure impacted the conversion of instructional practices to place-based knowledge by providing structures through which leaders were able to validate the professional knowledge that is created. Consider this account of a teacher improvement team:

> Betsy projects an Excel spreadsheet with student names in columns labeled Initial Placements. "Okay, so here are our initial placements in January. We have this huge block of kids, and now we will see where we are today." She re-sorts the Excel

spreadsheet and they all clap when they see how the list of kids has shifted to grade level. "So, what we are doing is working."

Later during the same teacher improvement team meeting, Heidi, a teacher on the team and Nancy, the school's principal, determined a strategy that was implemented in classrooms to be valid based on student outcomes and agreed that it should be codified to inform instruction during the upcoming school year:

> Heidi: And now they [the students] are coming in where they need to be at the beginning of second grade. They are set. They might need a reminder, but they are solid.
>
> Nancy: You need to write that down, so we don't miss it for next year. Being explicit about that part next year is going to be really important. We can't afford to lose that. It made a big difference this year, and now we have a solid strategy.

These examples show that boundary infrastructure, specifically boundary practices, impacted the conversion of instructional practices to place-based knowledge by allowing schools to identify and codify practices the team believed could be replicated at the school. Boundary practices allowed schools to determine whether an instructional practice was effective by evaluating the impact of its practical application in the classroom. This included instructional practices from ESSA's Tier IV evidence base.

Disseminating

To a lesser degree, boundary infrastructure provided structures through which leaders were able to disseminate new information within and beyond the walls of individual schools. Dissemination across schools was found to be informal, highly dependent on boundary spanners and boundary tools, and focused more on awareness than on disseminating validated practices. A

principal shared, “We’re really good at sharing it within our building, but not so much outside of here.” As one coach described:

> We’re the ones jumpstarting those conversations...If something’s going on in one building and you see something similar trying to take root...For example, marking the texts at the middle school, the high school was like, “We should do something around informational texts.” We were like, “The middle school has developed this resource. Why don’t you ask the middle school?”

The sentiment expressed by all participants was that the district “isn’t there yet” regarding having schools truly learn from one another about validated practices. Some participants were frustrated by this fact and felt it was time to “get this conversation going here.” Thus, even though boundary infrastructure fosters the conditions for rural improvement as noted in the previous article, this district still struggled to leverage a culture characterized by high levels of collaboration among schools. On the other hand, through careful and diligent work of boundary spanners, information about instructional practices was disseminated beyond the walls of individual schools.

District Level

Two themes emerged from the data to explain how the district leveraged boundary infrastructure at the district level to create place-based knowledge. The district leveraged boundary infrastructure at the district level to provide opportunities to build instructional leadership capacity and to bolster strategic alignment.

Provide Opportunities to Build Instructional Leadership Capacity

An additional finding was that the district leveraged boundary infrastructure to create place-based knowledge by providing opportunities to build the instructional leadership capacity

of school leaders. This was primarily done through interactions with coaches as boundary spanners during implementation team meetings and monthly check-ins. Consider this observation of an implementation team as they analyzed iReady scores:

> Numbers and operations scores are low. School leader suggests they start doing timed tests across the school. Coach says research is clear that timed tests and rote math are not the solutions. Teacher says that's how she learned, and it's worked for her. Another teacher agrees. Coach pulls up What Works Clearinghouse and suggests they all take a look.

Exchanges like this were frequently observed in implementation team observations. The coach later reflected during a focus group, "It's uncomfortable for me. At the same time, trying to push back...because I know that's not best practice. There's research to back that it's not best practice."

Coaches also saw monthly check-ins with the chief academic officer and school leaders as a time to "know where they [principals] are at" in their thinking about instructional practices. While principals communicated that they felt the monthly check-ins were not always valuable, a coach communicated feeling differently:

> For me, when I listen to those principals...you get the opportunity to hear their interpretive language. They're interpreting what they're being asked to do. They have to understand it...it's a real...opportunity to gain insight into where they are in their understanding and where they're wanting to go as a leader.

Coaches then went on to discuss that listening to school leaders helps coaches "provide support, maybe scaffold for them." Coaches described how "different leaders have different abilities to

take their vision and put it into action...I see this as an opportunity to help that action come to life."

As discussed above, these exchanges show how boundary infrastructure provided opportunities to build the instructional leadership capacity of school leaders with a particular emphasis on influencing the selection of instructional practices to be implemented in their buildings. By challenging assumptions and engaging in critical discussions about instructional practices, coaches were able to support leaders in expanding their instructional knowledge. In turn, this allowed school leaders to be more strategic in the selection of practices that were likely to have the desired impact in their schools. Finally, by having access to school leaders while they reflected during monthly check-ins, coaches were able to better understand how leaders were perceiving the work, provide targeted support where needed, and engage in sense-making with teachers.

Bolster Strategic Alignment

Boundary infrastructure was leveraged in Walnut Grove School District to create place-based knowledge by bolstering strategic alignment among outcomes, resources, and activities. Strategic alignment was facilitated using school-level planning tool and a district-wide improvement tool by implementation teams.

School-level planning tool. At the end of the school year, boundary tools intentionally fostered planning discussions during which teams clarified the problem to be solved using data and identified an associated student achievement goal. Based on the problem and the desired changes in student achievement, teams articulated the desired state of instruction, an intermediate outcome to be reached by the end of the next school year. The desired state of instruction was informed by what the school identified as the instructional root causes of student performance.

Next, schools identified the actions to be taken, and short-term and intermediate outcomes written as changes in teacher practice. Based on the changes in teacher practice, teams identified necessary training to be offered during the year. Figure 4-6 shows the boundary tool used in all schools to foster planning discussions. By engaging in planning this way, the boundary tool helped ensure alignment among goals, activities, short-term outcomes, and intermediate outcomes.

Figure 4-6

School-Level Planning Tool

ELA Priority: We will increase the number of students performing at grade level in ELA by 10% by May, 2024.			
Desired State of Instruction by May 2024 – By May, 2024 80% of teachers will consistently implement explicit teaching of academic and domain specific vocabulary.			
October Change in Teacher Practice: By October 2023, 80% of teachers will understand the difference between academic and content specific vocabulary.			
Training date	Training topic	Training outcome	Trainer
September	academic vs domain specific vocabulary	teachers will be able to define the difference and give examples between academic and domain specific vocabulary	[redacted]
October	instructional strategies	teachers will start to utilize grade level appropriate vocabulary protocol to explicitly teach academic and content specific vocabulary	[redacted]
February Change in Teacher Practice: By February 2024, 80% of teachers will identify content and academic vocabulary for each lesson and plan explicitly instructional strategies for teaching said vocabulary.			
Training date	Training topic	Training outcome	
November & December	continue instructional strategies	teachers will continue to gather tools for their instructional toolbox for vocabulary instruction	[redacted]
January/February	engaging students in repeated uses of domain specific vocabulary	teachers will understand the importance of giving students multiple opportunities to use vocabulary so it becomes a part of their lexicon	[redacted]

District-wide improvement tool. During the next school year, schools implemented the plans they created the previous school year using the school-level planning tool. As the plan was implemented, implementation teams used a different tool, the district-wide improvement tool (Figure 4-7) to evaluate progress. The district-wide improvement tool included all the elements of the school-level planning tool. In addition, the district-wide planning tool included student performance targets for each administration of the district's local, nationally normed assessment. Using a combination of implementation data to track changes in teacher practice and student performance data, implementation teams used the district-wide planning tool to monitor performance, adjust plans, and allocate or request resources in response to needs.

Figure 4-7

District-wide Improvement Tool

[redacted] **Strategy 2: Data Teams** Teachers and staff will meet in grade-level teams weekly to analyze student work and identify common needs and instructional strategies to improve Tier 1 instruction.		
CYCLE 1 IMPLEMENTATION BENCHMARK By November 30, 2022 the organizational structures to support data conversations will be in place for 100% of teacher teams including all specialist.	CYCLE 2 IMPLEMENTATION BENCHMARK By February 28, 2023 100% of data teams will increase by one performance level based on the Data Team Implementation Guide.	CYCLE 3 IMPLEMENTATION BENCHMARK By May 5, 2023 100% of data teams will perform at effective or higher in two areas identified by the team on the Data Team Implementation Guide.
CYCLE 1 ACTUAL PERFORMANCE	CYCLE 2 ACTUAL PERFORMANCE	CYCLE 3 ACTUAL PERFORMANCE
Interim Measure Data (iReady or NWEA)		
Name of Measure and Subtest	Winter Target	Winter Actual Performance
	increase the number of students at grade level by 15% from the August administration in reading and math	
Reflection on Cycle 1 (August – November 30)		
Plan/Adjustments for Cycle 2 (November 30 – February 28)		
Actions for Cycle 2 (November 30 – February 28)		Support Needed
		Coaching ☐ Training ☐ Implementation Guide ☐ Other:
		Coaching ☐ Training ☐ Implementation Guide ☐ Other:
		Coaching ☐ Training ☐ Implementation Guide ☐ Other:

These tools show that boundary infrastructure can be intentionally designed to shape important conversations related to the identification and strategic implementation of instructional practices. Their development and use in Walnut Grove suggest that boundary tools can provide a structured framework for rural districts, where planning aligns overarching goals with necessary changes in classroom practice, as well as with necessary teacher training for implementation. Further, boundary tools can facilitate a systematic approach for monitoring the progress of improvement efforts and re-aligning resources as necessary. Together, the iterative process of evaluating, planning, monitoring, and adapting ensured that resources were allocated effectively, and plans were adjusted as needed, maximizing the chances of improving student outcomes in Walnut Grove School District.

Discussion

This study is part three of a three-part study about how a rural district organized for the continuous improvement of its schools. In this case study, a rural district organized for continuous improvement of its schools through the implementation of internal boundary spanning infrastructure at each level of its system. The findings from this study address the research question: How did a rural district leverage internal boundary infrastructure to create place-based knowledge? Walnut Grove School District leveraged internal boundary to create place-based knowledge by integrating teacher levels of implementation (Hargreaves, 1999) with the actions taken by knowledge-creating schools (Frank et al., 2011) and district actions in a way that put classroom practices at the center of the continuous improvement process.

These findings show that Walnut Grove leveraged internal boundary infrastructure to create place-based in multiple ways. First, at the classroom level internal boundary spanning infrastructure supported levels of teacher implementation of new practices, including those from

ESSA's Tier IV evidence base. Second, internal boundary spanning infrastructure supported actions taken by schools in the creation of place-based knowledge. Internal boundary infrastructure was also leveraged to create place-based knowledge by bolstering strategic alignment and creating opportunities for instructional leadership development at the district level. Given the limited research on rural district infrastructuring in general and the impact of internal rural district boundary infrastructure on the creation of place-based knowledge more specifically, this case study makes a significant contribution to the research on rural district infrastructure for the improvement of schools.

In this section, I discuss how Walnut Grove leveraged internal boundary infrastructure at the classroom level and the school level to facilitate the creation of place-based knowledge through an integrated organizational framework. I discuss why an integrated approach is critical for the creation of place-based knowledge in rural districts. I then discuss the themes that emerged related to the district's role in the creation of place-based knowledge in Walnut Grove.

The Classroom Level as the Epicenter of Place-based Knowledge Creation

Walnut Grove leveraged internal boundary infrastructure to provide an integrated framework that situated classroom-level implementation, exploration, and adaptation of evidence-based practices at the epicenter of place-based knowledge creation in the district. Placing classrooms at the center of the approach to continuous improvement is critical for the creation of place-based knowledge. This is because it is at the classroom level that practices are explored and precisely adapted to meet the specific needs and strengths of the students who attend the school. By placing the focus at the classroom level, the improvement process leverages ongoing evidence of what is and is not working for the school's students.

At the classroom level, the enactment of boundary infrastructure such as implementation guides and teacher improvement teams enabled teachers to understand the standards for implementation of new instructional practices as well as make important connections with school-level goals and the broad purposes for implementing the practices. Sensemaking provided the foundation for teachers to explore instructional practices in a student-centered way. The use of practical measures to inform and evaluate necessary adaptations helped ensure that the data collected was highly contextualized and reflected the strengths and needs of students in the district. In turn, this allowed for ongoing, frequent, careful monitoring and adjustment of evidence-based practices, including those from ESSA's Tier IV evidence base, engendering the creation of place-based knowledge at the classroom and teacher team levels.

The School's Role in Place-based Knowledge Creation

At the school level, Walnut Grove leveraged boundary infrastructure to situate classroom practice and student outcomes as guideposts to navigate the improvement process. Using internal boundary infrastructure, the work at the classroom level was leveraged to inform school-level improvement work. While the role of classroom teachers was to implement and adapt practices, the role of schools was to audit and manage the creation of new teacher knowledge, providing ongoing support as necessary based on teacher needs and student data. Integration of classroom-level and school-level improvement resulted in an approach to improvement that was nuanced and highly contextualized.

Implementation teams at the school level used boundary infrastructure to assess and monitor the working knowledge of staff prior to and during strategy implementation. Practices adapted through the work of teacher teams and deemed effective using practical measures were validated and disseminated within schools and, in some cases, across schools. The integration of

classroom-level and school-level improvement work facilitated by boundary infrastructure ensured that validated practices were context-specific. This resulted in sustainable place-based knowledge creation and allowed the schools to begin to address the question, "What works, for whom, and under what conditions (Hinnant-Crawford, 2020) *at our school*?"

The District's Role in Place-based Knowledge Creation

In Walnut Grove, internal boundary infrastructure was leveraged at the classroom and school levels to create place-based knowledge by addressing teacher levels of implementation (Frank et al., 2011) and the actions taken by knowledge-creating schools (Hargreaves, 1999). Walnut Grove leveraged internal boundary infrastructure at the district level in two important ways: to foster strategic alignment and to create opportunities for instructional leadership development.

Strategic Alignment

Boundary infrastructure that was leveraged to facilitate a structured approach to planning, including collaborative goal setting, identification of necessary resources, and articulation of desired short- and long-term outcomes. The strategic alignment of goals, resources, and outcomes helped to ensure efforts were coordinated, resources were effectively allocated, and progress could be monitored using data. In this way, by leveraging internal boundary infrastructure focused on strategic alignment, Walnut Grove addressed the ESSA requirement for a well-designed logic model to guide planning, implementation, and evaluation of instructional practices from ESSA's Tier IV evidence base.

Walnut Grove also leveraged internal boundary infrastructure to bring about strategic alignment by facilitating a basic plan for studying the effects new instructional practices. This entails identifying the practice, identifying the desired outcomes, monitoring the implementation

of the practice, and collecting implementation data, achievement data, and additional relevant metrics. The boundary infrastructure implemented in Walnut Grove integrated each of these components and facilitated processes for gathering and analyzing relevant data and interpreting results to inform next steps. Thus, by leveraging internal boundary infrastructure focused on strategic alignment, Walnut Grove addressed the ESSA requirement to study the impact of instructional practices from ESSA's Tier IV evidence base and use the findings to inform decision-making and improve outcomes for students.

Instructional Leadership

Another way that Walnut Grove School District leveraged boundary infrastructure at the district level was to facilitate opportunities to build the instructional leadership capacity of principals. One way this occurred was through interactions with coaches during implementation team meetings and monthly check-ins. While principals questioned the value of monthly check-ins, it was at these meetings that coaches were able to gain insight into the evolving understandings of principals regarding instructional priorities in their buildings. Thus, coaches recognized monthly check-ins as valuable opportunities to understand the aspirations of principals as well as the needs of principals around moving their visions into action. In this way, coaches as boundary spanners helped develop the instructional knowledge of principals while playing a critical role in enacting each principal's vision by translating the vision for teachers.

Another way internal boundary infrastructure was leveraged in Walnut Grove to build instructional leadership capacity was by adding a coach to each school’s implementation team. This enabled coaches to gain insight into the broader context of the school’s continuous improvement work through the lens of both the principals and the implementation team members. As members of implementation teams, coaches probed the thinking of team members,

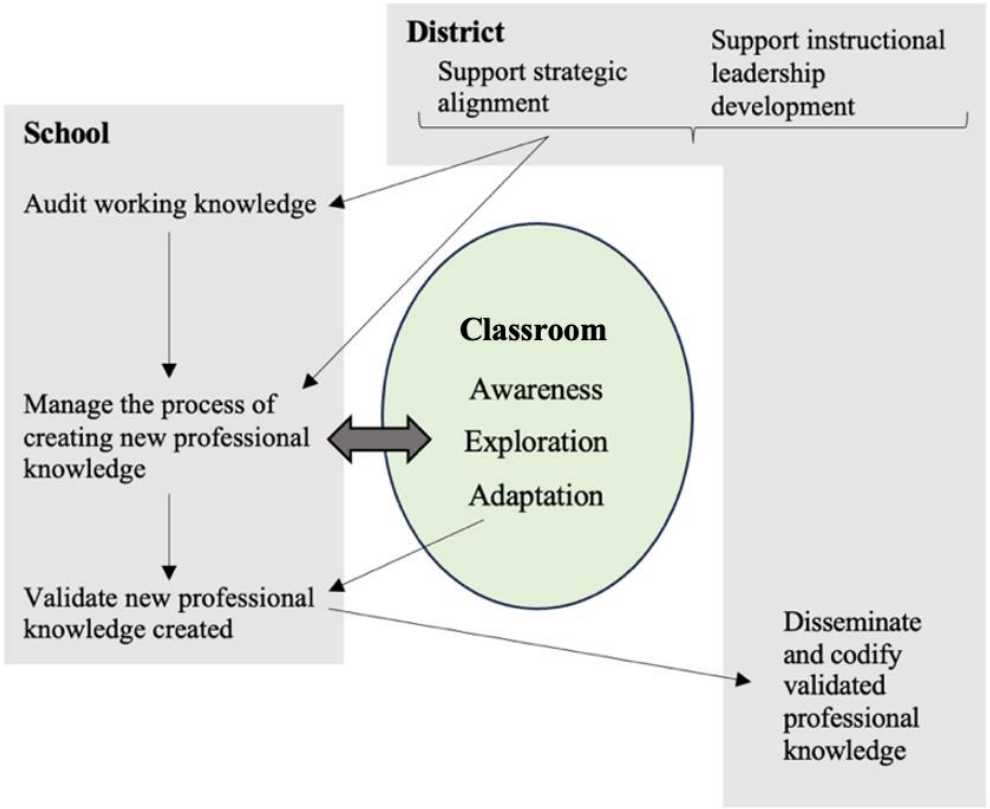
directed them to evidence-based practices, and attempt to guide them toward strategies that were a contextual fit and of the appropriate magnitude to bring about the desired outcomes for the school.

Implications

The case study of Walnut Grove School District describes how a rural district leveraged internal boundary spanning infrastructure to engage all levels of their system (classroom, school, and district) in different but coordinated actions to support the creation of place-based knowledge. Importantly, the creation of place-based knowledge emanated from the classroom level as teachers explored and adapted new instructional practices to precisely address the needs and strengths of the students in their classrooms. As teachers at the classroom level moved through the levels of teacher implementation, the role of the school was to manage and monitor the progress of classroom teachers through work with boundary spanners using boundary tools and boundary practices. Ultimately, when teachers had practical measures to prove the practice improved outcomes for students in Walnut Grove's classrooms, this practice was brought to the attention of principals, who then validated the practice. The struggle occurred around dissemination of validated knowledge across schools in Walnut Grove. For a variety of reasons, schools in Walnut Grove did not share validated practices beyond their own walls. Coaches as boundary spanners made efforts to informally disseminate practices, but all participants perceived this element of place-based knowledge creation was a weakness across the district. At the district level, the district leveraged internal boundary infrastructure to support strategic alignment and instructional leadership development.

Figure 4-8

Rural District Model for Place-Based Knowledge Creation



Note. This model pulls from Hargreaves' (1999) Levels of Teacher Implementation and Frank et al.'s (2011) Actions Taken by Knowledge Creating Schools.

The ways in which Walnut Grove School District leveraged internal boundary infrastructure at every level of the system has implications for the development of a rural model for place-based knowledge creation. Based on what was learned in Walnut Grove, figure 4-8 shows how a rural district can leverage internal boundary spanning infrastructure to engage all levels of their system in different but coordinated actions to support the creation of place-based knowledge. Of note, based on what was learned in Walnut Grove, this model moves disseminating professional knowledge from being a school action (Hargreaves, 1999) to being an action taken by the district, and adds codification of validated professional knowledge to the act of dissemination. A model such as the model shown in figure 4-8 can be used to clarify roles for each level of a rural system in the creation of place-based knowledge. Clarification of roles

allows everyone in the district to understand their contribution to the work and promotes necessary engagement at all levels. This is critical to rural district improvement.

Based on the Rural Model for Place-Based Knowledge Creation (figure 4-8) and what was learned in Walnut Grove School District, table 4-3 shows how boundary infrastructure may be leveraged at each level of a rural system to provide an integrated system for the creation of place-based knowledge.

Table 4-3

Boundary Infrastructure Associated with Rural District Model for Place-Based Knowledge Creation by Level of System

Level of System	Roles	Boundary Practices	Boundary Tools	Boundary Spanners
Classroom	Awareness Exploration Adaptation	Teacher improvement teams	Implementation guides Teacher improvement team protocol	Coaches
School	Audit professional knowledge Manage the creation of new professional knowledge Validate new professional knowledge created	Teacher improvement teams Implementation teams	School-level planning tool District-wide improvement tool	Coaches Implementation team members
District	Support strategic alignment Support instructional leadership development Disseminate and codify new knowledge created	Implementation roundups Monthly check-ins with principals	School-level planning tool District-wide improvement tool	Coaches

Note. This model pulls from Hargreaves' (1999) Levels of Teacher Implementation and Frank et al.'s (2011) Actions Taken by Knowledge Creating Schools.

Note. This figure is intended to be used alongside Figure 4-8, *Rural District Model for Place-Based Knowledge Creation.*

Together, the Rural Model for Place-Based Knowledge Creation and the associated boundary infrastructure shown in table 4-3 may be used to support other rural districts in leveraging internal boundary infrastructure to create a robust, integrated approach to creating place-based knowledge.

Future Research

While the case study or Walnut Grove makes a significant contribution to the understanding of how a rural district leveraged internal boundary infrastructure to create place-based knowledge, further research is needed. Specifically, given the role of the classroom as central to the district model, research is needed to better understand how rural boundary infrastructure supports classrooms in creating place-based knowledge. Further research is also recommended to understand what enables and hinders the dissemination of validated professional knowledge in a rural district. Further research to understand how schools determine the magnitude of strategies for dramatic improvement is needed. Finally, further research is needed to identify ways to develop absorptive capacity of rural school and district leaders as a crucial precursor to place-based knowledge creation that will bring about improved student outcomes.

Conclusion

This case study suggests that a rural district can leverage internal boundary spanning infrastructure in a way that engages all levels of its system in the coordinated creation of place-based knowledge using practices for any tier of ESSA's evidence base. While the premise of ESSA's tiered evidence base makes sense in theory, in practice ESSA's emphasis on the selection of practices and programs from the top three tiers of evidence serves to limit, rather than increase, the options available to rural districts to address highly contextualized, complex problems of practice. Rather than restricting options for rural districts, a shift should be made to addressing the infrastructuring needs of rural districts to allow them to effectively implement evidence-based practices that are of the strongest contextual fit and the appropriate magnitude regardless of their placement in ESSA's tiers.

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CHAPTER 5

CONCLUSION

This dissertation is a three-part study that used an improvement science approach to address a problem of practice in a rural district. The rural district had experienced persistent underperformance and lacked organizational structures to support the continuous improvement of its schools. Hinnant-Crawford (2020) asserts that a "critical component of being an improvement scientist is to see the system that produces the results" (p. 103). To "see the system that produces the results," improvers must see beyond the linear to consider persistent social problems from multiple angles to avoid solutions that focus only on fragmented, misaligned parts of a much more complex system (Hinnant-Crawford, 2020). Improvers must seek to see connections where connections are not plainly visible and seek to recognize interdependence within and across systems (Hinnant-Crawford, 2020). Bryk et al. (2017) discuss the increasing difficulty faced by complex systems, such as school districts, and go on to discuss how the effective execution of complex tasks at the organizational level requires "solving problems of coordination, communication, and system sensing" (p. 60).

The study of Walnut Grove[6] seeks to understand the coordination, communication, and system sensing (Bryk et al., 2017) in a rural district as it works to improve its schools. The study of Walnut Grove is a study of how systems and infrastructure shaped the ways in which levels of an organization worked together to coordinate actions toward common goals. It is a study of how systems and infrastructure shaped communication across communities of practice. It recognizes levels of a school district, the classroom level, the school level, and the district level, as a means to determine where specific activities occurred and how the activities at each level coordinated

[6] Pseudonyms are used for all names and locations per IRB requirements.

with the activities at the other levels of the system (Perry et al., 2020). Article 1 examined how Walnut Grove organized for continuous improvement. Article 2 studied the role of boundary infrastructure in Walnut Grove's continuous improvement efforts. Article 3 identified how Walnut Grove leveraged boundary infrastructure to create place-based knowledge. Together, these articles provide an in-depth analysis of infrastructure for rural district improvement from multiple angles. The case of Walnut Grove underscores the need to use "a wide-angle lens" when infrastructuring and to see the whole system rather than getting distracted by its parts (Hinnant-Crawford, p. 93).

As a whole, the study of Walnut Grove elevates several themes that have implications for other rural districts. First is the idea that infrastructuring is an iterative process that, in the case of Walnut Grove, was closely tied to a theory of action. In the case of Walnut Grove, the district started the work of infrastructuring by identifying and adopting a model that situated the rural district's role in the improvement of its schools. This is instructive for other rural districts wishing to engage in similar work. The model provided a starting point by providing a sense of when, where, and by whom key actions would be taken at different levels of the system in relation to continuous improvement.

Central administrators then observed authentic engagement with the infrastructure so that informed adjustments could be made based on the ways the infrastructure shaped interactions at and between different levels of the system. This idea of implementing and observing infrastructure to inform adjustments aligns with Penuel's (2019) description of "learning about systems by directly pushing up against them and learning how and when they push back" (671). In Walnut Grove, the spiraled improvement cycles described in Article 1 were initially designed to address a need for a systemic approach to improvement at all levels of the system. After

studying how the initial infrastructure impacted the system, central administrators determined that the infrastructure was not yet meeting a systemic need to access, understand, and act upon research-based practices. In response to this, they introduced and expanded the use of boundary infrastructure. In this way, as Penuel (2019) describes, adaptations to infrastructure occurred as a result of both successes and failures of the initial design of the district infrastructure for continuous improvement.

Another key theme from Walnut Grove focuses on how internal boundary spanning infrastructure, generalized from traditional Research Practice Partnerships, created key conditions for rural district improvement. The findings from Article 2 are significant because while existing research (e.g., Harmon, 2018; Sutherland et al., 2023; Zuckerman et al., 2018) has established that relationships, power sharing and coherence are critical conditions for rural district and school improvement, rural organizational structures that allow a district to foster and leverage these conditions have not previously been studied. As discussed in Article 2, not only did internal boundary infrastructure in general contribute to these conditions, but different types of internal boundary infrastructure were also associated with different conditions for rural district improvement in Walnut Grove. For example, boundary spanners played a key role in relationships, power sharing and coherence while boundary tools played a key role in coherence but were not as central to relationships and power sharing. Given that relationships, power sharing, and coherence have been identified as precursors to rural district improvement, knowledge of infrastructure that develops these conditions is a significant contribution to the research on rural district improvement.

The findings from Article 3 suggest that a rural district may leverage internal boundary infrastructure at each level of the district for the purpose of creating place-based knowledge. This

is significant given that one of the hallmarks of rural education is the need for place-based knowledge creation (Gruenwald, 2003; McHenry-Sorber & Budge, 2018). Further, if rural students are to receive equitable benefit from the Every Student Succeeds Act's (ESSA) tiered evidence base, it is critical to implement rural district infrastructure that elevates an understanding of local realities and supports districts in creating place-based knowledge using practices that are a strong contextual fit. Article 3 showed how Walnut Grove leveraged district boundary infrastructure at each level of the district to enact a coordinated approach to the creation of place-based knowledge. The ways in which Walnut Grove School District leveraged internal boundary infrastructure at every level of the system has implications for the development of a rural model for place-based knowledge creation. The findings make a significant contribution to the existing research on rural district improvement by showing how boundary infrastructure may be leveraged at each level of a rural system to provide an integrated system for the creation of place-based knowledge.

While most findings from this study reflected positive outcomes at the classroom, school, and district levels, an additional theme was surfaced. This was a theme suggesting tension between improving universal instruction versus improving outcomes for individual students through tailored adjustments that were in response to failed universal instruction. Multiple participants shared that they were, in the words of one, "regularly identifying the needs of individual students and supporting those students," yet participants also perceived there was a critical need going unaddressed: the need to "provide the best first dose in the best possible way." While participants largely agreed they should "always be refining best first instruction," they also perceived a struggle around refining universal instruction. One explained that at the classroom level, a lack of clarity existed about how to implement universal instruction in a way

that “lowers the floor to raise the ceiling...they [teachers] think lower the floor means put them [students] in an intervention group.” Another participant reflected on the outcomes at one of the schools, discussing universal (Tier 1) instruction, sharing, “The highest groups are at grade level...grade level kids did not make hardly any growth. That shows you that there are some Tier 1 issues going on that just need to be identified.” This tension speaks to a need for the development of absorptive capacity at leadership levels of the district.

Absorptive capacity is a competency leveraged through Research Practice Partnerships. Farrell & Coburn (2017) define absorptive capacity as "an organization's ability to recognize the value of new information, assimilate it, and apply it" (p. 200). The importance of absorptive capacity is that it allows an organization to benefit from the research base and opportunities that exist outside the organization, setting it apart as a "key driver of change and innovation" (Lenart-Gansiniec et al., 2022, p. 43). It is critical to the work of creating place-based knowledge.

While coaches in Walnut Grove were able to informally provide support for the general instructional leadership development of principals, the absorptive capacity needs of principals were not addressed. While boundary infrastructure aided in the strategic alignment of problem identification and strategy selection, a lack of understanding of the concept of magnitude – how the size of the solution needed to match the size of the problem – sometimes led to the selection of instructional practices that were too narrow to bring about the changes required to dramatically improve student performance by addressing universal instructional needs. Because absorptive capacity is context-specific, taking into account local needs, trends, and resource constraints to facilitate the creation of place-based knowledge (Lenart-Gansiniec et al., 2022), it is critical for rural districts. Due to its critical role in rural improvement, further research on the development of absorptive capacity in rural districts is recommended.

Policy Recommendations

The findings from this study demonstrate that boundary infrastructure was leveraged in a rural district to create key conditions for rural improvement and to create place-based knowledge. Based on these findings, recommendations are made for local, state, and federal policy. The objectives of these recommendations are to leverage the lessons learned in this study for two purposes: to elevate the use of boundary infrastructure in rural districts as a means to create the conditions for rural district improvement, and to allow rural districts meaningful access to ESSA's tiered evidence base, including Tier IV, to create place-based knowledge.

Recommendations for Local Policy

1) Require the use of implementation guides as a means of bringing clarity and consistency to the implementation of new practices.
2) Establish guidelines for the enactment of implementation teams at each school. Guidelines should articulate the composition of implementation teams, the role of implementation teams, and the frequency of implementation team meetings.
3) Advocate at the state and national levels for funding to support the implementation of instructional practices from ESSA's Tier IV evidence base as a means of creating a level playing field for rural districts.
4) Allocate resources to the design and implementation of district-wide boundary infrastructure.

Recommendations for State Policy

1) Engage in a comprehensive analysis of state-level ESSA-related policies to determine the degree to which a place-neutral stance has been taken and adjust based on findings.

2) Provide flexibility in evidence base requirements for rural districts, including for access to 1003 funds.
3) Incentivize the implementation and evaluation of instructional practices from ESSA's Tier IV evidence base in rural school districts.
4) Provide technical assistance to rural districts for the selection of practices to ensure contextual fit and magnitude are prioritized.
5) Provide state-wide training and technical assistance focused on building absorptive capacity of school and district leaders, with priority given to rural leaders.
6) Convene rural schools and districts to engage in rigorous evaluation of instructional practices based on a robust logic model.
7) Support the dissemination of validated instructional practices across rural SEAs.
8) Support the dissemination of best practices for identifying and evaluating instructional practices from ESSA's Tier IV evidence base.
9) Provide technical assistance and funding for the implementation of rural internal boundary infrastructure to build sustainable capacity for school and district improvement.

Recommendations for Federal Policy

1) Engage in a comprehensive analysis of ESSA policies to determine the degree to which a place-neutral stance has been taken and adjust based on findings.
2) Add to the existing base of instructional practices in ESSA's Tier IV evidence base to provide a wide range of strategies for districts, prioritizing those found to be effective in rural settings.

3) Add to the existing base of instructional practices in ESSA's Tiers I – III evidence base found to be effective in rural settings.
4) Provide flexibility in evidence base requirements for rural districts competing for federal dollars through competitive grant processes.
5) Require states to shift from prioritizing tiers of evidence to prioritizing contextual fit and magnitude in the selection of evidence-based improvement strategies, particularly in rural and low-performing schools.
6) Allocate funding for states to design and implement programs to develop absorptive capacity of school and district leaders, with a requirement that rural membership is prioritized by states.
7) Allocate funding for states to provide technical assistance in the design and implementation of boundary infrastructure and require that rural districts are prioritized.

Conclusion

While further research is needed, internal boundary spanning infrastructure has promise for rural districts, as demonstrated by each part of this broad study on rural district infrastructure to support the improvement of schools. In Walnut Grove School District, internal boundary infrastructure supported overall district organization for the improvement of schools. Internal boundary infrastructure in Walnut Grove also fostered key conditions for rural district and school improvement: relationships, power sharing, and coherence. With these conditions in place, internal boundary infrastructure facilitated the creation of place-based knowledge in Walnut Grove. The use of boundary infrastructure to create place-based knowledge has the potential to elevate educational outcomes in rural settings. By elevating educational outcomes in rural

settings, we take significant strides toward achieving equity and opportunity for all students, regardless of geographical boundaries, and ensuring that every student succeeds.

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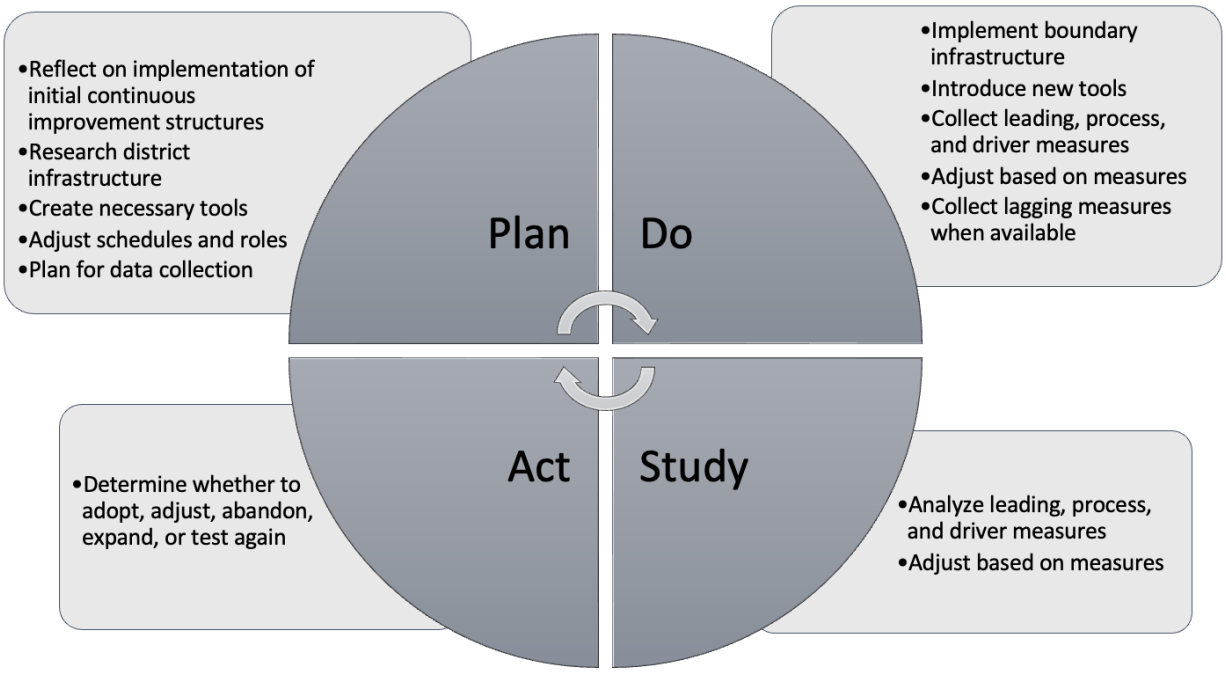
APPENDICES

APPENDIX A

Plan, Do, Study, Act Cycle



APPENDIX B

Data Collection Plan

Instruments/ Measures	Data Collectors and Sample	Timing/Reporting	Predictions
Leading Measures			
Changes in teacher practice as evidenced by movement on implementation guides	Principals will collect data using implementation guides during classroom observations.	Ongoing. Analyzed in November, February, and May as recorded in districtwide improvement tool	Movement on implementation guides will be predictive of improved student outcomes
Process Measures			
Completed teacher improvement team protocols	Principals will turn in a random sample to central administrators.	Monthly. Hard copies turned in at principal's meetings.	Instructional adjustments indicate teacher understanding and ability to act upon research-based practices
Note catchers from monthly check-ins with principals	We will store note catchers in the Google folder.	Monthly. The note catchers will be in the Google folder.	Principals' ability to reflect and discuss monthly questions will be indicative of their ability to access, understand, and act upon research-based practices
Driver Measures			
Changes in teacher improvement team practices using Data Team Implementation Guide	Principals will collect these from teacher improvement teams.	November, February, May. Analyzed during Implementation Team Roundups	Improvement on the Data Team Implementation Guide will indicate teachers are improving at accessing, understanding, and acting upon research-based practices

Completed districtwide improvement tool	Central administrators. Accessed through Google folder	November, February, May following Implementation Team Roundups	Ability of teams to monitor progress and adjust based on progress will indicate that leaders are improving at accessing, understanding, and acting upon research-based practices
Balancing Measures Response time to coaching requests	Coaches, CAO	Monthly	Lagged responses or lack of responses will indicate that coaching needs are going unaddressed as coaches shift to boundary spanning work
Lagging Measures 10% increase in student achievement by May 2024	Admin will collect from state reports	September 2024 when available from state	Whether or not the aim of 10% increase in student achievement has been met

APPENDIX C

Semi-Structured Interview Protocols

Coaches Focus Group

Boundary Spanning	Talk to me about the people you interact with as part of your job. ▪ What is that like? ▪ How has that changed? ▪ Who are your networks? ▪ How has your role evolved? As a coach, you interact with multiple people in various roles in the district, including teachers, principals, and central administration. ▪ What kinds of unique insight do you believe this allows you to have? ▪ How does that insight benefit the work of teachers and schools?
Boundary Practices	▪ Can you walk me through what your role looks like when you're working with data teams? ▪ How has that changed? ▪ What does your focus tend to be? ▪ How about when you're working with implementation teams? ▪ How about monthly check-ins with principals? Data teams, implementation teams, and monthly check-ins are all times when we have people in different roles coming together to talk about instructional practice. ▪ What stands out to you about these types of meetings?
Boundary Objects	We have tools in the district that are used by multiple teams. Implementation guides, data team protocols, and the district improvement tool are a few of these tools. ▪ As someone who interacts with each of these tools, how do you see them being used by people in different roles? ▪ How are they helpful to you in your role?
Continuous Improvement	We've discussed several topics today. ▪ How do you see this work connecting to continuous improvement in the district? ▪ How have the practices (data teams, implementation teams, monthly check-ins) and tools we've discussed shaped your work? ▪ How do you see it affecting the work of schools and teachers?
Anything else	What do you find most useful as a district coach? What makes it useful? What isn't working? What would you recommend for changes?

Chief Academic Officer Interview

Boundary Spanning	Talk to me about the people you interact with as part of your job. ▪ What is that like? ▪ How has that changed? ▪ Who are your networks? ▪ How has your role evolved?

	As Chief Academic Officer, you interact with multiple people in various roles in the district, including teachers (colleagues), principals, central administration, and district coaches. ▪ What kinds of unique insight do you believe this allows you to have? ▪ How does that insight benefit the work of teachers and schools? ▪ How has that shifted over the past few years?
Continuous Improvement	▪ How has continuous improvement work shifted over the past few years? ▪ Can you describe what continuous improvement looked like 3 years ago in the district? ▪ How does it look now? ▪ How have the tools and practices affected that work? ▪ How has your role shifted?
Boundary Practices	We've implemented several district practices that bring together members of multiple communities of practice. For example, data teams now include teachers plus district coaches. Implementation teams include coaches, principals, and staff. Monthly check-ins include central administration, coaches, and principals. ▪ How do you feel this has affected interactions in the district? ▪ What has stood out to you? ▪ How has it shaped your work with schools and teachers?
Boundary Objects	We have tools in the district that are used by multiple teams. Implementation guides, data team protocols, the data team development tool, and the district improvement tool are a few of these tools. ▪ As someone who interacts with each of these tools, how do you see them being used by people in different roles? ▪ How are they helpful to you in your role as CAO? ▪ How are they helpful to schools? ▪ Teacher teams? ▪ Teachers?
Anything else	What do you find most useful? What barriers still exist? What recommendations do you have?

Principal Interview

Continuous Improvement	▪ How has continuous improvement work shifted over the past few years? ▪ Can you describe what continuous improvement looked like 3 years ago in the district? ▪ How does it look now? ▪ How have the tools and practices affected that work? ▪ How has your role shifted? ▪ How has the work of teacher teams shifted? ▪ Individual teachers?
Boundary Practices	We've implemented several district practices that bring together members of multiple communities of practice. For example, data teams now include teachers plus district coaches. Implementation teams include coaches, principals, and staff. Monthly check-ins include central administration, coaches, and principals. ▪ How do you feel this has affected interactions in the district?

	▪ What has stood out to you? ▪ How has it shaped your work?
Boundary Objects	We have tools in the district that are used by multiple teams. Implementation guides, data team protocols, the data team development tool, and the district improvement tool are a few of these tools. ▪ As someone who interacts with each of these tools, how do you see them being used by people in different roles? ▪ How are they helpful to you in your role as principal? ▪ How are they helpful to schools? ▪ Teacher teams? ▪ Teachers?
Anything else	What do you find most useful? What barriers still exist? What recommendations do you have?