The Dissertation Committee for Audrey R. De Zeeuw certifies that this is the approved version of the following dissertation:

The Context of a Rural Professional Learning Community

Committee:

James Barufaldi, Supervisor

Joan Hughes

Michael Marder

Jill Marshall

Walter Stroup

The Context of a Rural Professional Learning Community

by

Audrey R. De Zeeuw, BS Bio.; MA

Dissertation

Presented to the Faculty of the Graduate School

of the University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2015

Acknowledgments

My doctoral journey would not have been attainable without the support of several important people. To my committee, thank you for your role and support through this process; each of you has provided unique knowledge and perspectives, guided me with your leadership and inspired me to produce the best research I possibly can.

To my supervisor, Dr. Barufaldi, thank you for pushing me and believing in me, it is my honor to be your last supervised defense. To my editor, Sarah Cale, for helping with all the details, you really had the job cut out for you. To my students throughout the years, y'all were the inspiration for this degree and the reason I have persevered throughout this process. To my participants, who gave up precious hours of their time and are some of the most passionate educators I have ever encountered, it was my pleasure to work with you over the course of the past year. I have also been incredibly fortunate to have the tireless support of my dear family and friends who made sure I actually left a desk and got outside and smiled. Finally, thank you to Craig, whose love and encouragement got me through the challenging days/weeks/months/years and for reminding me to have fun every once in a while, I love you (and Boo & Uno) to pieces.

The Context of a Rural Professional Learning Community

by

Audrey R. De Zeeuw, PhD

The University of Texas at Austin, 2015

Supervisor: James Barufaldi

This dissertation is concerned with exploring the context of a rural professional learning community and the interactions between the context and participants, both teachers and facilitators. An interpretive, qualitative, instrumental case study, the format of data collection and analysis used an instrumental case study approach and interviews, classroom observations, field notes, and artifacts. Participants included four teachers across three different rural locales and two facilitators. Data on the six study participants was collected over the 2013-2014 school year. Findings from this study add to research on the understudied rural context as well as work of in-service educators and teacher educators working within and across these communities. First, this study elucidates nine components of the rural context: students, standards, and student learning needs; teachers and teacher learning needs; practices, curriculum instruction, assessment, and the learning environment; organizational culture; organizational structures and leadership; national, state, and local policies; resources; history of professional development; and parents and community. Additionally, this study identifies new roles for professional development facilitators and explores classroom the teaching practices

in rural science classrooms. Finally, this dissertation highlights the importance of rural communities on the interactions of facilitators and participants who work in a rural context. Attention to the roles and interactions between facilitators, teachers and the rural context is of utmost importance towards understanding and ultimately improving professional development experiences for these predominantly isolated educators. This work has the potential to directly impact current and future STEM students and ultimately the STEM workforce by improving professional development for science educators and ultimately science students. Therefore, attention to who is working in and around these communities as well as what is happening within the context of the professional development of rural educations is of particular interest for all those working to improve science education.

Table of Contents

xii

List of Figures

List of Tables

Chapter One: Introduction

"It is a tough job, it is not something for wimps to take on. And I say that all the time,

when people say your job is easy…Really? Come spend a day with me, I'll make it look

easy to you."

(Jennifer Edwards*, Singleton ISD, Interview, April 28, 2014
* Pseudonyms used to protect the identity of participants)

Jennifer is a middle school math and science teacher who works in a small

central Texas town, Singleton. She teaches two math and five science classes for 50

minutes every day on a small K-12 campus. Jennifer is a member of the Texas Regional

Collaboratives (TRC), a professional learning community (PLC), and travels to a city an

hour and a half a way every two months to meet with teachers who work in similar rural

areas. Research has shown the importance PLCs as forms of professional development

(DuFour & Eaker, 1998; DuFour & Fullan; 2013, Hord, 2004), but little research has

explored the roles of teachers and facilitators within these PLCs and their interactions

with the rural context of their work. This dissertation uses an instrumental case study

approach to describe the context and participants roles and interactions in a rural

professional learning community.

Background of the Problem

The No Child Left Behind Act of 2001 called for states to ensure high-quality

professional development for all teachers (Holloway, 2002). One particular area where

professional development (PD) is of utmost importance is Science, Technology,

Engineering, and Math (STEM) education (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2010). This interest in STEM specific professional development is partially driven by recent reform efforts as international test scores in STEM subjects constantly point towards the need to improve. This improvement burden falls on the people directly responsible for STEM instruction, the teachers. These test scores coupled with the rhetoric surrounding the lack of student preparedness for a STEM workforce (Augustine, 2005), drive the increased interest and subsequent interest in the professional development of STEM educators. One type of PD, PLCs, has emerged as an effort that often claims to improve teaching of all subjects, including STEM teaching from good to great (Fulton & Britton, 2011). Although PLCs are a form of professional development used across grade levels, locations, and content domains, there is not a formula for creating and sustaining the ideal PLC (McLaughlin & Talbert, 2006; Wilson, 2013). What is known is that PLCs can encourage and support teacher learning, which in turn can improve student learning and student achievement (DuFour & Fullan, 2013). Although key components of PLCs have been established (DuFour & Fullan, 2013; Fulton & Britton, 2011; Jones, Gardner, Robertson, and Robert, 2013; Hord, 2004), little work has been done to explore what characteristics of these components and more specifically how these components interact within specific contexts (Wilson, 2013, particularly rural environments.

Statement of the Problem

Most Americans form opinions about the residents of rural communities and areas from a distance (through literature, art, and music), rather than through direct experience with conditions of rural communities and their people. This lack of interaction fosters a complex mix of attitudes (Brown & Swanson, 2003) towards rural communities amongst the population in general. Rural communities are often generalized as isolated and characterized as the polar opposite of their urban and suburban counterparts. For example, in a recent Internet search of "Rural American Classroom" images of dirt-covered floors, nuns in habits surveying small wooden desks, and essentially rather bleak circumstances dominated the screen. In contrast, when searching "Urban American Classroom" books about the subject appeared, as well as images of minority students raising their hands, only one black and white "traditional" classroom was on the first page of images. However, in reality rural communities across the world are as unique and diverse as their urban and suburban counterparts (Anderson & Lonsdale, 2014; Howley & Howley, 2014). Almost 8,000, more than half (56%), of public school districts in the United States are located in rural areas and these districts occupy one third (31%) of the nations public schools and more than one fifth of the total US student population (Strange, Johnson, Showlater, & Klein, 2012). More than 739,000 teachers work in rural schools educating 10 million students (Harmon & Smith, 2012), representing twenty-three percent of all US students attending public schools (US

Department of Education, 2012). Rural students and teachers do represent a minority population in education, but since when has education research, education policy, public school leadership, administration and journalism shied away from the minority? The answer; rarely as minorities dominate discourse about education, except when it comes to examining rural communities.

Science teachers in rural communities rarely have opportunities to engage in subject specific professional development, if any professional developments at all, as these areas are lacking resources and expertise to implement such programs (Howley & Howley, 2000). This professional and intellectual isolation leaves rural STEM educators without the opportunity to improve their practice in response to reforms, increased pressure on the subject matter, and scrutinized performance on student standardized tests.

Since rural schools and the number of faculty are relatively small, if PLCs as a form of professional development exist in these locations, they stretch across more than one community, often across districts, creating a complex context for a rural PLC. As PLCs are often held under one roof, in one school, or at the extreme, a district (DuFour & Fullan, 2013; Hord, 2004). Although looking at PLCs is a common research interest *within* school settings, PLCs *across* campuses and districts are a relatively new area of research (Vescio, Ross & Adams, 2007), nonetheless PLCs exist *across* rural districts. Aside from examining a sprawling PLC, there are also few research studies using

observational classroom data to explore and document science-teaching practices inside the classrooms of teachers who are members of PLCs. This examination of pedagogy and student interactions in classroom can be used to inform the continued development of PLCs (Vescio et al., 2007), yet is lacking in the literature.

Ultimately the problem is this, STEM educators in rural communities represent a sufficient portion of educators who teach enough students to force the education research community to pause and ask, why aren't we paying attention to this? However, aside from pointing out disparities in student test scores and inaccurately portraying these rural communities, the educational research base examining *what is happening to*, w*ith,* and *within* the rural education setting is lacking. Examining the rare, but existing sustained professional developments opportunities for STEM educators, such as a PLC, in these communities can not only unearth the *what is occurring* in this misunderstood and isolated locale (Burton, Brown, & Johnson, 2013) but also inform continued design of professional development experiences with a deeper understanding of the context and participants in rural professional learning communities.

Purpose of the Study

This dissertation addresses the context of PLCs in the often neglected and ill-understood setting of rural education (Burton et al., 2013; Arnold, Newman, Gaddy, & Dean, 2005), specifically science education (Oliver, 2007). The overall purpose of this study is two-fold: First, to elucidate the context of a rural PLC and second, to identify

the roles and interactions of participants, specifically, the teachers and facilitators, within the rural context of statewide professional learning communities.

Secondary science education in rural communities has often been touted as a unique and isolated experience where teachers have minimal opportunities to interact with their peers (Burton et al., 2013; Holloway, 2002). University partnerships with PLCs (Burton et al., 2013) are one plausible way to remedy this feeling of isolation amongst rural secondary science teachers. If quality professional developments are part of the national STEM education reform effort, then all areas of the nation must be considered, including rural communities (Clark, 1972; Burton et al., 2013).

The context of any professional development is known to influence its effectiveness (Borko, 2004; Garet, Desimone, Porter, & Yoon, 2001), yet there is little current research across the variety of contexts, specifically educators who work in rural communities (Arnold et al., 2005). Secondary science PLCs located in rural communities provide a rich area of untapped information, specifically the relationships and interaction between teachers, facilitators, and context. Understanding the characterization and negotiation of the context amongst participants is essential for the continued design, development, and implementation of PLCs as a form of professional development.

Research Questions

The overall goal of this research agenda is to understand the context of a rural PLC; specifically, the roles of the members of a statewide PLC, the teachers and facilitators, and their interactions with the rural context of their profession. The study is guided by the following research questions:

1. What is the rural context, as defined by Loucks-Horsley and colleagues (2010), of the Texas Regional Collaboratives?

2. What is the role of the facilitators within a rural context of Texas Regional Collaboratives?

    A. How do the facilitators interact with the Professional Learning Community within a rural context of Texas Regional Collaboratives?

3. What is the role of the teachers within a rural context of Texas Regional Collaboratives?

    A. How do the teachers interact with the Professional Learning Community within a rural context of Texas Regional Collaboratives?

Importance

The results of this study will inform the improvement and development of PLCs that extend beyond the school building across a large rural area. This study provided a unique opportunity to study the facilitators as well as the teacher participants in a rural PLC, creating a holistic interpretation of the key participants (Borko, 2004) of a

professional development. This study will provide greater insight, through observational data, into the teaching practices of teachers that are part of a rural PLC. Further possible insights could inform strategies to connect rural teachers to their peers beyond district lines, thus reducing the feeling of isolation (Holloway, 2002). Although the rural educator is currently viewed as "romantically simple" (Burton et al., 2013, p. 9), lessons learned from rural education can inform the design and implementation of PD across all contexts. Possible results from this study can contribute to the knowledge base of high quality, large-scale PD across a variety of contexts necessary to support teachers in acquiring the knowledge and skills in the current climate of educational reform (Wilson, 2013). Outside of this immediate influence of results, a broader scope of impact includes policy makers, public school leaders, journalists, and academic researchers at large.

Scope of the Study

The data for this study was gathered from June 2013 until June 2014 across the state of Texas. The researcher visited the study site four times over the course of the school year and conducted interviews and observations during each visit. Data was analyzed throughout the course of the study with in-depth analysis during the summer and fall of 2014.

Definition of Terms

Context of PD: Consists of a) students, standards, and student learning needs; b) teachers and teacher learning needs; c) practices, curriculum instruction, assessment, and

the learning environment; d) organizational culture; e) organizational structures and leadership; f) national, state, and local policies; g) resources; h) history of Professional development; and i) parents and community (Loucks-Horsley et al., 2010).

House Bill 5 (HB5): Law passed in the Texas legislature in the spring of 2013. The bill eliminated 10 out of 15 high stakes end of course tests that were previously required for high school graduation. The bill also eliminated the requirement for high school students to take 4 years of science, mathematics, language arts, and social studies, which were replaced by personalized graduation plans where students could earn Endorsements, or a more focused sequence of coursework.

PLC (PLC): An inclusive group of people, motivated by a shared learning vision, who support and work with each other to inquire on their practice and together learn new and better approaches to enhance student learning (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006)

Preps: an abbreviation for preparation, representing the number of classes a teacher must prepare for during a given teaching cycle. For example, if a teacher is assigned to teach math, chemistry, and biology, he or she has three preps.

Resources: material or intellectual resources with the purpose of teaching or learning. For example, time, professional materials, teaching materials, computers, content expertise (from local college faculty, mathematicians or scientists from industry), and experienced teachers (Loucks-Horsley et al., 2010, p. 73).

9

Texas Regional Collaboratives (TRC): a statewide network of 58 P-16 partnerships that provide sustained and high intensity professional development to P-12 teachers of science and mathematics across the state of Texas.

Limitations

The study contains limitations that should be recognized. First, this study included six participants, although this is sufficient for an instrumental case study (Stake, 2005), the findings of this study are purposefully limited by the context. Therefore, the results should not be generalized to other populations (Firestone, 1993) of rural PLCs without careful consideration of the subject area, particular aspects of the school culture, the type of professional development being implemented, and the relationship between these entities.

Also important to note, participants were aware of the relationship between the researcher and the TRC. This could have made participants feel like they should answer questions disingenuously out of consideration for the relationship. However, open-ended questions and specific observed examples from classroom and TRC meeting observations were employed during participant interviews to facilitate authentic and honest answers. This limitation was also an advantage to the study as participants felt more comfortable sharing their insights with a researcher they trust (Guba & Lincoln, 1994).

Summary

This dissertation is concerned with exploring the interactions between participants, both teachers and facilitators, and the rural context of a professional learning community. Findings from this study add to research on the understudied rural context as well as work of in-service educators and teacher educators working within and across these communities. Attention to the roles and interactions between facilitators, teachers and the rural context is of utmost importance towards understanding and ultimately improving professional development experiences for these predominantly isolated educators. Additionally, this study identifies new roles for professional development facilitators and explores classroom practices in rural science classrooms. Finally, this dissertation highlights the importance of rural communities on the interactions of facilitators and participants who work in a rural context. This work has the potential to directly impact current and future STEM students and ultimately the STEM workforce by improving professional development for science educators and ultimately science students. Therefore, attention to who is working in and around these communities as well as what is happening within the context of the professional development of rural educations is of particular interest for those working to improve science education.

Overview of Chapters

Chapter two of this dissertation includes a discussion of the literature relevant to this study. These areas include literature on PLCs as a form of professional development, research on the context of PLCs, and what is currently known about the rural context of PLCs. Chapter three characterizes the research design, the methodology, and the data collection and analysis methods for the study. Chapter four presents the results illustrating the nine elements of context (Loucks-Horsley et al., 2010) as well as the roles of participants and their interaction with the rural context of the PLC. Chapter five interprets the study data, discusses the findings within the lens of relevant literature, and discusses the implications of these findings for the STEM professional development community.

Chapter Two: Literature Review

Three bodies of research inform the research questions. The first is literature on

PLCs as a form of professional development. The second is research on the context of

PLCs, and the third is the literature on the rural context of PLCs. This review of

literature supports the case that the rural context of PLCs for secondary science teachers

is an important area to explore with the purpose of informing the domain of effective

professional developments.

PLCS

PLCs as a form of professional development for educators became popular in the

1990s, using lessons learned from "learning organizations" in the business world. Senge

(1990) described learning organization as places "where people continually expand their

capacity to create the results they truly desire, where new and expansive patterns of

thinking are nurtured, where collective aspirations are set free, and where people are

continually learning how to learn together" (p. 3). Building on this notion, Lave and

Wenger's work (1991) explored the creation and sharing of knowledge across multiple

organizations. They recognized that adults working in their professional organizations

need to engage in social exchanges, experimentation, and shared experience in order to

develop and share knowledge. Although they originated in the business world, learning

communities began to appear in schools and districts and quickly became a common

term in education journals and professional development models during the 1990s. At

13

the same time of the development of these learning communities, education researchers

began exploring ways to improve the long-despised in-service professional development

experiences for teachers. A few of the features identified of effective professional

developments include, but are not limited to: sustained and ongoing, inquiry oriented,

accessible, administrative and facilitator supported, constructivist based, collaborative

and embedded in the work of teachers (Garet et al., 2001;Putnam & Borko, 2000).

PLCs are based on these principles of effective PDs and the premise that teacher

knowledge is embedded in the lived experiences of teachers. An ultimate result of

actively engaging teachers in reflecting on their professional knowledge and practices is

to possibly alter instruction to better promote student learning (Vescio et al., 2007).

However, people working together, meeting regularly and discussing their practice does

not necessarily mean a PLC exists. As Hord and Summers (2008) pointed out, PLCs are

structures for continuous learning and use of knowledge in the course of conducting the

work of teaching. Stoll and colleagues (2006) echoed this sentiment describing the

importance of the social context of PLCs, " at the heart of the concept…it's the notion of

community. The focus is not just on individual teachers' professional learning but of

professional learning within a community context – a community of learners, an the

notion of collective learning" (p. 255). Many researchers have identified the essential

elements of PLCs. Rather than supply an exhaustive list, the most cited and recent

examinations of these characteristics are shared in Table 1.

14

Table 1

Components of PLCs

DuFour and Fullan (2013)	Fulton and Britton (2011)	Hord and Colleagues (2004)	Jones and Colleagues (2013)
Shared Mission, vision, values, and goals which are all focused on student learning	Shared values and goals	Shared Values and Vision	Building the foundation on teachers' shared values and vision
A collaborative culture with a focus on learning	Collective Responsibility	Supportive and Shared leadership	Promoting Collective Responsibility for student learning
Collective inquiry into best practice and current reality	Authentic assessment	Collective Learning and application of learning	Increasing reflective professional inquiry
Action oriented or "learning by doing"	Self-directed reflection	Supportive conditions	Promoting Collaboration
A commitment to continuous improvement	Stable Settings	Shared Practice	Integrating collective as well as individual learning
A results orientation	Strong Leadership support		

Culture of a PLC. Beyond a checklist of characteristics of a PLC, the culture of a PLC is an important component of its success as it can make or break a professional development (DuFour & Fullan, 2013; Hord, 2004; Loucks-Horsley et al., 2010). Strengthening the culture of the PLC must be a central and consistent goal of all professional developments (Loucks-Horsley et al., 2010). In her work on designing

15

professional developments for math and science teachers, Susan Loucks-Horsley and her colleagues (2010) described the relationship between culture and professional development as symbiotic, "Professional development activities contribute to a culture of collegiality, critical inquiry, and continuous improvement; the school culture, in turn, stimulates ongoing professional development-a mutually reinforcing relationship" (p. 62). Wilson and Berne (1999) described echoed a similar sentiment, "teacher learning out not be bound and *delivered*, but rather activated" (p. 194). This relationship between the culture of the PLC and the PLC itself form the backbone of the learning community.

Collaboration. One important component of the culture of all professional development programs, including PLCs is collaboration (Hill, Beisiegel, & Jacob, 2013; Noyce, 2006). When describing their conceptualization of PLCs, Loucks-Horsley and colleagues (2010), emphasized the importance of a collaborative and collegial environment that emphasized the de-privatization of teaching, "moving teaching out from behind closed doors so teachers share ideas and practice with one another" (p. 62). In practice, PLCs break the tradition of isolation in the classroom and create an opportunity for teachers to build trust and openness amongst their colleagues (Hord, 1997). With this sense of trust, teachers can then benefit from collaborative problem solving as well as increased feelings of efficacy and professionalism (Talbert & McLaughlin, 2002). Borko (2004) also emphasized the idea of responsibility, describing the willingness of community members to assume responsibilities for their colleague's

16

growth and development. Liebermann (2000) further characterized this sense of responsibility when examining the importance of networking across learning communities, describing a sense of shared purpose, a mixture of information sharing and psychological support.

Loucks-Horsley and colleagues (2010) described the collaborative culture of a professional development as a soil where leadership and changes in teaching and learning can "take hold" and establish a sustainable professional learning environment (p.65). The collaborative component combats the feeling of isolation many teachers feel in their classroom and on campus (Liebermann, 2000) and allows participants of PLCs to support the culture of the PLC and ultimately achieve the fundamental purpose of learning for all (DuFour & Fullan, 2013).

Whitcomb, Borko and Liston (2009) found that PD experiences are particularly effective when situated in a collegial learning environment, where teachers work collaboratively and reflect on their teaching. Beyond feelings of efficacy and shared responsibility, collaboration can also be somewhat linked to student improvement. In a study of student achievement on elementary math and science tests in an urban district, Goddard, Goddard, R. D., and Tschannen-Moran (2007) found that teachers who reported more collaboration with their colleagues worked at schools with gains in student achievement.

Risk Taking. One component of the psychology of learning communities involves teacher risk-taking. Risk-taking in education is an often-cited component and product of professional development experiences (Darling-Hammond, 1994) and specifically professional learning communities (Hord, 2004). However, the study of risk-taking in relation to education represents a small cadre of literature. Spitzer (1975) concluded that "group discussion has a profound effect upon attitudes toward educational risk-taking" (p. 373) instilling a sense of confidence and the willingness to take a risk; however, what transpired in the classroom was not identified. In 1991, Short and colleagues examined how teachers' perceptions of involvement with administration in decision making affected their perceptions of a risk buoyant environment. Not surprisingly, teachers who felt like they were not involved in final administrative decisions did not feel as supported to take risks in their environment. Later in 2010, Gallo-Fox, examined risk-taking within a co-teaching professional learning community and found that the practice of co-teaching opened up situations for risk-taking and created an environment of support and experimentation. However, these elements support the likelihood of educational risk-taking, but what this looks like in practice remains to be explored.

STEM PLCs. The charge for innovative professional development is felt across all subject areas in the Untied States. Ongoing professional developments, such as PLCs,

are one attempt to incorporate effective professional development with the goal of improving teacher practice and ultimately student learning.

In their thorough examination of the literature of STEM specific PLCs, Fulton and Britton (2011) found that PLCs were universally recommended as a form of professional development; however, there were limitations in the research about "being clear and substantial rather than superficial in defining and implementing them" (p. 7). In this review, Fulton and Britton (2011) found that STEM teachers in learning teams: understood math and science content better and felt more prepared to teach math and science. Beyond this notion of preparedness, STEM PLCs influenced teacher's instruction as the research reported practices becoming more reformed-oriented, teacher attention to students' reasoning and understanding increased and teachers engaged students in more diverse modes of problem solving.

Richmond and Mankore (2011) designed a 5-year project in urban communities to serve as a backbone for improving science teaching effectiveness in the district. Interestingly, an urban district was chosen as the site to address the great expectations of teachers and their desperate need for "substantial scientific understanding…and access to sufficient resources…where large numbers of teachers are teaching outside of their subject matter of expertise and where there are fewer available resources to support teaching and learning" (Richmond & Mankore 2011, p. 544). This choice of site is interesting as many teachers, not only those in urban settings, experience a sense of

isolation teaching science (Fulton & Britton, 2011; Wong, Britton, & Ganser, 2005). Other STEM PLC research was conducted in urban settings with a similar rational (Mundry & Stiles, 2008). The research on urban PLCs research demonstrates that building trust and openness in a learning team leads to a collaborative professional environment where STEM teachers can comfortably talk and learn about STEM content, thus breaking this sense of isolation.

The research surrounding STEM educators involved in PLCs yields positive results. Many of the investigations and literature examining STEM specific PLCs are found in evaluations of Math Science Partnership (MSP) grants. A primary goal of this effort of the MSP was to identify and develop strategies that deal with issues of teacher quality, quantity, and diversity. Proposals were encouraged to offer solutions that would:

strengthen the mathematics and science teaching profession, especially in underserved areas, through (a) recruitment of qualified individuals to become teachers, (b) preparation of future teachers in significant content and pedagogy, (c) support of the teacher certification process, (d) policies that impact where teachers are employed, (e) induction into the field, and (f) continuing professional development (Hamos et al., 2009, p. 18)

Fulton and Britton (2010) discovered positive changes when examining the MSP projects. For example, they found that participation in PLCs can successfully engage teachers in discussion about content knowledge or knowledge about how to teach it

(pedagogical content knowledge), which in turn positively impacts their understanding

of or preparedness to teach content, or attitudes toward teaching methods. Fulton and

Britton (2010) also found participation in PLCs increased teachers' deliberation about

students' mathematics or science thinking.

      Gap. Currently, PLCs are a model of professional development for quality

teaching. The National Commission on Teaching (2003) described these communities of

learning as "building blocks" of the foundation of American schools (p. 1). PLCs are

now used across all content domains, including science education (Jones et al., 2013).

Although many definitions and descriptions of PLCs exist across the literature (Stoll et

al., 2006), this study will use the Fulton and Britton's (2011) definition in their report on

STEM specific PLCs, "requiring that the enterprise involve three or more teachers and

be a sustained effort over time, rather than a one-time event…However, they all share

the general aim of focusing teachers on improving their practice and learning together"

(p. 5). The recent literature surrounding PLCs in situ, rather than created for the purpose

of research, is emerging as PLCSs are explored in the real world context (Vescio et al.,

2007). Fulton and Britton (2010) called for precise and fine-grained understandings on

specifics of carrying out various PLC configurations for specific purposes. Purposefully

exploring the role of culture within a PLC and how the components of a PLC are

enacted and interact within a real world context, rather than created for the purpose of

research. This gap in the literature is not an issue unique to the United States and the

21

examination of specific models of PLCs in practice are "hot topics" in many countries (Stoll et al., 2006, p. 221) as rural is not rare and professional development is an international concern.

Members of a PLC. Although STEM PLCs are examined across the literature, what is continually emphasized is the importance of the members of these PLCs. PLCs strives on social capital (Spillane, Diamond, Walker, Halverson, & Jita, 2001), meaning, the importance of social networks and relations among individuals across the group. These relationships result from the existence of norms, trust, collaboration, and a sense of obligation (Spillane, Hallett, & Diamond, 2003). Richmond and Mankore (2011) found that PLCs were successful not only because of the content and instructional knowledge shared, but the confidence shared by participants. They argue that PLC membership was a vehicle that provided the foundation for reform, in part by supporting the development of a shared vision of teaching, creating a safe space for teachers to share their practice, and to learn with and from each other. They also received support from their PLC colleagues for taking instructional risks.

Jones and colleagues (2013) surveyed 65 elementary teachers who participated in a science PLC, she supported this notion of social capital, as participants emphasized the importance of sharing ideas; however a majority of her participants reported a differential impact of PLCs depending on teachers' levels of experience. PLCs were reported as being more beneficial to new teachers than experienced teachers.

Experienced teachers tended to serve as mentors with few opportunities to be challenged by more experienced educators. One solution to this differential experience is a PD experience that extends over time, especially if it involves an outside expert, such as a university educator or district level content coach (Borko, 2004; Grossman, Wineburg, and Woolworth, 2001; Hamos et al., 2009; Richmond & Mankore, 2011).

Facilitator. The PLC as a sustained form of professional development requires guidance in the form of a facilitator. When Borko (2004) proposed a way to evaluate effective forms of professional development she identified three important participants within the context of the PD; a) The teachers, who are the learners in the system; b) The PD program and; c) the facilitators who guide the teachers as they construct new ideas (Figure 1). The facilitators of a professional development, amongst many other things, are charged with creating the culture of collaboration and responsibility between the participants (DuFour & Fullan, 2013). These facilitators should also support teacher risk taking and the continuous improvement of teaching practice (Lieberman, 2000; Putnam & Borko, 2000). In their synthesis of STEM specific PLCs, Fulton and Britton (2011) summarized three important roles facilitators need to fulfill for a successful PLC: "1) facilitating knowledge, including helping to find relevant STEM or STEM education expertise is needed 2) processing facilitation to attend to the structure and interactions of the groups 3) focusing facilitation to keep the group on target" (p. 15). Thus, facilitation is needed to make a PLC work as productively as possible as appropriate facilitation is a

key variable in PLC effectiveness (Nickerson & Moriarty, 2005). Facilitators must

navigate a new forum of learning as learning communities for adults are different than

facilitating a learning environment for students (Sparks & Hirsh, 1997).

Figure 1. Framework for Evaluating Professional Development from Borko (2004)

      Effective facilitators must possess important skills because helping other adults

(teachers) learn is a different form of expertise than helping children to learn

(Hammerman, 1997). The facilitator must also be interested and able to inquire into the

thinking of other members of the PLC. This requires the facilitator to be a good listener

who is able to make sense of the meanings conveyed by others (Carlson, Moore,

Bowling, & Ortiz, 2007).

Facilitators are responsible for not only creating a sense of trust (Richmond &

Mankore, 2011), but also leading members to be comfortable in reflection (Stoll et al.,

2006) with content expertise. This leadership component of facilitation should not be

overlooked, as they are key to building professional learning communities within and

between schools (McLaughlin & Talbert, 2006). Facilitators working to build a learning

community are challenged with focusing and supporting teacher learning towards goals

such as: discipline knowledge and skills, individual learners, assessment, and

establishing a peer learning community.

These facilitators should support and nourish meaningful collaboration among

teachers. Therefore, it may be critical in early stages of the PLC to focus as much or

more on development of relationships, trust and socio-emotional issues as on academic

content (Hammerman, 1997; Puchner & Taylor, 2006). For STEM specific PLCs, a

facilitator with content expertise is better than one without content knowledge in the

field, as a content knowledgeable facilitator can push the conversation and add his or her

own content expertise (Fulton & Britton, 2010).

Aside from essential characteristics of effective facilitators, facilitators act as the

glue that holds the PLC together (Mundry & Stiles, 2008). In one of the few studies

examining an online virtual science PLC to support high school chemistry teachers

across the state of Illinois, participants credited facilitators with helping the group

acquire critical knowledge for teaching (Hamos, et al., 2013). In this study, participants

25

interviewed indicated that it would be difficult for them to continue with the PLC

meetings without outside facilitation. They felt that they had learned much but did not

feel skillful or empowered enough to bear significant responsibility for keeping the work

moving forward productively. This reliance on facilitators can negatively impact a

PLC's sustainability; however, a fine balance is possible. Garet and colleagues (2001)

described the importance of the staging of particular experiences and the degree of

sustained engagement for long-lasting change. Although facilitators are essential to the

success of a PLC, their role within the PD must be strategically supportive.

At times, school administrators can fulfill the role of facilitators; however it is

can also be an outside expert from a university or district level content coach (Borko,

2004; Grossman, Wineburg, & Woolworth, 2001; Hamos et al., 2009; Richmond &

Mankore, 2011). Not to discount the importance of school administrators, specifically

the principal, as their support is essential to the success of PLCs (Hord, 1997; Maynor,

2010; Richmond & Manokore, 2011; Stoll et al., 2006). Administrators, specifically

principals, are conceptualized and described as leaders within PLCs (Mullen & Schunk,

2010; Hord, 1997, 2004). In order for this leadership to be effective, members of a PLC

need to know that their school administrators support them in this honest reflection and

that their team members are all working together to help each other improve student

learning. Lambert and colleagues (2002) described this type of leadership as

constructivist leadership, "Constructivist leadership addresses the need for sense-

26

making, for coherence, and for seeing educational communities as growth producing entities. Leadership that is formed around the principles of constructivist learning for adults captures these possibilities for learning" (p. 35).

Essentially, leadership in the form of a principal or facilitator must create a culture of trust and collaboration, forming a productive learning environment for adult learners.

Where PLCs are implemented. PLCs have become very popular both in the United States and other countries as a vehicle for engaging both schools and teachers in examining professional practice and implementing reform-based change in the classroom. Although PLCs have been studied in other content disciplines such as mathematics, there is limited research on the efficacy of PLCs for science teachers (Fulton, Doerr, & Britton, 2010) and even less known about PLCs as a model for rural secondary science teachers.

PLCs can be particularly helpful for teachers in schools and districts that serve diverse student populations. Some experts noted, however, that even in "less than ideal" learning community designs and implementations, there were instances when the participants still felt there was profound value to breaking teachers' isolation by conferring, collaborating, and sharing strategies and plans for mathematics and science lessons (Hamos et al., 2013, p. 20). Melville and Yaxley (2009) investigated breaking this barrier of isolation by exploring singleton PLC membership, meaning composing

PLCs of teachers across a district rather than within campus departments. This effort forced collaborative work to be conducted during the designated PLC meeting time. Although this time was productive; participants rarely had the opportunity to continue this work and find mutual and immediate support or collegial feedback where they spent most of their working lives–namely, at their school site. One solution was examined in rural Illinois (Hamos et al, 2009); the Virtual PLC (VPLC) project explored the importance of an online, a-synchronous PLC. Results from this project yielded important findings for the design of other Virtual PLCs such as: a) allowing for in-depth investigation and analysis of discussion topics, which promotes deep thinking and learning, and b) creating opportunities for more teachers and faculty to participate in the same discussion session, which enhances collaboration and social interaction. Although this was an isolated study of STEM PLCs in rural locations, this work indicated early success of reducing the sense of isolation as one Fellow noted,

> [t]he networking with others in my field has meant a great deal to me. I have taught chemistry in Illinois for over twenty years and knew virtually no other chemistry teachers. Now I have a HUGE network of fellow teachers I can use for support and resources (Hamos et al., 2009, p. 19)

Networked Learning. Networked Learning is one way in which information can be shared and communication can exist within a PLC. Networked learning is defined as "learning in which information and communications technology is used to promote

connections: between one learner and other learners…between a learning community and its learning resources" (Banks, Goodyear, Hodgson, & McConnell, 2003, p. 1). This form of learning is best implemented with on-line materials and with other people. Meaning, the existence of online materials does not necessitate a networked learning environment because human-human interaction is an essential part of networked learning (Banks et al., 2003). This interaction is the centrality of these environments, as participants should value collaboration amongst the online community members. The dominant medium of this environment, specifically in education is using texts, such as email messages and entries (Goodyear, 2005). Once human-human interaction occurs and trust is established, participants can engage in dialogue, which can then help them form a networked community. This is an oversimplified description and definition of the careful design and detail that networked learning communities entail and their various approaches. However, the key points include the importance of human-human interaction prior to engaging in an online learning environment, the importance of trust before collaboration can be established, and the possibility of creating an environment in which participants can used a text based medium to communicate and collaborate.

Cady and Reardon (2009) examined the effects of implementing online professional developments for rural middle school mathematics teachers. These courses focused on both content and pedagogical subject, which offered "the opportunity to learn through rich social interactions with one another" (Cady & Reardon, 2009, p.282).

Teachers worked in cohorts of three to five examining which the authors identified as a professional learning community. Cady and Reardon stated, "By developing professional learning communities, teachers are able to interpret the broader vision set forth in the professional development within their local teaching contexts" (Cady & Reardon, 2009, p. 285-286), but do not support this strong statement with theoretical claims or evidence. Participants in this study valued online group problem-solving sessions and opportunities to share ideas with other teachers. They saw the value in being able to interact with others online, but preferred face-to-face interactions with each other. Cady and Reardon (2009) found that the online courses fostered collegiality amongst the small cohorts of teachers rather than isolation. The authors call for a cycle of experimentation and reflection over an extended period of time that develops a community of learners.

Systemic PLCs. The call for systemic education reform has been reverberating across academia, policy-makers, and other stakeholders since "A Nation at Risk" (Gardner, 1983). Almost two decades later, the Leave No Child Behind Act placed an emphasis on quality professional development for teachers. Currently, the federal government funds 2.33 billion dollars of professional development to school districts each year (Gulamhussein, 2013). Reform efforts paired with new standards, such as the recently released Next Generation Science Standards (NGSS), will require large-scale professional developments for science teachers; particularly those interventions that take

a systemic approach (Wilson, 2013). Aside from training pre-service teachers, helping all teachers, including in-service teachers acquire the skills necessary to meet the rigorous NGSS standards requires "large-scale professional developments of high quality that is adaptable across contexts" (Wilson, 2013, p. 310). Large scale professional learning communities have the opportunity to be organizationally-minded, meaning extending beyond the walls of schools and districts and embracing agencies, networks, institutions, and communities (Mullen & Hutinger, 2008).

Large scale and systemic collaboratives have emerged as a plausible type of reform aimed to educate and support STEM educators (Barufaldi & Reinhartz, 2002; Lieberman, 2000), specifically in rural communities (Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). One such collaborative, the Collaboratives for Excellence in Teacher Preparation Program (CETP), is aimed at preparing STEM teachers. This program focused on a culture through collaboration paired with inquiry-oriented capstone STEM content courses to produce better-prepared teachers (Lawrenz, Huffman, & Gravely, 2007). CETP posits that training teachers in this culture results in teachers using the content in their classrooms and eventually improving student understanding of science. In a study examining the effects of the CETP on participating university institutions and the teachers it trains, Lawrenz et al. (2007) found that the program had a positive impact on both the institutions and on the science and mathematics teaching of teachers prepared by the CETP program. One limitation of this

study was the lack of qualitative data as the results were self-reported survey information.

Another systemic attempt at addressing the issue of quality STEM educators is the Texas Regional Collaboratives (TRC) for excellence in science and mathematics teaching. The TRC professional development experiences were designed around both constructivist and socio cultural theories (Barufaldi & Reinhartz, 2002). The TRC supports in-service math and science teachers with quality professional developments in a model that is designed to meet the needs of practicing teachers (Barufaldi & Reinhartz, 2002). The focus of the TRC represents an alliance between 39 Regional Collaboratives among local colleges and universities, education service centers, school districts, business and industry, informal education sites, and the community. Assessment of the effects of the TRC is a complicated measure because of the construct and context of teaching within the systemic entity. However, case studies and classroom observations have revealed an improvement in teacher classroom instruction (Barufaldi & Reinhartz, 2002). Pre- and Post-tests administered at the beginning and end of the school year have also resulted in increased teacher knowledge and skills about specific content areas (Fletcher, 2013).

DuFour and Fullan (2013) explored characteristics of systemic PLCs. They described the PLC as a *process* rather than an *implementation* of a specific type of PD. Systemic PLCs drive an entire system of multiple schools and communities tied together

within a single authority, the smallest system being a school district. The goal of a systemic professional development is to "fundamentally alter the culture of a system" (p. 10). Du Four and Fullan (2013) charged the leadership of a system with the concept of clarity preceding competence. They called for well-intentioned leaders who posses a deep, shared sense of the conditions of their PLC. This clarity must always result from experience rather than rhetoric and emphasize a collective coherence, meaning these leaders need to cultivate a shared mindset amongst the individuals within the system.

Ultimately, finding where and how PLCs fit into the ecosystem of current professional developments is crucial to reform efforts. The interactions between schools, districts, teachers, students, and the community must be understood in order for reform efforts to understand and ultimately improve the systemic reform effort (Knapp, 1997; Wilson, 2013).

Gaps in the literature about STEM focused PLCs. Although the conceptualization of PLCs has been fleshed out among the research community, secondary science specific learning communities are still an area of needed research (Fulton & Britton, 2011). Fulton and Britton (2011) also suggested studies that are focused on science teachers in PLCs and investigations of PLCs happening in the field rather than specifically created for research purposes. The role of facilitators is acknowledged as important (Borko, 2004) and necessary (McLaughlin & Talbert, 2006) for a PLC to succeed; however, the role of these facilitators in specific context has yet to

be fleshed out. Aside from their initial design and implementation, PDs must be frequently redesigned in response to shifting standards and policy agendas (Hill et al., 2013; Wilson, 2013). Studies in this area should include professional development activities that are extended over time and across broad teacher learning communities in order to identify the process and mechanisms that contribute to the development of teacher learning communities (Bransford, Brown, & Cocking, 2000, p. 240). Professional learning communities that support teacher risk-taking represent an often-cited result of professional development (Darling-Hammond, 1994; Hord, 2004), but what that risk-taking looks like in context is not represented in the literature base.

The Role of Context in PLCs

As seen in Borko's representation of a professional development (Figure 1), the PD and participants are situated within the circle of context. Context is often acknowledged as an important, if not the most important, factor of professional development (Borko, 2004; Loucks-Horsley et al., 2010). However, one context does not fit all. Professional developments need to be tailored to fit the context in which the teachers teach and the students learn (Hill et al., 2013; Scribner, 2003).

The term "context" for professional development is overly simplistic. When examining existing professional developments, context is described as the "who," "when," "where," and "why" of PD as well as involves the organization, system, or culture in which PD takes place and where new understanding will be implemented

34

(Guskey, 2000, p. 73). Melville and Yaxley (2009) sought to examine the sociocultural context of teacher learning communities across Tasmania in which "learning activities occur and strongly influence how teachers may understand and respond to learning opportunities" (p. 359). Ultimately their finding supported the work of Wenger (1998) emphasizing the importance of teachers acting as knowledge "brokers" in their science PLCs. Teachers felt the need to not only learn content and pedagogical knowledge, but to be respected and valued in their learning communities (Sahin, 2004). They argued that the aspect of community and collegiality within teacher practice is a "key ingredient" of effective PLCs.

Loucks-Horsley and colleagues (2010) identified nine factors of context important to consider when designing professional developments specific to math and science teachers:

- students, standards, and student learning needs;

- teachers and teacher learning needs;

- practices, curriculum instruction, assessment, and the learning environment;

- organizational culture;

- organizational structures and leadership;

- national, state, and local policies;

- resources;

- history of professional development; and

- parents and community

This study examines these nine components of context of a PLC; however, it is important to note that this list is by no means exhaustive, it is a specific starting point to begin the examination of context, long acknowledged, but little explored.

Putnam and Borko (2000) used the situative orientation towards learning to identify the various contexts of professional developments. They described situated learning for teachers occurring in the context of their classroom where learning is situated in ongoing practice. When using the situative perspective, identifying and characterizing the context of teacher learning is as important as what they learn (Borko, 2004).

Specifically, for math and science teachers the integration of the content in the context of the learning environment is of utmost importance (Garet et al., 2001). In a recent survey, a majority of science teachers reported that they were given more opportunities for generic PD rather than science-specific PD (Luft, Wong, & Ortego, 2009 as cited in Wilson, 2013). In their study of what makes PDs effective, Garet and colleagues (2001) identified science content specificity as a key component of professional developments.

A more complex view of this science specific context is needed where teachers' experiences in their classrooms are connected with opportunities for reflection (Osborne, Simon, Christodoulou, Howell-Richardson, & Richardson, 2013) as well as the

perceptions teachers have regarding the benefits of their participation in PLCs (Melville & Yaxley, 2009). Despite the work conducted on PLCs, little is known about the dynamics of these PLCs in a variety of contexts (Melville & Yaxley, 2009; Vescio et al., 2007), specifically rural contexts (Oliver, 2007). If PLCs are going to be advocated as a reform-oriented professional development, then researchers need to explore the implementation of these communities in multiple contexts.

Rural context. Research on rural communities has not necessarily been extant in the literature base, but it most certainly has been under studied. This begs the question, why study rural? The answer is four-fold:

- First, most Americans form opinions about rural people and their communities from a distance (through art, literature, and music) rather than through direct experience with conditions of rural communities and their people, which fosters a complex mix of attitudes (Brown & Swanson, 2003). In order to better understand exactly what a rural community, experience, and education consist of, descriptive, qualitative studies must elucidate the context of rural education (White & Corbett, 2014).

- Second, a large proportion of students and educators in the United States work within rural communities; however, despite a cry from the research community over 20 years ago (Theobald & Nachtigal, 1995), professional development remains aimed to support urban populations and initiatives. There is a need to

37

accommodate the differences associated with work in rural and remote areas to support this proportion of the population. As Theobald and Nachtigal (1995) aptly stated, "The work of the rural school is no longer to emulate the urban or suburban school, but to attend to its own place" (p. 132).

- Third, the cry for more research framed in the context of rural models and values illustrate an important issue in rural education, which is undervalued in scholarship. There is a need to establish a theory of rural education and a need to connect rural education to community through research framed in the context of rural models and values (Barter, 2008).

- And finally, rural education is not a solely American phenomenon. It is an international issue, many countries are faced with the challenge and are interested in ways to understand and support isolated rural communities (Yarrow et al., 1992)

What is known. Many international definitions for the term *rural* exist. These definitions range from population density, reliance on single resource industries, and geographical isolation (Arnold et al., 2005), making it difficult to derive a universal set of criteria to identify a place as rural (Barter, 2008). Some researchers (Arnold et al., 2005; Herzog & Pittman, 1999; Nelson Mandela Foundation, 2005b; Oliver, 2007) point out that one of the problems facing rural education is this lack of a definition.

When examining the research on rural schools and communities, spectrums of characterizations emerge. As the Nelson Mandela Foundation (2005a) pointed out, "one cannot speak of schooling without understanding the context within which schooling takes place and how rural communities experience education" (p. 2). Harmon and Smith (2012) described the barriers that challenge rural communities including: high poverty rate, agrarian society, cultural and geographic barriers, high teacher and administrator attrition rate, few external resources, lack of human resources, distrust of educational systems, and lack of parental involvement.

Although all rural areas, by widely accepted definitions in scholarship, have in common is a relatively small population and low population density, research indicates there is much diversity across these areas. Rural sociologist Gene Theodori (2003) stated it best, "When you've seen one rural community, you've seen one rural community. Every rural community has certain social, economic, and/or environmental issues that are unique to that particular community and contribute to its diversity" (p. 1). In the United States, 31% of the school districts (Strange et al., 2012) are located in rural areas, representing over 10 million students (Harmon & Smith, 2012). In the state of Texas, over 3 million people live in rural communities, representing 474,000 students, the largest number of rural students in the United States (US Census Bureau, 2013). Although this represents a large number, rural students in Texas represent less than one-fourth of the state's total student population and are often disregarded and overlooked in

39

policy decisions (Jimerson, 2004). As a result, only educational historians and rural

sociologists have paid much attention to issues and dynamics of such places (Hartman,

2013, p. 168).

   Schools and communities. Rural schools are important components of rural

towns as they are central to the regenerative process in those small towns and play a key

role in their long-term sustainability (McSwan & Stevens, 1995). Existing literature cites

many characteristics of rural schools including: small enrollment numbers, enrollment

decline, high poverty rates, longer school commutes, and associated costs (Chance &

Segura, 2009; Hilty, 1999). Aside from these somewhat bleak characteristics, Monk

(2007) found rural schools reported fewer discipline issues and because of their small

enrollment sustained smaller class sizes. The small size of a rural school often promotes

a connection with their social setting and the relationship between the school staff and

community are interconnected (Chance & Segura, 2006; DeYoung, 1995).

   The school community connection is an important component of rural schools as

these schools are tightly knit to the communities they serve (Theobald & Nachtigal,

1995). Aspects of the school-community connections that benefit students include:

parental participation in schools and student learning, family and community social

capital, use of community as a curricular resource, and active and productive school

business relations (Khattri, Riley, & Kane, 1997). Hartman (2013) also described assets

of the community including: the presence of strong community connections, a sense of

localism and value of place, and an informal community decision-making mechanism. On the contrary, Gjelton (1982) suggested that the isolation of communities, regardless of poverty, affects a school system's access to resources, and, therefore, has an influence on student achievement.

One aspect in particular, parental involvement in a student's education, has been identified as an important predictor of student success (Epstein, 1995). Parental involvement extends beyond participating in the local PTA. It can involve volunteering at the school, communicating with the school about their child's progress, monitoring school assignments and homework, as well as encourage discussion about future education plans (Lippman, Burns, & McArthur, 1996). Community appreciation and support of education encourages teacher retention and satisfaction in rural and remote areas (Boylan, 1993). Schools need communities, not only because communities raise taxes to pay for schools (Herzog & Pittman, 1999), but also because communities see education as a shared commitment and responsibility (Lawrence, 2009).

Although parents and the partnership with the community are often cited as benefits to rural communities, these relationships are susceptible to abuse (Bauch, 2001). Power relationships are an important aspect to consider within every day life (Foucault, 1979), especially for the teachers at the rural schools. Teacher behavior is more scrutinized in rural districts; in particular because of the power relationship between the

teacher and the community, subjecting educators to community pressures (Nachtigal, 1982; Peshkin, 1978).

In many rural communities, the relationship between the school and local church(es) are also closely linked (Bauch, 2001). Often church members are employed by the school district and the relationship between the church and student is encouraged. This delicate relationship pushes the ties between church and state and needs to be more closely examined "to determine how churches contribute to the social capital of a community" (Bauch, 2001, p. 255).

When examining the relationship between teachers and the community, only one study described a negative interaction between a first-year elementary teacher in the rural south with her community. Burton and Johnson's (2010) study examining the question "Why teach in rural communities?" used a narrative portraiture methodology to explore this question with two elementary teachers. While one teacher immediately established a positive relationship with the community, the other experienced personal isolation because she was an "outsider to the community" (Burton & Johnson, 2010, p. 382). Ultimately the authors called for place-conscious teacher education, purposefully exploring the connection between the school and the surrounding community for perspective, preservice, and novice teachers. This form of engagement can provide "insight into the needs of rural communities and complexities of every day life there"

42

(Burtn & Johnson, 2010, p. 384). The authors made no mention of the effect of the importance of this understanding for experienced, inservice educators.

Teachers. In the most recent review of literature examining the narratives of rural educators, Burton and colleagues (2013) found that rural teachers "were seen in one of two ways: they were either framed as the 'problem' within the rural teaching context or as the people working to address the 'problem'; of the rural context" (p. 8). Regardless of who or what is the 'problem' there are many demands and challenges that rural teachers face. The list of what qualifies an ideal 'rural' teacher is exhausting, including: certification in more than one subject area or grade level; ability to teach a wide range of students in the same classroom; ability to supervise extracurricular activities; ability to over come students' cultural differences and understand the larger society; and adjustment to the uniqueness of the community in terms of social opportunities, lifestyles and continuous scrutiny (Harmon & Smith, 2012).

Rural teachers are not alone in these exhaustive lists of qualifications; however, literature states they are challenged with a unique set of circumstances. In their literature review, Burton and colleagues (2013) found 20 articles (58%) that depicted a story of isolation of rural teachers; ranging from geographic isolation, distance from resources, colleagues, and professional learning programs. Professional development is often lacking in rural areas because of its high cost (Howley & Howley, 2000). This lack of funding in conjunction with isolation and small student populations make it difficult for

43

rural schools to attract and keep highly qualified STEM teachers and administrators (Sipple & Brent, 2008). Rural teachers with backgrounds in chemistry, physics, or calculus may be unable to teach these courses because the student body is too small to support advanced courses–or one teacher may require much preparation to teach multiple small classes (Cady & Reardon, 2009).

Not only are teachers distanced from material objects they are culturally and socially isolated as well. This emotional isolation is the primary reason young and more inexperienced teachers leave rural settings for the first opening in non-rural settings (Garmen & Alkire, 1992). Rural teachers also felt a mistrust of urban-based incentives that did no fully take into account the nature of rural life (Boylan, 1993).

Despite these challenges, teachers who live and work in rural communities describe the school as the heart of the community and their colleagues as a family (Chance & Segura, 2009; Howley & Howley, 2004). McIntosh (1989) found that while rural teachers, like their urban and suburban counterparts, ranked salary and fringe benefits as very important incentives, rural teachers differed on one important aspect-the need for support from parents and community members. Teachers in rural settings credit the support from parents and community as important, whereas those in urban and suburban settings saw the support from the administration as important. Chance and Segura (2009) found that the small size of rural schools allowed for ease of collaboration

because of existing relationships between students, families, and staff that had existed for many years.

Students. More than 20% of public K–12 students are enrolled in rural schools (Brown & Schafft, 2011) and 31% of schools are located in rural areas (Harmon & Smith, 2012). However aside from the rural label, this is where the commonalities of rural districts end. Nationally, the poverty rate (as measured by eligibility for Title 1 funding) for all rural and small town districts is 18.5%, slightly higher than the national average for all districts. But in the 10% of rural and small-town districts with the highest rates of disadvantaged students, over 37% of the students live in poverty. Moreover, 59% of the 1.3 million students in those high-poverty rural districts are children of color-28% Black, 23% Hispanic, and 8% Native American (Strange et al., 2012). If these high-poverty rural and small-town districts were one school district, it would be the largest, poorest, most racially diverse district in the nation, but "they're not one district" (Strange et al., 2012, p. 20). Family units look different in rural communities as well. For example, 48.6% of rural students live with grandparents who are responsible for grandchildren, compared with 38.7% in urban communities (US Census Bureau, 2010).

Aside from demographic characteristics, students in rural districts span a range of learning abilities. Research shows that children in rural schools are identified for special education services more often and referred less often for gifted services than their non-rural peers (deYoung, 1995; Pendarvis & Wood, 2009; Seal & Harmon, 1995).

45

Although rural students score significantly higher than, and consistently outperform, urban students on the National Assessment of Educational Progress reading, mathematics, and science assessments (NAEP, 2009; 2011), and have higher graduation rates, rural student college enrollment still lags behind urban students (Schafft & Jackson, 2011), with emerging research suggesting the same lag in STEM subject areas (Versypt & Versypt, 2013). Avery (2013) offered a possible explanation for this lack of enrollment, she concluded that students obtain a deep understanding of STEM concepts outside of school (Avery & Kassam, 2011) and their knowledge does not fit the mold of traditional school science. This standardization often leads to the implementation of curricula that are disembedded from local, rural contexts (Schafft & Jackson, 2011). Other reasons for this lack of college enrollment might stem from lack of recognition. In her review of current literature of gifted students in rural schools, Lawrence (2009), found that students were often not recognized for their intelligence and performance in schools, but rather performance in extracurricular activities.

Thomas (2005) examined the effects of standardized testing on instruction. He found that newly imposed state standardized testing at a small rural high school limited the amount of time teachers had for instruction. His four participants expressed a common understanding of the expectation for them to teach "more rapidly and cover more content during their instruction" (Thomas, 2005, p. 21). The science teacher at Thomas' site expressed these sentiments but continued to teach local environmental

topics in her curriculum, despite the pressure of the impeding standardized test. Implications of this study pointed toward increased responsibility of school leadership. Thomas called for school leaders to train faculty members to interpret test data to design and implement instruction to meet the needs of students. He also recognized the importance of collaboration across faculty members, which did not occur at the small high school under study.

Rural Science Education

The context of rural science education is not easily defined, particularly because of the difficulty to discern what is and is not rural science education (Oliver, 2007). Research on rural science teacher education has been neglected (Finson & Beaver, 1990), yet the "idea of rural education and the context in which it occurs combine to form a core construct that must always be considered" (Oliver, 2007, p. 363). However, in the large system of science education reform, aspects of the rural school setting are often neglected. These contexts are worth studying as "our nation's rural schools may be physically removed from urban areas, they are no longer isolated from policy makers" (US Department of Education, 2003, para. 5).

Essentially the rural context is ill understood despite decades worth of research attempting to characterize it (Burton et al., 2013; Oliver, 2007; Scribner, 2003). The complexity and layers of rural education and rural teachers needs to be explored in order to provide alternative story lines and counter narratives besides the geographically

47

isolated "place" challenged teacher (Corbett, 2007). Burton and colleagues (2013) called

for "qualitative research that explores the stories of teachers in rural areas, their success,

and their needs…to understand the complex nature of rural teaching" (p. 9). In his

synthesis of recent research of rural education, Oliver (2007) addressed the issue of

defining the rural context and offered a qualitative solution as well,

> Perhaps statistics and data are the real issue…qualitative assessments of science
>
> education can sometimes supersede quantitative methods for the value of
>
> description and communicating understanding. And thus, qualitative
>
> methods…may signal an end to the long search for definition of rural education
>
> that may no longer exist (p. 356)

For all its challenges and ultimate lack of a definition, science education in rural

settings is an important context to study as "Science education in rural settings may be

able to provide the most conclusive and useful examples of successful reforms due to the

ability of personal experiences to drive knowledge exploration in real life context"

(Blunck et al., 1995, p. 90).

Gap. The oversimplification of the experience of the rural educator, as opposed

to the urban and suburban one, is almost taken for granted without data or research to

support or refute these claims. For example, Sparks and Wayman (1993) assumed urban

areas had more diverse and complex social groups while rural areas had one set of

cultural traditions without any supporting citations or evidence. This assumed simplicity

of rural settings is a deficit for those involved in rural schooling (Burton et al., 2013). Corbett (2007) suggested a remedy to this by considering schooling within the framework of rural identity, agency, and culture. Studying this framework can explain and validate the things, which outside researchers currently may view as deficient and romantically simple.

Aside from over simplification, the isolation, high poverty levels, and lack of institutional resources across all communities purport a notion of "place as obstacle" or "place as deficit" (Burton et al., 2013; Roberts, 2014). These themes resonate in urban (Jeynes, 2005) and rural education (Burton et al., 2013) and merit further research. More exploration into these complex issues must occur to provide an alternative narration and provide more detail into the complexity of rural issues (Burton et al., 2013).

Evaluating the complexity of context is not an easy task for the education researcher. However, at the time of their review examining the studies to elucidate the narratives of rural educators, Burton and colleagues (2013) found 71% (34) reviewed were survey studies while 27% (13) relied on qualitative or ethnographic methods-interview, participant observation, or artifact analysis. They called for qualitative research that explores the stories of teachers in rural areas, their success, and their needs, which would add understanding of their complex nature through an open, yet critical, lens. Therefore, although difficult, carefully researching the context of rural education is necessary to begin to understand what it is like to teach in a rural locale. Eventual

49

comparisons of the unique needs, cultures, and strengths of teachers, schools, and students in various rural areas could also add to the multi dimensional story of rural education.

Summary

PLCs are at the forefront of professional developments in education reform. STEM specific PLCs are often touted as improving teaching from good to great yet the mechanisms that make these communities successful is not fully understood. The primary components of a PLC as a form of professional development include the teacher, the facilitators, and the professional development itself. Although research has been conducted on the teachers as members of the PLC, little has been conducted on the role of the facilitators, and the interaction between these participants, specifically in a rural context. Collecting and analyzing local data on in-situ PLCs will help inform the design, development, and implementation of systemic professional development reform efforts (Fulton & Britton, 2011; Hill et al., 2013).

Chapter Three: Research Design

Design Overview

This dissertation was the result of a yearlong study focusing on the experiences of rural STEM educators and facilitators throughout their participation of a year of the Texas Regional Collaboratives for STEM Education Professional Learning Community. Specifically, the study asked the following questions:

1. What is the rural context, as defined by Loucks-Horsley and colleagues (2010), of the Texas Regional Collaboratives?

2. What is the role of the facilitators within a rural context of Texas Regional Collaboratives?

    a. How do the facilitators interact with the Professional Learning Community within a rural context of Texas Regional Collaboratives?

3. What is the role of the teachers within a rural context of Texas Regional Collaboratives?

    a. How do the teachers interact with the Professional Learning Community within a rural context of Texas Regional Collaboratives?

This chapter will discuss the theoretical framework and methodology for the study. In addition, this chapter will address the topic of researcher perspective, which invariably shapes the interactions between the researcher and the data. Finally, this chapter will address issues of validity and trustworthiness.

Epistemology and theoretical framework. This dissertation study emerged out of my interests as a former secondary science teacher, my previous participation in secondary science professional developments, and my current work as a graduate research assistant working with in-service STEM teachers. Since I began graduate school I have consistently gravitated towards the subject of in-service STEM educators.

The use of theory in this dissertation proposal is reflected in the design of the study as well as the methods used for data collection. For this study the theoretical framework serves as an effort to develop theoretical sensitivity. Theoretical sensitivity is the ability to sense the subtleties of the data (Glaser, 1978). Theory was used in this study as a "tool" (Thomas, 2011, p. 179) to help explain the findings of the work. Figure 2 illustrates the relationship between epistemology, theoretical perspective, methodology and methods as described in Crotty (1998) and applied to the design of this study. The initial framework for this study, the epistemology, as described by Crotty (1998) is "how we know what we know" (p. 8). For the purpose of this study and in agreement with my own beliefs about learning, constructivism was used as the epistemological framework. The theoretical base of constructivism suggests that, "multiple realities exist and that each reality is an intangible construction; rooted in people's experience with everyday life, and how they make sense of them" (Israel, Eng, Schulz, & Paker, 2005, p. 81).

As the constructivist epistemology informs the theoretical perspective, an interpetivist perspective was used for this study. Interpretivism looks for "culturally derived and historically situated interpretations of the social life or world" (Crotty, 1998, p. 67). Specifically, a naturalistic inquiry approach within the theoretical framework of interpretivism was used throughout the design and analysis of the study. A naturalistic inquiry approach acknowledges that there are multiple constructed realities that can only be studied holistically (Lincoln & Guba, 1985). In this study, the multiple realities of participants are studied as nested cases within the rural context of a professional learning community. Studying the participants and their context of a rural professional learning community aligns with a naturalistic approach throughout the study because the research questions for this study can only be answered and realized within their natural setting (Lincoln & Guba, 1985).

Epistemology: Constructivism

Informs

Theoretical Perspective: Interpretivist

Guides

Methodology: Instrumental Case Study

Defines

Method: Interviews, Artifacts, Field Notes, Classroom Observations

Guides

Research Questions
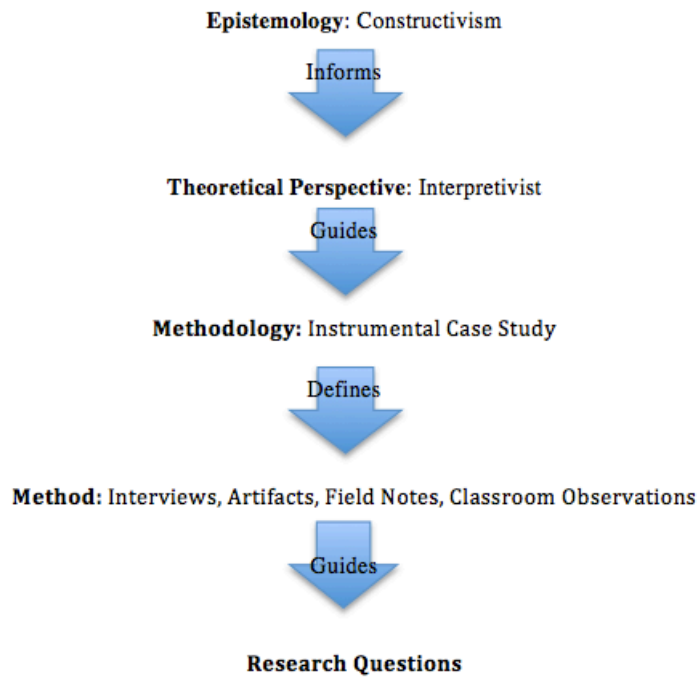
Figure 2. Theoretical Framework for Proposal

Methodology. A methodology is the theory of how researchers gain knowledge in research contexts and why. The "why" question is critical since it is through understanding the methodology that researchers are provided with a rationale to explain the reasons for specific strategies and methods in order to construct, collect, and develop particular kinds of knowledge (Scott & Morrison, 2005).

The methodology for this study stems from the constructivist epistemological stance. A qualitative tradition was chosen because the aim for the study was to inductively (Lincoln & Guba, 1989) gain an understanding of the context and the interactions within this context. This method of data generation was flexible and

sensitive to the social context in which the data were produced (Berg, 1995; Charmaz, 2006). Additionally, a qualitative approach enabled a design, which "turns on the use of a set of procedures that are simultaneously open-ended and rigorous and that do justice to the complexity of the social setting under study" (Janesick, 2000, p. 379).

An instrumental case study methodology (Stake, 2005) was chosen because this study sought to understand a case set in a real-world context and to examine the complex conditions related to the case (Yin, 2009). Merriam (1998) states that a case study design is appropriate when the proposed study has the following 4 characteristics: a) particularistic, b) descriptive, c) heuristic, and d) inductive. This study is particularistic in that it focuses on the particular phenomenon of the context of a rural PLC. This study is descriptive as its goal is to produce a rich, thick description (Lincoln & Guba, 1998) of the situation under study. The results of this study are heuristic and illuminate the reader's understanding of the phenomenon, the rural context, under study. Specifically, an instrumental case study methodology was selected for this project because this research aims to describe the context from various perspectives of a rural PLC for secondary science teachers. This study is a tool to begin understanding the context of rural education; thus, making it an instrumental case study (Thomas, 2011). The case study methodology also drove the "How" and "What" nature of the research questions (Thomas, 2011). The results of this study are also the result of inductive reasoning of the data to provide specific evidence to answer the proposed research questions.

This research used a single, nested case study design (Thomas, 2011) with the

TRC as the single case and the six participants nested within the larger case (Figure 3).

The nested cases within this study were the four individual teachers and two facilitators

who work within the region. These participants volunteered after a meeting where all 32

members of the TRC in this region were informed about the study. Opening up

participation in the study to all members ensured every participant in the regional

partnership knew about the study, thus ensuring maximum variation (Glaser & Strauss,

1967).
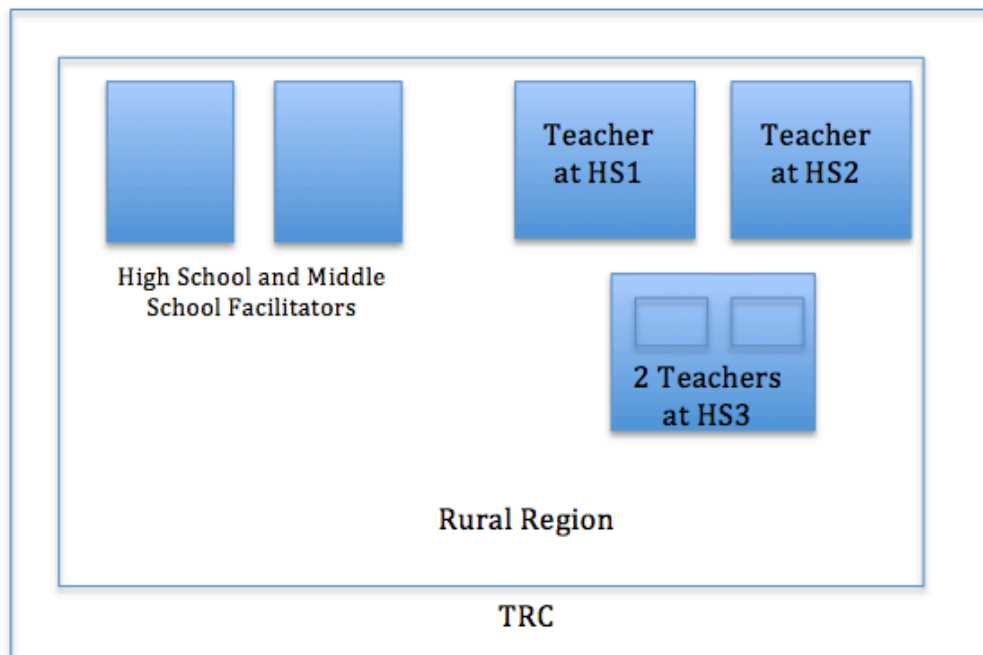
Figure 3. Case Study Diagram

Contexts and participants. The systemic collaborative, the TRC, in this study is housed within the University of Texas at Austin. It is an award-winning network of P-16 partnerships that provide sustained, high-intensity PD to P-12 teachers of science and mathematics. The partnership supports 39 science collaboratives, across 239 districts and 7,127 teachers. The TRC is a type of PLC rather than a university-region partnership providing professional development "du jour" because its design aligns with many of the characteristics of PLCs and is an on going and sustained form of professional development (DuFour & Fullan, 2013; Fulton & Britton, 2011; Jones et al., 2013). In particular, the TRC process builds its foundation and mission around *participants' shared values and goals*. The TRC prides itself and works to create a *collaborative culture* amongst participants. At TRC meetings, participants use the time to reflect on their practice. These *reflections, self-assessments and inquiry-based approaches* to teaching are also continuously discussed via an online platform when the teachers are not able to meeting face to face. This *collective learning* is a result of the group and leaders *commitment to continuous improvement*. As summarized by Dr. James Barufaldi, the TRC's founding father, "The TRC is a PLC!"

A rural region in the state of Texas was selected as the study site. This region is one of 20 education service agencies across the state. As previously mentioned, describing an area as rural can be somewhat challenging (Oliver, 2007); therefore, it is important to provide a thorough description of the area. Rural areas can be described in a

57

variety of ways including population density, geographic isolation, and poverty rates (Burton et al., 2013; Oliver, 2007). This region serves an area over 25,000 square miles with a population of 267,180, averaging 10.59 people per square mile (US Census Bureau, 2010). Considering the average population per square mile across the US at 87 people per mile (US Census Bureau, 2010), this site can be considered a rural location according to its small population. Another characteristic of a rural location is its geographic isolation. This area supports 46 school districts across 25,224 square miles representing a district every 548 miles, which suggests a distinct geographic spread of the locations it serves. Yet another characteristic of rural communities is a significant population below the poverty line. Across this region, the average population living in poverty is 18.1% compared to the state average of 16.8%. Although these descriptive statistics may seem similar, it is important to note that the state of Texas has the fourth highest poverty rate in the United States (US Census Bureau, 2010).

Even though descriptive statistics are one way to characterize a location as rural, a description of the setting might also suffice as a descriptor of the rural context. While driving to one school during my pilot study, I drove 12 miles on a dirt road off a state highway to reach a K-12 campus. Upon my arrival I walked the campus grounds and observed a pair of donkeys mating adjacent to the small football field (Field note summary, pilot study, September 17, 2013). During a classroom observation, one student described why he could not attend the football game because, "I live an hour

58

away from the school and my grandpa has to pick me up because my parents work in [town] and they don't get home until 8" (Classroom observation, pilot study, September 17, 2013). This campus was located in a region so remote that due to a lack of referees for their sporting events, high school football games are played on Tuesday as opposed to traditional Friday so the referees can work at all the games across the area as they cannot travel quickly from one to another. Demographic information for each district compared to the State average for further descriptive purposes can be found in (Appendix E).

Four teachers at three high schools (Table 2) elected to participate in the study with a range of teaching experience from 1-17 years. All teacher participants taught 6-12 grades. Two facilitators, the middle school and high school science coordinators at the service center, also agreed to participate in the study. These two facilitators support an area that not only covers 25,224 square miles, but also supports 7,018 school staff in 42 school districts (http://www.tea.state.tx.us/regional_services/esc/, 2013). This region site was optimal because: a) the demographics of each school in terms of student diversity represent a spread seen across the state, b) the descriptive statistics of each school are aligned with characterizations of rural locations across the literature, c) the researcher relationship with TRC, and d) the region has a consistent communication and a strong relationship with the TRC. This strong relationship with the TRC promotes a sense of trust between the participants and the observer. This relationship is a benefit when

59

conducting qualitative research because this approach requires time from the participants as well as an honest insight into their thinking throughout the research process (Marshall & Rossman, 2006). The TRC participants across this district met every two months at a central location to discuss their current classroom practices as well as met with their peers. Participants also communicate electronically throughout the week via a listserv or emails with each other and their facilitators.

Table 2

Participating School Demographics

School and Participants	Demographics
HS1, Grades PK-12, Singleton ISD 1 Teacher, Jennifer Edwards, Female, 7 years teaching experience	214 students 68% white, 29% Hispanic, 1% Black, 1% 2 or more races 2% Limited English Proficient (LEP), 22% Special Education (SPED), 52% Economically Disadvantaged
HS2, Grade 6-12, Ferdinand ISD 1 Teacher, Melissa Deer, Female, 5 years teaching experience	255 students 75% white, 22% Hispanic, 3% 2 or more races, 1% American Indian 1% LEP, 2% SPED, 25% Economically Disadvantaged
HS3, Grades 9-12, Central Academy 2 Teachers, Leanne Rice and Kerry Robbins, Female, 2 and 7 years experience	245 students 48% White, 43% Hispanic, 4% 2 or more races, 3% Black, 1% Asian No information available about sub populations

Facilitators. Both facilitators who participated are female, and have earned Masters of Arts degrees in education.

Mary is a Caucasian woman who currently works as the middle school science facilitator in the region and has obtained a master's of education in curriculum and instruction. She has worked in education for 27 years, 23 of those years were spent teaching in rural areas. She has served as a middle school teacher, department head, and instructional coach. She has been working at the region center for a total of 4 years. She grew up in a rural area and currently lives an hour away from the region center on a farm. She is married and has two children.

Piper is a Caucasian woman who currently works as the high school science facilitator in the region. She has obtained a masters of arts in curriculum and instruction, has worked in education for 22 years, and has spent time teaching in both suburban and rural areas. She has been working at the region center for a total of 6 years. She grew up in a suburb of a major metropolitan area and is married with three children.

Data Sources

The qualitative tradition of case study allowed for multiple sources of data to inform the study. This data was gathered in multiple stages with the purpose of refining themes and ideas throughout the research effort (Creswell, 2012). This study included data collection from four, weeklong visits to the study site consisting of at least one observation and interview with each participant during the visit.

I attended and observed 4 PLC meetings, which occurred in September 2013 and February, March, and April of 2014. Teacher interviews were conducted before or after these mandatory meetings, and were outside of the regular school day hours. Facilitator interviews were also conducted before or after the mandatory meetings and outside of regular workday hours (8AM-5PM). Each participant was observed a minimum of three times through out the year. All classroom observations were documented using the UTeach Observation Protocol (UTOP) during the 2013-2014 school year. Table 3 represents site visits and data collection.

Table 3

Data Collection Events

Date(s)	Event	Data Collected
April 22-24, 2013	Attend West Ed Training in Austin, Texas	Field notes and introduction
June 17, 2013	IRB Approval	N/A
July 10-14, 2013	Region Center Visit	Field notes, 1 interview with facilitators, IRB permission slips, memos
September 17-20, 2013	Region Center and campus visits	1 PLC meeting field note, 1 facilitator interview, 4 teacher interviews, 3 classroom visits (field notes and UTOPs), memos
February 18-21, 2014	Region Center and campus visits	1 PLC meeting field note, 1 facilitator interview, 3 teacher interviews, 3 classroom visits (2 UTOPs and 1 field notes ONLY), memos
March 18-20, 2014	Region Center and campus visits	1 facilitator interview, 3 teacher interviews, 3 classroom visits (field notes and UTOPs)
April 28-May 1, 2014	Region Center and campus visits	1 PLC meeting field note, 1 facilitator interview, 4 teacher interviews, 3 classroom visits (2 UTOP, 1 field notes ONLY), memos

Surveys. All participants were administered a survey consisting of demographic questions via the Qualtrics software. These questions included information about years of teaching experience, teacher preparation program, and years of experience within the PLC (Appendix B). All data was electronically sent to the researcher and then de-identified, classified, and securely stored.

Personal interviews. In order to collect information about teacher perception and experiences within the PLC, semi-structured interviews were conducted within a week following a PLC meeting. Semi-structured interviews were chosen because of their ability to ask questions about specifics and provide the interviewer the freedom to ask follow up points if necessary (Thomas, 2011). The interview questions were created using existing research for the purpose of this study. They were created from Loucks-Horsley and colleagues (2010) specific description of the key components of the context of professional development. The purpose of these interviews was to determine what teachers report and describe about the context and their recent experiences with the PLC. These interviews served to elaborate or expand on themes that emerged from prior data analysis. The interviews lasted from 30 minutes to 90 minutes and were digitally recorded and transcribed. The interview protocols can be found in Appendix C and Appendix D. As the study progressed, due to the iterative nature of data analysis, more questions were added to gather data or elucidate emerging themes, when necessary.

Artifacts. Artifacts for this study were collected throughout the research with the purpose of triangulating emergent themes throughout the study. When possible, artifacts were scanned and labeled with the appropriate time and date and identifying information was immediately redacted. Examples of artifacts include, e-mails between participants, teacher created documents or presentations, and listserv discussions. If artifacts were too large to travel with, digital images were taken and digitally archived with the appropriate time and date with any identifying information redacted.

Observations. Observations were chosen as a data source for this study as they are often heralded as the most unbiased form of data collection and allow a clear look into what is actually occurring during a professional development activity as well as in the classroom (Wragg, 1999 as cited in Desimone, 2009). Classroom observations and observations of the PLC meetings were used as a way to triangulate data from interviews and artifacts collected throughout the study.

Classroom observations were analyzed using the UTeach Observation Protocol (UTOP) (http://uteach.utexas.edu/UTOP/). The UTOP has been in use since 2007 and is designed for use in grades 4-12 mathematics and science classrooms. The UTOP classroom observation and teacher interview protocols are based on the Local System Change Classroom Observation Protocol, or COP and the Inside the Classroom Teacher Interview Protocols from Horizon research (http://www.horizon-research.com/instruments/). The UTOP analyzes teaching practices with a focus on the

65

depth of content knowledge made explicit by both teachers and students. The UTOP recently was an observation protocol used to characterize teaching practices in the Measuring Effective Teaching (MET) study. This national and extensive study corroborated the instruments validity and reliability (Kane & Staiger, 2012).

The UTOP instrument was chosen as a structured observation tool rather than an unstructured observation because of my previous experience and expertise using the protocol and its ability to provide a content specific lens to view STEM classroom practice. The UTOP instrument consists of four domains; classroom environment, lesson structure, lesson implementation, and math and science content, that captures not only teacher practice, but also student behavior in the classroom (Appendix A). This instrument is a tool that forces observers to explore what is occurring in the classroom more in depth than the unstructured observation. When using the UTOP instrument, observers take field notes during an observation and then complete the UTOP instrument within 24 hours of the observation. To complete the UTOP instrument, the observer must rate each of the 30 indicators on a 1-5 scale with specific and supporting evidence. Scores of 3, 4, and 5 on the instrument represent sufficient to excellent teaching practice. When training teachers on the scale, UTOP experts reiterate that a score of 3 or higher represents an excellent teacher (Walkington & Marder, 2103). Walkington and Marder identified specific indicators as consensus or innovative components of classroom practice (Appendix A). Although all indicators on the UTOP instrument represent

research-based practice, the differentiation between consensus and innovative indicators was intentional; "consensus indicators are intended to be a subset that almost all reasonable observers would consider an essential component of effective teaching…innovative indicators are those that reflect qualities of classrooms valued within UTeach, but not necessarily shared by all observers." (Walkington & Marder, 2013, p. 8). In addition to consensus and innovative indicators, the each of the 4 domains of the UTOP contains synthesis indicators, meant to serve as a general/overall ranking for that domain.

Participants were observed one to three times throughout the school year as at least three observations over an extended period of time are required for reliable measures of teachers' overall instruction (Kane & Cantrell, 2013). Observations lasted the duration of a class period, varying from 45-90 minutes, and continued into other class periods because some aspects of teaching do not occur in short time frames (Kane & Cantrell, 2013). During the observations, I acted as an observer of teacher and student actions and recorded field notes in a journal, which were then organized and analyzed according to the UTOP indicators and domains.

The PLC meetings amongst the TRCs were also observed and field notes were recorded. These field notes were taken with a detailed, non-judgmental lens with concrete descriptions of what had been observed (Marshall & Rossman, 2006). The

focus of these field notes were the interactions between the teachers and facilitators in and amongst themselves as well as the topics discussed throughout the meeting.

Data Analysis

Data analysis began at the beginning of this study and continued throughout. The primary sources of data included the semi-structured teacher interview transcripts, PLC meeting observations, and classroom observations. These data sources were analyzed as a whole to refine collection strategies, as well as the refinement and interrelationship of categories and information (Strauss & Corbin, 1998). Artifacts collected during observations were used to triangulate findings.

The first stages of data analysis involved recording and then transcribing the interviews. The researcher transcribed interviews verbatim within 24 hours of concluding the interview. During transcription, researcher thoughts or questions were noted with comments or questions within the document. When classroom observations were conducted during the visit, field notes from the observation were used to complete the UTOP instrument as a way to capture and describe teaching practices. The UTOP instrument was also completed within 24 hours of the observation. This analysis occurred in a refurbished feed silo of a former chicken farm turned art center in an area centrally located between the various sites. Organization of artifacts from the PLC meetings involved scanning of the document and immediate redaction. Artifacts were also collected, organized and redacted if necessary throughout the process. Similar to the

interview process, researcher thoughts, questions, and impressions were recorded within these field notes. This data was stored electronically on the researcher's computer as well as saved on an external hard drive.

Figure 4 represents the general process of analysis employed throughout this study. Interviews and analyses took place in phases. The first step involved open coding the interviews. Open coding involved examining each piece of data and coding it as necessary. For example, when coding a transcribed interview, the researcher could code for any theme that appeared such as, community, school district, football games, etc. These codes were organized using the Nvivo QSR 10 software and are documented in Appendix G. Codes were both theoretical and researcher generated. Theoretical, a priori, codes included previously identified units of the context of professional development (Loucks-Horsley et al., 2010), as well as the participants within the context of the professional development (Borko, 2004). Researcher created codes were created from researcher memos or notes identified in step 1 of analysis or as they became apparent throughout the analysis. The investigator should not fail to draw on this tacit knowledge or intuition in making this judgment to code as once these incidents are eliminated or ignored they are "virtually impossible to recapture" (Lincoln & Guba, p. 341). The purpose of this phase of analysis was to allow ideas to emerge that might disappear in a general thematic analysis (Charmaz, 2006).

69
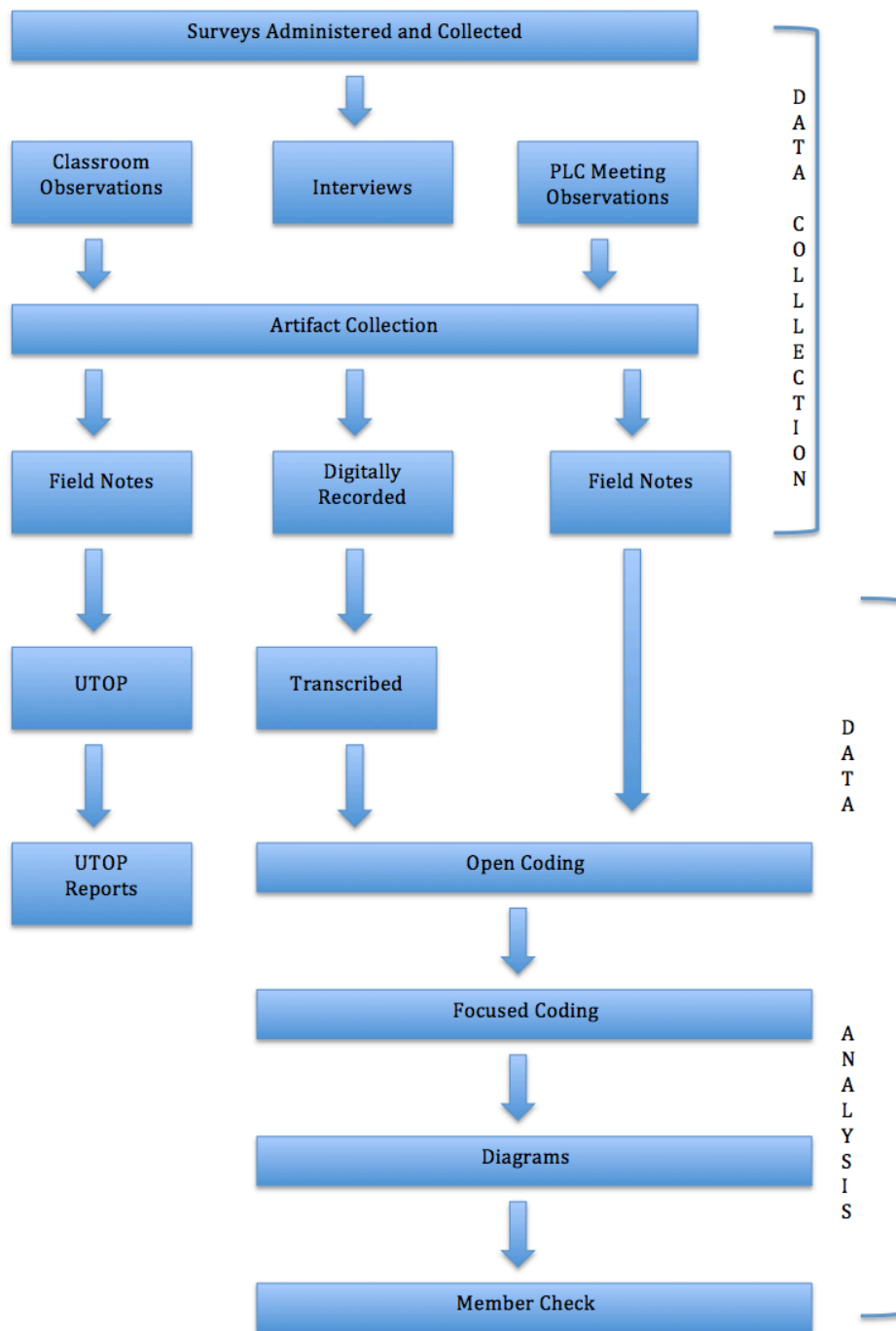
Figure 4. Data Analysis Process

Using a technique of constant comparison (Glaser & Strauss, 1967) the 122 open codes and the subsequent data were reread, compared with one another, and refined to form focused codes. This next step of data analysis involved focused coding with the purpose to synthesize and explain larger sections of data. Two steps occurred during this phase of data analysis. First, using the NVIVO software, the researcher analyzed the open codes that were most prevalent throughout the data. Specifically, the researcher looked at codes most predominant overall and then codes most prevalent dependent on participant role, either facilitator or teacher. At this point in analysis, core categories were filtered and examined within the emerging concepts of the data. The second step of coding involved focused coding which included creating matrices using the NVivo software. This process allowed the researcher to organize overall and participant dependent codes in a visual representation of trends within the data. These focused codes allowed a concentrated view into the components of the rural context. As a result, these focused codes revealed tacit understandings and perceptions of the rural context of the professional learning community. Through the researchers consistent interaction with the participants, the researcher had an opportunity to deepen the understanding of the participants' perspectives. Throughout this process of coding and categorizing data from all sources, the researcher was able "fracture the data and force interpretation" (Strauss, 1987, p. 55).

71

Focused codes then enabled the process of memo writing. Throughout the study, I wrote and recorded copious amounts of memos as a form of analytical notes used to define and refine categories of data. This memo-ing step served as a space for making comparisons between data, codes, categories, and concepts with the purpose of articulating conjectures and new ideas about the data (Glaser & Strauss, 1967). These memos included raw data with the explicit purpose of keeping the participant's voice and meaning present in the theoretical outcome (Charmaz, 2006). The iterative process of writing and re-reading memos allowed the focused codes to become emergent categories throughout the constant comparative analysis. As codes came in tandem with the memo-ing process, the researcher began organizing data in the form of charts and diagrams.

The final step of the data analysis was member checking. A summary of the findings was emailed with the 6 participants asking for their input regarding my findings with their perspectives. All participants responded to the member check. Their feedback was compared to the data and integrated into the findings.

Positionality. Research efforts must address the issue of researcher and participant's positionality. In their work exploring the constructivist and post-modern view of insider/outsider as a negotiation rather than set extreme (Merriam, Johnson-Bailey, Lee, Kee, Ntseane & Nyganadm 2001) identified three components of this perspective: positionality, power, and representation. I approached participants with the

positionality of *external-outsider*, meaning I was "socialized within a community different from the one in which [I] was doing research" (Banks, 1998, p. 7). I was raised in a suburb of a large city in Texas and taught in a suburb of another metropolitan area of the state. Although I have had many month-long stays in very remote locations in Alaska, Mexico, and India, I have not experienced rural life in Texas. The *power* component of positionality in this research was shared amongst myself in participants as the facilitators and teachers were colleagues in the research process (Merriam & Simpson, 2000). I approached this work from the position of *power* as a graduate student working under Dr. Barufaldi, the founder of the TRC. However, despite my power, participants were also in a position of power as they decided when and what was shared. Cochran-Smith and Lytle (1993) described the power of teacher research "based on the notion that knowledge for teaching is 'inside/outside,' a juxtaposition intended to call attention to the complex and non-linear relationships of knowledge and teaching as they are embedded in the contexts and relations of power" (p. xi). *Representation* is perhaps the most complex aspect of positionality as many researchers struggle with representing the "truth" of their findings (Merriam & Simpson, 2000, p. 414). In this study, the "truth" of knowledge I represent stems from a constructivist perspective, meaning the truth is co-constructed by the participants and myself. As previously discussed, extracting the researcher and my interactions with the data was difficult, if not

73

impossible, because of the iterative and intimate analysis of the data as well as member checking the findings have been represented as close to the truth and reality as possible.

Validity and trustworthiness. Research methods should address the issue of validity. Maxwell (1992) and Tracy (2010) suggested areas of validity that should be addressed in qualitative research. Aside from validity, the issue of trustworthiness should also be addressed. A research project must be designed to create trustworthy outcomes if it is believed to be pursuing the truth (Briggs, Morrison & Coleman, 2012). The threats to validity and trustworthiness as well as strategies employed in this study are represented in Table 4.

Table 4

Threats and Strategies for Validity

Strategy Employed	Validity Threat	Methods
Intensive, long-term, prolonged involvement (Maxwell, 1992; Lincoln & Guba, 1985)	Limited involvement leads to pre-mature theory and spurious associations, participant lack of trust	Repeated observation and interviews, well-sustained presence of researcher in setting studied (Lincoln & Guba, 1985)
"Rich" data (Maxwell, 1992)	Mistaken conclusions from limited Data	Verbatim interview transcripts; detailed, descriptive observation field notes of concrete events observed, "thick descriptions" (Lincoln & Guba, 185, p. 359)
Triangulation (Lincoln & Guba, 1985; Maxwell, 1992)	Risk chance associations and systematic biases due to a specific method	Collecting information from a diverse range of individuals using a variety of methods (Denzin, 1978)
Sincerity (Tracy, 2010) and Credibility (Lincoln & Guba, 1985)	Researcher perspective imposed on data collection and interpretation	Describe and acknowledge researcher perspective, detailed proposed methodology, member checks (Merriam, 2009) and peer debriefing (Lincoln & Guba, 1985)

Summary

In summary, this chapter addressed the epistemological stance of the study as well as the influence of this perspective on the theoretical framework and research

design. The chapter rationalized the appropriateness of an instrumental case study methodology in addressing the research questions. This chapter also provided a detailed account of the data sources collected and the methods employed to analyze the data. In addition, the positionality was discussed in detail regarding the participants and data of the study. Finally, this chapter discussed the issues of validity and trustworthiness as they relate to the robustness of this dissertation study.

Chapter Four: Results

The findings of this study represent the views and perspectives of all participants as it relates to the rural context of the Texas Regional Collaboratives Professional Learning Community. As stated earlier, a naturalistic inquiry approach within the theoretical framework of interpretivism was used throughout the analysis of results. In this study, the participants were studied as case within the rural context of a professional learning community. This chapter first discusses the results from open and focused coding. Next, the chapter discusses each component of the context of the rural professional learning community to answer the first research question. Finally, the roles and interactions of participants to answer the second and third research question and are explored to conclude the chapter.

Coding Results

Open coding. After transcribing interviews verbatim, the researcher conducted data analysis using the specific procedures of open coding, this process resulted in 122 codes, representing 2,090 coding references. These codes, with their subsequent descriptions (Appendix G), were analyzed to answer the research questions. These categories represent different aspects of the rural context of the professional learning community.

Memo-ing. The memo-ing step served as a space for making comparisons between data, codes, categories, and concepts with the purpose of articulating

conjectures and new ideas about the data (Glaser & Strauss, 1967). These memos included raw data with the explicit purpose of keeping the participant's voice and meaning present in the theoretical outcome (Charmaz, 1995). The iterative process of writing and re-reading memos allowed the focused codes to become emergent categories throughout the constant comparative analysis. As codes came in tandem with the memo-ing process, the researcher began organizing data in the form of charts, flow charts, and diagrams.

Focused coding. After open coding and memo-ing, the researcher continued conducing data analysis using the specific procedures of focused coding to identify core categories. As a result of the focused coding process the researcher was able to organize the focused codes into diagrams and other representations, which provided insights into results. Another important component of focused coding involved organizing codes using matrices in the NVIVO software. For example, when examining the research question, *What is the role of the facilitators within the rural context of the TRC?*, the researcher began looking at trends in data using the following matrices in which she searched for facilitator and challenges or constraints, professional development, professional learning, and support (Table 5). The numbers in the matrix represent the number of sources coded for that particular condition.

Table 5

Sample Matrix

	Challenges or Constraints	Professional Development	Professional Learning	Support
Facilitator	16	15	29	18

Rural Context

Each component of the rural context is described individually with supporting

data from interviews, classroom observations and artifacts to answer the first research

question of this study: *What is the rural context, as defined by Loucks-Horsley and*

Colleagues (2010), of the Texas Regional Collaboratives?

Students, student standards, and learning needs. Loucks-Horsley and

colleagues (2010) described students, student standards, and learning needs as "who the

students in the system are, what standards are in place for the students, and how they are

performing in relation to those standards" (p. 56).

Students. Exploring students within the rural context yielded a diversity of

findings. Students within this region represented a diversity of socioeconomic groups

and other defining characteristics. In Singleton ISD, over 39% of the students enrolled

were in the foster care system (CPPP, 2013;NCES 2013), this resulted in many transient

students as well as large learning gaps. Jennifer described these students as having "a lot

of social/emotional issues" (Jennifer, Interview, Feb. 2014). When observing her

classroom during February of 2014, one student was continually acting out and rather than disciplining the student in front of the class, Ms. Edward asked the student to leave. In the post observation interview, she said, "I didn't rip into him like I would have some other kids, because...I know there is this whole shut off system…" (Jennifer, Post Observation Interview, Feb. 2014). She identified other issues affecting her students:

> We have several other things that are affecting their education, so what we see is, especially with the newer foster kids, they have not been in foster care before. Singleton is one of those places where we get a lot of first time placements. Typically when we look at school records, they've either bounced around because they're running from CPS or they haven't been in school consistently. Their mom wouldn't make them go. When you start looking at them educationally, they have these massive gaps and so I'm constantly trying to do this whole background/catch up. (Jennifer, Interview, Feb. 2014)

In addition to students involved in the foster system, Singleton ISD had a small population of special education and ELL students. In one observation, Jennifer attempted to help an ELL student using non-linguistic representations to describe lab procedures; however, she later said, "I try to help her as much as I can, but we don't have an ELL person on campus, so I really just do what I think is correct."

Ferdinand ISD represented a different type of student population. These students are described by Melissa as "upper-middle" class and "very, very few" students who

received free and reduced lunch as a result of the increase in the oil and gas industry in their particular region of Texas. When discussing where students are from, meaning if they are native or non-native to the school, district, or region they are enrolled, the facilitators offered insight into this situation. In this particular region of Texas, students can be recruited from district to district. All three campuses involved in this study had an open and free transfer policy. Students are able to move from one district to the other with an application. Districts provide transportation for students; some bus rides might take an hour to and from the home campus. One district in the region advertised for student enrollment as they paid for a sign in another district asking students to transfer across the county to their district.

Melissa described the transfer process in her district:

We have transfer busses that meet the kids in a certain area of town and then it's like a lottery system, kind of, we only have so many seats, then if you are one of the lucky kids, you get a seat on the bus and go. (Melissa, Interview, Feb. 2014)

The facilitators described the rationale and motivation behind this open, cross-district, transfer process as monetary, "More kids raises the amount of funding, so… it comes back to the money. If you have a space and the personnel and the money, and I know in some small counties 'round here, there's competitions for students" (Mary and Piper, Interview, Mar. 2014).

At the Central School, students "came from everywhere" and from different types of homes, including homes with one parent or grandparents. Leanne described her students as "about half and half, half with parents, um, more nuclear, and half with one parent or grandparents" (Leanne, Interview, Sep. 2013). This particular campus emphasized collaborative learning in their classroom. In one lesson observed, students from the upper grades in Kerry's class reviewed Biology students in Leanne's class for the upcoming standardized test. The students were given little advanced warning of this type of collaboration, but did so without hesitancy (Classroom Observation Field notes, Apr. 2014). When asked about what collaborative learning entails, Leanne described it as a classroom where "everybody is exposed to every perspective so they can gain better knowledge" (Leanne, Interview, Sep. 2013).

One facilitator also described the diversity of the student population:

> We've had a great influx of diverse students in higher level sciences that you didn't use to have, and so in the 'old days' or prior to about five or so years ago, you had what you would call the academic elites taking chemistry, physics and anatomy, the upper level science classes. Well, so now you have everybody or at least a lot more of everybody is taking chemistry and a lot more kids taking physics and a lot more kids taking anatomy and other advanced sciences. (Mary, Interview, Mar. 2014)

Student standards. Texas state standards were a strong influence on the teachers and facilitators. All teachers felt like they were rushed over the course of the school year to cover the state standards, Texas Essential Knowledge and Skills or TEKS, required for their courses and curriculum. Aside from the state standards, both teachers and facilitators frequently mentioned formal standardized testing a total of 28 times throughout their interviews. At the time of this study, one science end of course test, the STAAR, was required for students to take over the course of their secondary science career. Both teachers who taught biology in this study, Melissa and Leanne, mentioned the STAAR Test in every interview. For example, Melissa described feeling rushed in her classroom because the end of the course test was a month before school ended. "I try to make it as interesting as I can, but sometimes I just feel like I'm going as fast as I can because I have to [to cover the standards]" (Melissa, Interview, Oct. 2013). All teachers felt pressure from the state mandated standardized test, the STAAR, in some form. Every teacher in the study taught more than two types of classes or "preps." As a result, teacher's felt like they were "spread thin" and the facilitator interviews corroborated this data. Teachers believed the students were spread thin as well. Leanne even went so far as to say the students are "are sick of biology."

Every teacher and both facilitators, besides a general acceptance of standardized testing as a necessary evil, relied on standardized test scores as a measure of their success. Melissa describes herself as "blessed with good test scores," whereas Jennifer

looks towards other teachers outside of her district to compare how her students are doing. She felt a sense of relief when she realized in at discussion during a TRC PLC meeting, every body missed a similar or same question or she "was right in there" with other district's scores.

 Learning needs. Just as students in this region are described as diverse, so are their learning needs from the perspective of the four participating teachers. Jennifer, stated that her students in Singleton ISD's biggest learning needs involve "a lot of intervention tools, a lot of hands on activities" (Jennifer, Interview, Feb. 2014). She believed that her students need to be learning by doing because of the previous teacher in her position. The previous 6th grade teacher asked the students to "get out the book and fill out a worksheet every single day" (Jennifer, Interview, Feb. 2014). She attempted to incorporate some type of hands-on activity, such as a lab or conducting observations outside, in each of her six preps (Figure 5).

"I try to make it as interesting as I can, but sometimes I just feel like I'm going as fast as I can because I have to [to cover the standards]" (Melissa, Interview, Oct. 2013).

Figure 5. Mrs. Edwards' students conducting observation in a lab

Aside from the type of pedagogy her students need, she has identified many "gaps" in student knowledge and attributes this to the highly transient nature of her student population as well as the previous 6th grade teacher. Jennifer described her process for identifying these gaps:

> Ok, here's what I think you [the students] know, so I do a lot of pre assessments and to try and figure out what they even have a clue about. And then, you know, I gave one class a pre assessment, more than half of them failed. That tells me we need to back up a whole grade level and go, let's start from here and build the whole foundation up. (Jennifer, February 2014)

In Ferdinand, Melissa believed her students need to be exposed to different types of science. She accomplished this through her multiple preps and sponsoring many extracurricular clubs including horse judging, skeet shooting, and teaching animal science in the CTE department for juniors and seniors. She stated that her "rural kids" should be exposed to sciences outside of the traditional realm because although she acknowledges the notion of college-readiness, she does not believe every student should go to college; and therefore tries to teach other subjects to supplement their science knowledge beyond the state standards. Melissa described her students' biggest learning need as "knowing [she] cares…because I think they are so successful because they enjoy having me as a teacher" (Melissa, Interview, Feb. 2014).

At Central School, both teachers believed their students must be exposed to a collaborative learning environment. Collaboration was mentioned 13 times, 27% of the total amount of codes, in their interviews more than any other teacher of facilitator. Leanne, "feels bad" for some of her students who are required to attend a STAAR prep tutorial observed during lunch because she believes her students are

…spread thin and I'm just teaching them how to take a test, that's not fun. Sometimes I look at them and think, "Ya'll need a break, go take it." So…sometimes I think they just need to relax and get away from the STAAR because it's being jammed down their throat every other second of the day. (Leanne, Interview, Feb. 2014)'

During this observation, students were clearly lethargic, yet they participated without complaints in practicing test-taking skills. Leanne spent 10 minutes discussing how to eliminate incorrect answers and deciding between two possible correct answers. After 10 minutes, she released the students to eat lunch with their friends, because it was the first sunny day after a week of rain (Classroom Observation field notes, Apr 2014).

In conclusion, participants described the students in their district or region and their learning needs, as diverse. State standards and standardized testing heavily influenced their perceptions of student learning and student success in their classroom; resulting in both teachers and student feeling "spread thin".

Teachers and teachers' learning needs. Teacher and teacher learning needs involve the teachers' background and experience, knowledge and beliefs, and goals and needs (Loucks-Horsley et al., 2010).

Influence of standardized testing. Standardized testing requirement and scores from these assessments impacted all participating teachers in this study, there were 28 instances of teachers discussing standardized testing or high stakes testing in their interviews. For example, Melissa described her success as an educator based on her test scores. She feels "blessed" with good test scores and believes this is a reason she has been able to keep her job for the past three years in the district. However, she described an underlying tension as an educator in the intense standardized testing environment:

> I feel like whatever the score you have, it is emblazoned on your forehead. When you walk around and it's like "Oh my god, she did horrible," and they [administration] blame it on the teacher, like that teacher was so bad, she only got this many to pass. (Melissa, Interview, Feb. 2014)

On the other hand, Kerry at Central School feels that her students do not take one of the classes she teaches, Chemistry, as seriously because they are not tested on it, she explains:

> In the science field the way [change in testing requirements] have affected me is that they've taken a lot of focus off science…and to me it's made to seem less important to the kids and there are so many things that we can bring into the

classroom that have made it really important, so it has affected me indirectly in that [the state legislature] that my classroom, my content area is not as important as the students' being able to write and read and that sort of thing. (Kerry, Interview, Mar. 2014)

House Bill Five is discussed in more detail when exploring state and local politics as a component of context.

Spreading them thin. Facilitators described the teachers as "spread thin" and the teachers echoed this statement. All participants with families described their families as taking the "back burner" to their careers, "It's hard…what happens to my family at home, I don't ever see 'em" (Kerry, Interview, Mar. 2014). At the end of the 2013-2014 school year, all teacher participants applied for other jobs or resigned to spend more time with their family. Jennifer, who taught six preps a day (see Figure 6). summed it up best, saying that, "the pace of teaching out here just isn't sustainable" (Jennifer, Interview, Mar. 2014). All teacher participants had duties outside of the classroom as well as athletic or UIL coaching, and club sponsorships. Aside from time away from family and extended duties on campus, participants described investing a significant amount of time in their schools, in general, spending more time commuting, on campus, planning because they are working individually. There were 20 instances during the interviews of participants referencing the challenge of time.

Figure 6. Jennifer's agenda for her six preps daily in Singleton ISD

Teacher learning needs. All participants in this study, both facilitators and educators described the professional development from the TRC as the only meaningful professional development they receive. The facilitators described their professional development as facilitators of adult learning as empowering and important in their success:

What I love about the TRC, it has grown me fast in pedagogy as far as understanding why things work, what they are. I feel much more current on stuff.

I've learned teaching trial and error. I learned what worked and what didn't and what really helped students forge forward. I didn't know what that was called. I learned from trial and error. I feel much more professional in my knowledge now and it's because of the TRC trainings. (Piper, Interview, Apr. 2014)

Teachers described their learning needs as continuous. All teachers mentioned that the only time they were provided learning opportunities was through the professional development opportunities offered by the TRC or the Region Center. The history of professional development is described later; however, it is important to note that this avenue of professional learning for the participants living in this rural region is of utmost importance. Melissa described the importance of the support from the TRC:

The only way I survived, I know, was with the collaborative. My first year I wasn't in it and that is when I relied heavily on the Region center, but still it is my lifeline. If, I know the government is thinking about shutting down some of the region centers and if they do that out here in rural Rural Texas I don't know if I would have stayed in it five years. I might have quit after the first year, it as hard. (Melissa, Interview, Feb. 2014)

Collaboration. Teachers described the need for a community and collaborative interaction with their peers. All teachers in this study were the only ones on their campuses teaching a particular subject, meaning they did not have a team to plan with. The communication, either electronic via listserv or in person via the PLC meetings, was

91

a necessary part of the professional learning experience. All participants described the importance of electronic communication via the PLC listserv or social media sites. The teachers used the listserv for a variety of purposes for asking questions about a particular lesson plan for a topic to polling the TRC members about the sequence of science courses on their campus. The following email exchanges occurred between participants, which were then going to be used to inform one member's principal about the impending science course realignment.

> T1: For new graduation plans our district is trying to decide how we want to do our sciences. My principal wants me take a poll and find out how many schools are keeping Biology on Freshman level or moving to sophomore.

> T2: I would also like this information. I want to move biology to sophomore and put IPC for freshmen. My admin thinks this will cause problems when students transfer.

> T3: We are keeping biology as freshman and IPC to sophomore. The only reason we kept freshman biology is for the biology EOC. If we start them as freshman, we give them the maximum number of opportunities to pass the EOC before they graduate. (Email Exchange, PLC listserv, May 2014)

Piper commented on this exchange as an example of the e-collaboration across the region stating,

[Teacher 1]'s principal knows that she has access to the decisions of many of the districts in our region because of the science collaborative. The principal is using that fact to her advantage. It indirectly allows the principal to 'collaborate' with regional districts. (Piper, Personal Communication, May 2014)

Later this participant compiled a table of her fellow colleagues advice and made the decision to move biology to the 10th grade "so the kids have one more year to mature. Since biology is the only tested science now, we thought it would be good to get their feet under them and then focus on the test their sophomore year" (Personal Email, May, 2014). Aside from electronic content and pedagogical support, participants also received emotional support from the list serve. Jennifer described an incident where she" just had to" email the facilitators:

Last year I was having one of those moments going, what am I doing, why am I here, I was having one of those moments. And I just emailed Piper and I was like ok, I need to vent to someone and only you would understand, and it was all about Junior High. And I was talking to her and telling her what was going on and she came back with several very helpful ideas to help me through what I would see in my classroom and what was happening with my kids and the things that they were missing and not getting, and gave me some ideas about where to back up to look for those missing pieces and she sent me several word files and documents and so I was, I love our TRC people, they are the best, they are

93

always willing to help or just email or text or whatever we need to do to get the

job done. So they [the facilitators] are really wonderful. (Jennifer, interview, Sep

2013)

Aside from the electronic communication and restraints on time, all participants

described the importance of face-to-face, in person collaboration. Mary described these

PLC meetings as "time with my people, it's different from instructional coaching, these

are who I feel most at home with." All four teacher participants described their time at

the TRC, PLC meetings as feeling "At home," "with family," or "belonging," and none

of them described these meetings as a waste of time.

In addition, teachers described the need for collaboration in their professional

learning opportunities. As these teachers existed as isolated entities or an "island", they

need to work with their peers. Isolation and outsider codes were present in 43 instances

throughout the teacher interviews. These relationships were formed out of respect and

trust throughout their time at the meetings. Leanne described the reason she trusted the

TRC participants because they are a dedicated group of teachers. This aspect of the TRC

will be further described in the organizational culture component of the context.

**Curriculum, instruction, assessment practices, and the learning

environment.** The dimensions of classroom practice that professional development

seeks to improve include the curriculum (what is being taught), instruction (how it is

taught), assessment (how learning is measured), and the learning environment (the

physical facilities and arrangements as well as the culture within a classroom) (Loucks-Horsley, et al., 2010).

Classroom instruction, assessment and the learning environment. All participants in this study were teaching on-level, state-mandated science courses for graduation credit. The curriculum, instruction, assessment, and the learning environment domains of the context of the rural TRC PLC were examined through UTOP data and reports. This data is organized in Appendix F according to indicator and teacher scores on each indicator. From this UTOP data, 65% of the synthesis indicators were 3 or higher, indicating that a majority of teaching practices observed were sufficient and above (Walkington & Marder, 2013). More specifically, each teachers UTOP data brought to light important insights into the teachers' practices, specifically the consensus and innovative indicators. For the purpose of this study the innovative indicators represent practice that can be characterized as risk-taking, since the cadre of literature characterizing exactly what risk-taking looks like in a classroom is minimal, at best.

Risk Taking. The Classroom engagement indicator (1.1) characterizes the classroom environment as encouraging students to generate ideas, questions, conjectures, and/or propositions that reflect engagement or exploration with important science concepts. When examining this indicator across the four teaching participants results vary with ratings from 1-4. Five of the nine total observation events received a

rating of 3 or higher for the classroom engagement innovative indicator. The following evidence represents a "4" rating:

> During the lab, the students were asking questions of each other and of the teacher. The overall environment of the classroom welcomed student questions. Most of the conversations were focused on techniques or how to use the new instrument properly, I noted a few instances when the students were observing physical properties of a sample and the teacher did not elicit further discussion, a missed opportunity. (Robbins, UTOP Indicator 1.1 Evidence, Oct. 2013)

In contrast, the following observation represents a score of a 2 on the indicator:

> During this lesson there were occasional student questions of low or medium quality, primarily about the logistics of the class or clarification of what the instructor was doing/demonstrating. For example: "S: Is it always going to be the same two colors? T: no, I just made it look that way." "S: Do we have a video to watch tonight? T: I'll answer that in a second" "S: That's what I don't get. T: Your body processes it, it already occurs, it already happens. How long does it take without enzymes?" "S: Are we going to be doing labs a lot this year? T: Yes, that is my whole purpose of flipping the classroom, so I don't spend time lecturing." There majority of questions about the content were focused around the general "I don't get it" statement, rather than asking deep or thoughtful questions about the content (Deer, UTOP Indicator 1.1 Evidence, Oct. 2013).

96

The next innovative indicator, 3.1-Implementation Questioning, examines how the teacher used questioning strategies to encourage participation, check on skill development, and facilitate intellectual engagement and productive interaction with students about important science and mathematics content and concepts. Across the observations, participants were scored a 2 (55%) or a 3 (45%) on this indicator. An example of evidence for a 3 on this indicator from the observations:

> The questioning strategies employed during this lesson were directly related to the objectives of the lesson. The teacher would point to a position on the graph of a roller coaster graph or discuss a scenario (bow and arrow) and ask the students to fill in the blank as potential or kinetic energy. During the lab, the questions were more geared to check in on student understanding and completion of the task to maintain a sort of rotation schedule. Examples of questions include, T: "When I pull the bow back, what kind of energy is this?" (wait time) T: "What I release the bow, what kind of energy is it?" (waits for response). These questioning strategies and use of wait time, not only encouraged student participation, but allowed time for student responses and provided opportunities for the teacher to formatively assess student learning. (Edwards, UTOP Indicator 3.1 Evidence, Oct. 2013).

The final three innovative indicators are within the content domain of the UTOP

Instrument, 4.6-content relevance, 4.7- content interconnections and 4.8 content societal

impact. The first of these indicators, 4.6- content relevance examines if and how explicit

connections were made to students why the content was important to learn throughout

the lesson. Scores on this indicator ranged from 1-3 across the observations, but only

one of these represented the highest score, a three. Most lessons were scored a one on

this indicator as no mention of why the content was important to learn was mentioned in

any capacity throughout the lesson observed. The next innovative indicator in the

content domain, 4.7-content interconnections explores if and how appropriate

connections were made to other areas of science and/or other disciplines (including non-

school contexts). Ratings on this indicator across the observations ranged from 1-5, the

entire spectrum of UTOP scores. However, only one rating scored a 5 as the entire

lesson was focused around the biochemistry of artificial sweeteners and the research

surrounding potential neurological implications of these sweeteners in diets. The last

innovative indicator in the content domain, 4.8-content societal impact explores the

discussion about the content topic's role in history and/or current events. Ratings on this

indicator scored from 1-3 across all observations, with one observations scoring a 3:

> At the beginning of class, the instructor showed a short news clip about a
>
> mysterious white powder in an envelope opened at a state senate meeting. The
>
> students then wrote a reflective piece in their notebook about why identifying

98

unknown substances is important. (Robbins, UTOP Indicator 4. 7 evidence, Oct. 2013)

Across the nine classroom observations, a total of 36 indicator rankings were possible, 25 of these ratings across all four domains were rated a three or higher, representing 69% of observations.

In addition to UTOP observations, in an interview, Jennifer described how she took risks with her classroom instruction. "I have taken several risks as far as how I handle different situations and it really works out for the better. One of the risks that I took when I was teaching math full time was that I was doing math stations and that was really not heard of in our region, at all… I jumped off on that risk. They [administrators] were like, Oh my goodness what are you doing? And I said, 'well it's a risk that I'm taking to make sure my kids get what they need and it ended up working beautifully" (Jennifer, Interview, Oct. 2013). In other interviews teachers described "pushing their students to perform" or flipping their classroom, and even cross-curricular instruction across the science department.

Equity. Although not an initial component of classroom practice as defined by Loucks-Horsley and colleagues (2010), equity pervaded as a theme in classroom observations and field notes. For example, during an interview, Mrs. Robbins was vocal about the need for special education professional development and staff, "I asked for a professional development about special education paperwork because I felt like we were

a liability. We didn't know what we were doing or supposed to be doing" (Interview, Mar., 2014). During one of the observations, a group of special education students were working together during an investigative lab exploring the chemical properties of various substances. From observation field notes and supporting UTOP evidence:

> This group [of special education students] was consistently confused and conducting the multiple lab tests incorrectly. At one point, while the instructor was helping another student and this group began mixing the contents at their station, I motioned to the instructor to help them….it was after class that she [the instructor] said these were special education students and missing their inclusion teacher. Although not intentional, these students did not conduct the lab correctly and missed out on some important content and observation data; which will ultimately affect their grade. (UTOP evidence, indicator 1.6- Classroom Equity, Evidence, Oct. 2013)

Although this equity issue was present in this one observation of Mrs. Robbin's class, two later observations did not identify any negative equity issues in her classroom. The equity issue was present in Mrs. Edwards' classroom observations as well; however each observation represented a different issue. For example, during one class observation, she reminded students of previous classroom behaviors and suggested modifications rather than reprimands for the next class day. After this instance she used cooperative learning strategies to encourage students to work with peers that would assist them rather than get

them off task (UTOP evidence, indicator 1.6-Classroom Equity, Apr. 2014). A negative

instance regarding equity observed involved a special education student who was

> …continuously called out for being off task and singled out in front of the class.
>
> Although the rest of the students felt comfortable offering incorrect answers to
>
> questions, this student had a difficult time interacting and was clearly
>
> uncomfortable, but continuously called upon. In another class, after the instructor
>
> asked a particular student to move, he yelled out answers to question. The
>
> instructor sent him out of the room, [and] talked to him outside (students were
>
> told to put their heads down, but still saw). He missed the lesson and activities
>
> and was singled out in front of his peers. (Field notes and UTOP evidence,
>
> indicator 1.6, Classroom Equity, Apr. 2014)

Perhaps one of the most striking and disruptive issues of equity occurred in Ms.

Rice's classroom observation. In one lesson another instructor on campus walked into

the room with the purpose of visiting the instructor and students. During his brief time in

the classroom, I introduced myself as a researcher from the University exploring how

schools in rural communities work. Upon hearing this, the instructor walked up to a

Hispanic male student, put his arm around him and said, "Oh, you're here to study us

because we have a bunch of Mexicans [sic]" (Field notes, Classroom Observation,

February 2014). Upon hearing this, the Hispanic male student showed no sign of

emotion. Ms. Rice, the class instructor, politely asked the visiting instructor to leave.

Although this was not an indicator of this particular teacher's classroom equity, it is an important instance that represents what can occur in classrooms related to equity.

   Resources. Resources in various forms were a prominent theme when examining this particular component of context. From classroom observational data, Mrs. Robbins immediately used the resources provided by the TRC the next day in her classroom. In the aforementioned lab, the instructor "created a new lab station using the iscope that she had received at the TRC meeting. This lab station was added and one of the highlights of the lab for the students" (UTOP evidence, indicator 1.5- Lesson Resources, November 2013). Resources were present in observation data again in Mrs. Edwards' class. When examining UTOP indicator 1.5-Classroom organization, which represents the classroom is organized appropriately such that students can work in groups easily, get to lab materials as needed, and the teacher can move to each student group, etc. Mrs. Edwards scored high (4 or 5) in each of her three observations despite limited resources in the amount of space and consistent switching of subject taught. When exploring how Mrs. Edwards used resources in her classroom, she scored 3 or higher on this UTOP indicator (1.5, Lesson resources). In one of her observations she used previously supplied resources from the TRC as well as a cobbled together amalgam of lab supplies that she was able to find on campus or purchase at the local big box chain store. One observation in Fall 2013 captured this use of resources,

The instructor selected a variety of resources for this class. She used an iPad, paired with an Apple TV (both supplied by the TRC) to share the warm-up graph with the students. The students each had notebooks (supplied by the instructor) to record their warm-ups and lab finding in an interactive notebook format. Each of the lab stations was previously set up by the instructor with sufficient materials ranging from cups with fans on the top to propel a plastic car, rulers, spring scales, and ramps. The only resource that was required but missing, was plaster of Paris because it was not available in the town that Singleton ISD was located in. The instructor would have to go visit a nearby, more metropolitan area later in the week to get this material. (UTOP observation, Mrs. Edwards, Lesson Resources- Indicator 2.5, November 2013)
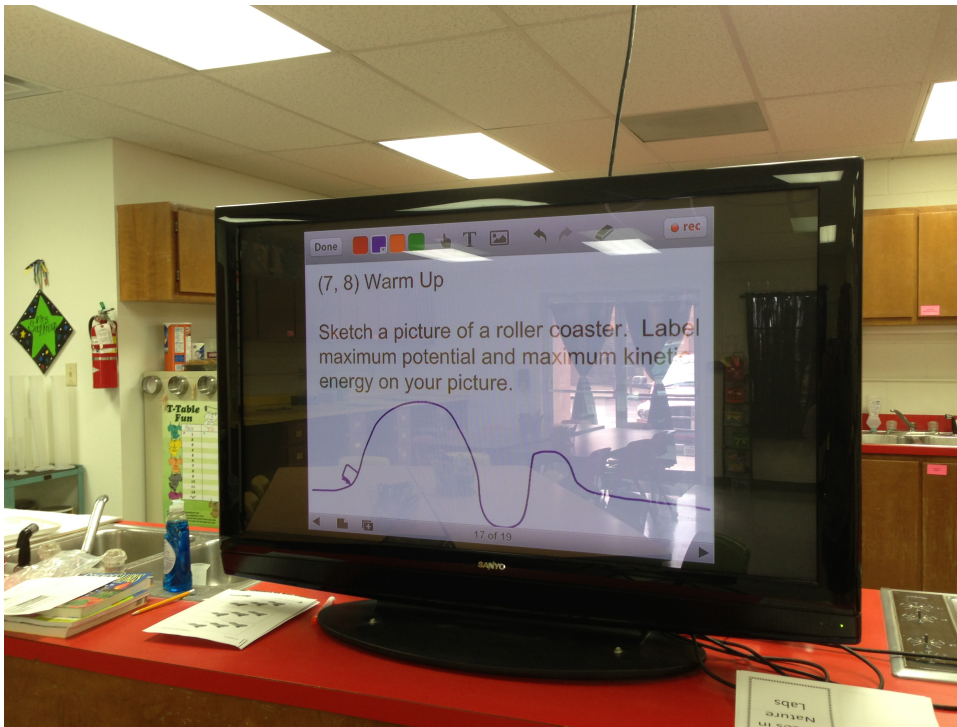
Figure 7. Apple TV set up in Mrs. Edwards Room

Both of Mrs. Deer's observations used resources appropriate for the lesson and resources that enhanced the lesson. One lesson observed was her first attempt at implementing a flipped classroom format. In this lesson, she created a Socrative quiz using a cell phone application, used a real-time assessment device (See figure 8), and found and incorporated pool noodle to represent the abstract concept of an enzyme and substrate binding.
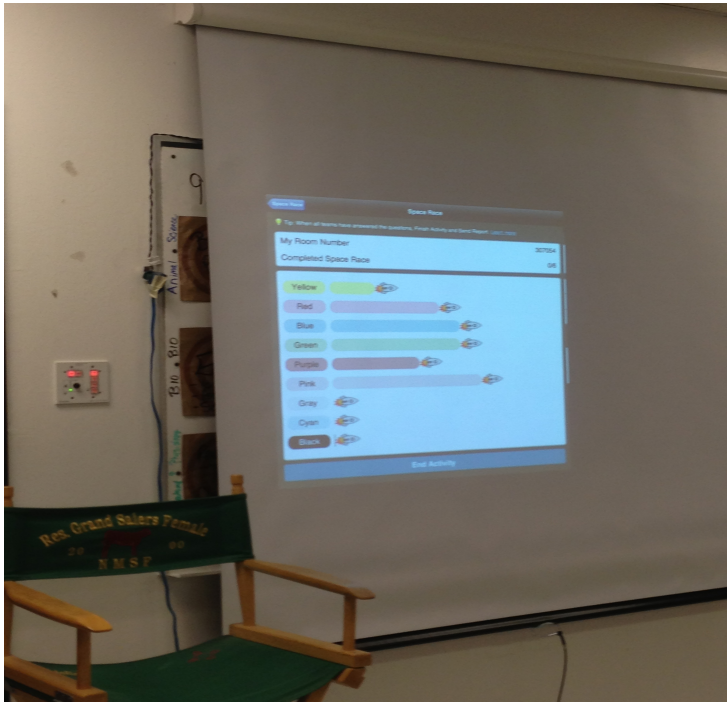
Figure 8. Real Time Quiz Scores on Socrative Quiz in Mrs. Deer's Class

Content. In two of the three observed lessons for Mrs. Robbins, she made several attempts to draw upon students' prior knowledge of previously learned mathematics/science concepts and students' everyday experiences with science. This indicator represents a fluidity of knowledge and depth of understanding on the part of the instructor, suggesting that this teacher, even with multiple preps and responsibilities is able to implement elements of effective teaching. The content chosen in the course was taught accurately (indicator 4.3), and occasionally made clear for the students why they were learning the content (Indicator 4.6), as well as efforts to connect the content

taught to other areas of math and science (indicator 4.7), history and current events (indicator 4.8). These latter two indicators (4.7 and 4.8), are rarely observed in classrooms (Gates Foundation, 2012), and represent strengths in Mrs. Robbins' science instruction.

Mrs. Edwards represented a different spectrum of the use of content in the classroom. While scoring rather high (3 to 5) on content significance (indicator 4.1), and fluency (indicator 4.2), meaning in each of the classes and grade levels Mrs. Edwards taught, she was teaching aligned and correct content. This content was delivered without much emphasis on conceptual understanding as her scores on content relevance (indicator 4.6), interconnections (indicator 4.7), and societal impact were low (indicator 4.8), scoring a 1 or 2.

Curriculum. Participants across this region were responsible for creating their own curriculum as there were no instructional coaches or support staff on campus for such purposes. In prior years, participants used a state created curriculum, "C-scope," as a guide for their instruction. However, because of political reasons C-scope was pulled out of campuses across the region and teachers were faced with the challenge of creating multiple curricula for their multiple courses. The facilitators were empathetic towards the teachers across their region and attempted to assist their participants; however, because of a change in policy at their region center, they could not share specific lessons with participants. Mary described this situation:

We've been told [by the Region center], even with our workshops, not to [share curriculum]. We can share things with them that we found, not in the sense that this would be a good one too… You can give them examples of activities but not give them a specific lesson that would be good because as we've been told, "we're not in the lesson business." (Piper, Interview, Mar. 2014)

When prompted to describe the business they were in Piper described it as "facilitating and supporting teachers, but without lessons."

Many participants negotiated this lack of available curriculum through the listserv and emails, as illustrated in one email exchange between an anatomy and physics teacher and a 7th grade teacher across the region:

T1: Does anyone have a good simple/compound machines lesson? We have covered work and power. I don't have anything else for machines.

T2: Here is the simple lab that I use. It is an interactive lab online. You can use any part of the lab questions or graphs. The students enjoy this lab every year. http://aspire.cosmic-ray.org/labs/machines/ (Personal Communication, May 2014)

Essentially, participants were using their colleagues and the collective expertise of the TRC to meet the challenge of designing multiple curricula in the absence of resources. Jennifer discussed a situation in which she reached outside of the TRC to a colleague in

107

an urban area and found that teachers in other locations enter conversations about curricula differently than her TRC peers:

> A friend of mine lives in [major metropolitan area] and she's applied to be one of their science specialists in their region area. We've had a lot of conversations in the ways that rural schools approach science as opposed to my more inner city friends are doing. There seems to be a difference in how we enter the discussions. I know she asked me about what lab I was doing. I forget for what, and I said how I would do it, and she said I would never do that, and I asked her what would she do and she told me and it, I think it has to do with the resources that I had available and the stuff that she had in her classroom. She had all of the Lab Aid equipment available and all of the latest and greatest pieces of science materials and I had washers, just washers. I didn't have that other stuff…we [rural educators] go to Wal-Mart for supplies, if they don't have it, we don't get it. (Jennifer, Interview, Apr. 2014)

Organizational culture. When referring to organizational culture, Loucks-Horsley and colleagues (2010) described the importance of culture of the school in which the professional learning community occurs. For the purpose of this study, the culture examined was of the rural region where this portion of the statewide PLC was implemented. Culture is defined as norms, values, beliefs, rituals, ceremonies, symbols

and stories that make up the "persona" of the organization (Loucks-Horsley et al., 2010, p. 62).

"It's Rural Texas." In two of the interviews with the facilitators, they mentioned the perception that due to the region's location in Rural Texas, "people are nice" (July, 2014). From my experience visiting the site, this statement rings true. Participants were always welcoming, opened their classroom doors, invited me to dinner, and were overall very polite. This notion of "people are nice" resulted in a strong sense of community and support amongst the TRC members beyond simple "please", "thank you" and "yes ma'am" and "no ma'ams." Participants felt that they could reach out to other members of the TRC at any time for pedagogical suggestions or emotional support. All participants described a sense of community (65 coding instances), trust (10 instances), collaboration (48 instances), and respect (15 instances) amongst the facilitators in their region and as a member of the TRC.

Culture of the TRC. The facilitators described the culture of the TRC as "selfless". This was noted in one of the PLC meetings I observed in which the co-director of the TRC visited the region. He spent time addressing the group as a whole and then with individual members, answering questions and sometimes just listening to their concerns and experiences. One issue with the culture of the TRC was that these participants felt different than the state-wide TRC participants. For example, when Melissa described visiting Austin, Texas for the annual TRC meeting in which many

109

TRC members across the state participate, she described feeling different than other regions and enjoyed being part of the rural regions culture.

> I remember a comment...It was the last day and the last session before you could
> head out and we were in our group talking, like we want to go to this one
> [session], or we want to go to this one and trying to figure out because some of
> us couldn't go to some of them. …one facilitator was like, this is what I
> appreciate about y'all. Because instead of y'all saying, "you know I'm not going
> to go [leave] so I can go early," you guys are trying to figure out how you can go
> to more [sessions], and that is a direct reflection of your attitudes. Because if
> they [other regions] have the attitude of it wasn't important [and] that we could
> go whenever we wanted, then we would have the attitude, but it started from the
> top and you can see it all the way down. (Melissa, Interview, Apr. 2014)

The facilitators in this region are very proud of their teachers, Piper even went as far as to say, "I think they are some of the best science teachers in the state" (Piper, Interview, Mar. 2014).

Few teachers. One of the challenges facing the TRC as an organization, specifically in this rural region of the state, is the reduced number of available participants. The facilitators described this tension, "If we lose a mentor teacher, where are we going to get another one from?" (Piper, Interview, Mar. 2014). There is also a challenge in recruiting teachers because of the culture of their campus or district. Some

principals did not want their teachers leaving the classroom, because of time away from students or the lack of substitutes available in the area. As one facilitator described, "Who are you going to get to sub? The local pastor, the grandma? They most certainly won't be teaching content" (Piper, Interview, Mar. 2014). The challenge of few teachers was also an issue because of the TRC mentoring structures. If there were few teachers on campus, which is the case in many rural schools, then the teachers did not have anyone to mentor. The facilitators did offer a solution for this, "For someone like Jennifer [in Singleton, ISD], she should be able to go to a neighboring district and mentor someone there, that would make her life much easier" (Beth, Interview, Mar. 2014).

Collaborative culture. Despite the geographical and professional isolation of participants in this region, all participants and facilitators often described the collaborative culture of the TRC (48 coding instances). Collaboration exists in many ways, in-person or electronically (10 coding instances). Teachers often described using the listserv established by the TRC as a place to get information or feedback on ideas. One pair of teachers, Kerry and Leanne, presented on this culture of collaboration within the TRC at one of the PLC meetings (Figure 9).
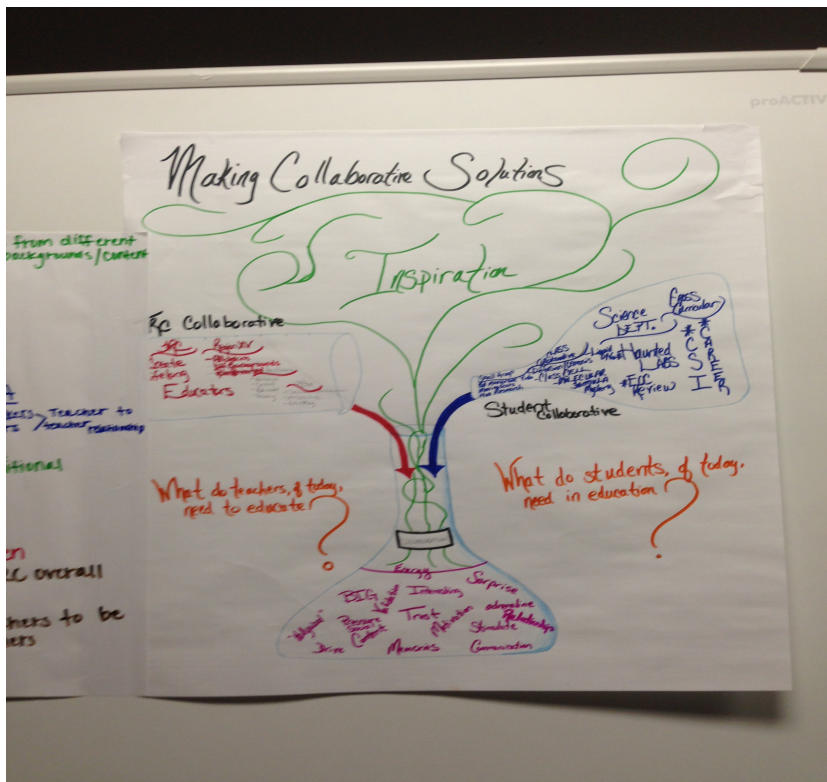
Figure 9. Collaboration Diagram created by Kerry and Leanne presented to the TRC

When asked to explain their presentation, they immediately began describing how the collaborative culture of the TRC permeates into their classroom. Leanne described this collaborative learning as being:

> able to identify with other people and knowing that they come from a similar
>
> place as far as resource go, multiple preps because they each science. I think that
>
> ultimately comes from these similarities that we all share, that we bring to the
>
> table. We have our own experiences, but it's our similarities that bring us

together in the first place; I think that creates a big part of the culture among us.

(Leanne, Interview, Apr. 2014)

During a classroom observation in April 2014, a few weeks before the state standardized test, this collaborative culture was visible. Students from Kerry's 10th grade chemistry class were rotating between their classroom and Leanne's 9th grade biology class. The 10th grade students were teaching the 9th grade student biology concepts. When asked about this lesson plan, the instructors said they decided on it the night prior, and their students had no issue with it because they are used to rotating and working together in and across grade levels, "Just like in the TRC meetings."

Organizational structure and leadership. Loucks-Horsley and colleagues (2010) described organizational structure and leadership as procedures for decision making, rules and regulations, resource allocation, incentive and accountability systems, collective bargaining agreements, assignments of people, and scheduling of time. Essentially, this area of context describes the logistics of the TRC in the rural region.

Mentoring. As previously discussed, the facilitators saw the mentor-mentee requirement of the TRC as a challenge for their isolated teachers. For Jennifer, this challenge was difficult to overcome. During the course of the study, she made the decision in Spring 2014 to not apply for the TRC for the upcoming school year. When asked about this issue she said because she "Was fighting a battle she couldn't win" (Jennifer, Interview, Mar. 2014) on her campus. She continued to describe the fact that

113

teachers on her campus were spread thin or did not want to continue professional development beyond district requirements.

Time. One theme that permeated all teacher interviews was the idea of time (58 coding instances). Teachers who act as STMs within the TRC are asked to give up 100 hours of time over the course of the school year. A bulk of these hours are attributed during 5-day trainings over the summer; however, they still are asked to attend at least 2 PLC during the school year, missing two school days, with mentoring hours attributed after the school day ends. This is a significant amount of time for teachers and the facilitators in this region are sensitive and empathetic of this time requirement for the teacher participants. For example, one of the PLC meeting dates was scheduled a week before the state standardized biology test. Rather than making this a required training, the facilitators scheduled an alternate day for teachers who did not want to leave their classroom at that point of the school year.

This time requirement also represents a salient bond amongst the participants. They describe a sense of commitment, common ground, and ideology amongst people who sign up to give an extra 100 hours of their time during the school year. Teachers also describe a sense of trust or belonging because of the amount of time they dedicate to the TRC as well as the time they spend together. Leanne described this sentiment:

> That's a big part of it, but how many teachers will give up that much of their
>
> time to sit in workshops, and I think that says a lot about the kind of people that

are there. Yes, there are some people there whose principles told them to do it, but for the most part, people are there because they want to be, they want to be better teachers. I think that, in and of itself, knowing the time it takes, because it does take time, I think that says a lot about who's there, I think it makes it easy to trust them, to know that they are not going to leave you full of anything you don't need here, they are going to tell you exactly what you need to know. (Leanne, Interview, Feb. 2014)

Resources. All teachers and facilitators described a lack of resources on campus whether it is personal or material resources. However the facilitators described the TRC listserv as a resource because it assists the teachers with their time. As Piper said, "They could spend hours and hours searching the Internet and find 50,000 things or they just ask a peer and get an email response, quick" (Piper, Interview, Mar. 2014). For example, when one high school instructor asked for a specific lab, a middle school teacher shared information about the work in her classroom. This situation would not be possible without the connections made at the TRC meetings as well as the listserv. As Kerry said, "you need a certain amount of trust or you're not going to have these resources" (Kerry, Interview, Mar. 2014). Organizations outside of the TRC also rely on the listserv as a resource, one school district administrator asked a teacher on his campus to poll the TRC for information about the recent statewide textbook adoption. He wanted an informed decision made with data gathered across the area.

115

National, state, and local policies. As Loucks-Horsley and colleagues (2010) described, "professional development programs swim in a stream of state and national policies as well as local mandates" (p. 69). During the time of this study, the local and state politics were teeming with initiatives that affected secondary science education in the state of Texas. The 2013-2014 school year was the first year in which students entering the 9th grade were required to take and pass 5 end of course exams rather than 15 in order to graduate. This was a result of legislation referred by participants as "House Bill 5" or "HB5." During the September 2013 TRC meeting, the facilitators made an effort to "translate" how these new policies would affect their participants' teaching practices because they, "want to make sure you [the participants] know what's going on in Austin [the state capitol] that has an impact on us." The participants were frustrated by the lack of clarity from the state board of education surrounding the house bill. The facilitators shared in this frustration and emailed the participants their congressman's address and encouraged teachers to "share what you think…whatever you think you need, stand at the door of who is in charge and ask for what you want" (Investigator Field Notes, September 2013).

Melissa described the pressure she felt from teaching the state standards for biology, the one science test under House Bill 5:

I feel rushed when I'm held to the policies of teaching all the TEKS, and in a
short span of time, school time, I feel like instead of being able to teach, and pick

116

up on something that the kids are interested in, I have to be more specific, and I have only stay in this narrow road, I feel like I can't bring more things into supplement. State policies dictate that, they are dictating what we have to teach (Melissa, Interview, Mar.2014).

The 2013-2014 school year was also a year in which districts around the state were adopting new science textbooks. During the spring of 2014 teachers were deciding which science textbook would be used across their district for at least the next 5 years. Aside from new testing requirements and textbook adoptions, the Texas legislators were in the process of determining a new sequence of courses in which students could specialize in an area of expertise. For example, students could take a series of courses related to biotechnology and biochemistry if they were interested in the forensic sciences. This example is by no means exhaustive of the state legislative decisions made about education during the 2013-2014 school year, but they were the most discussed by participants.

Available resources. Resources included time, money, materials, facilities, as well as access to intellectual resources such as university faculty and experienced teachers (Loucks-Horsley et al., 2010). Both tangible and intangible resources were examined throughout the analysis of context in this study (52 coding instances).

Variety of resources. Resources represented an important piece of the context of this professional development. Resources were coded as traditional resources for

117

classrooms, as well as electronic resources and personal resources. Examples of resources mentioned by participants throughout the study that included: material resources, such as lesson plans or lab equipment, intellectual resources, such as strategies for classroom management, and personal resources, such as access to peer and emotional support.

Lack of resources. On their home campus and traditional to the region, resources were lacking and this presented a challenge for the teachers and students (30 coding instances). Participants described this lack of materials and lack of access to resources as a challenge for the teachers and ultimately a detriment for the students. In interviews, all participants mentioned a lack of resources for specific populations, including Special Ed, At Risk, Homeless, or English Language Learners. In every one of Jennifer's observations she made modifications she "thought would work" for her special education students. Many participants described feeling helpless in identifying strategies or determining how to best support and assist these students. The TRC did not provide specific training for these populations, but the previously mentioned electronic listserv was peppered with questions about how best to assist these students or alternative teaching strategies.

One type of resource teachers reported lacking were science-specific administrative support. Kerry described the lack of administrative appreciation on her campus:

118

It would be beneficial to us, as teachers, that administration be able to understand

what it is to teach science and how it is different from teaching other

subjects…there's a lot of preparation that goes along with that and I don't think

that our administration really, truly understands that. What is involved to teach a

science class (Kerry, Interview, Oct 2014).

Jennifer echoed a similar sentiment on her campus:

My principal doesn't exactly have a science background, he was a coach who

was certified in multiple areas, so he just bounced from class to class to class. He

knows, he studied the TEKS, but as far as other knowledge besides that, I really

don't have anyone else to come observe me and support me as far as content

related. (Jennifer, Interview, Oct. 2014).

TRC supplied resources. Resources supplied by the TRC did "trickle down"

from the region center to the campus level. These resources included information and

strategies for vertical alignment across grade-levels, a task Jennifer described as "easy

because we are all in the same building," to methods of formative assessment.

Participants did not describe time as a resource, rather it was described as a limitation.

However, despite this limitation, all participants described their time at the TRC as

"worth it" when referring to the time investment.

Resources provided by the TRC included Apple TV which was used in three of

the four classrooms observed. One participant, Kerry used an electronic microscope,

119

which was connected via the wireless network to a teacher's mini-iPad, also provided by the TRC, to share an image with the class. Other resources provided by the TRC included access to resources available within the local community. For example, at one TRC meeting in February of 2014, a Park Ranger from a local state park delivered a presentation and shared resources available at the nearby state park. Later, the facilitators reported that 6 TRC members took their students on a field trip to the park or utilized the Park Ranger as a guest speaker in their classroom.

History of professional development. The history of professional development was described by all participants as lacking, "sub-par" or "non-existent." The facilitators corroborated this history as they believe principals lack the vision to support their staff, as Piper said:

> Most of our principals are not curriculum and instruction people so they don't truly understand how to be leaders. They are not instructional leaders. They don't know how to give professional development to their people. It's more about needing and what to do. It's not about direction and how to do it. (Piper, Interview, Apr. 2014)

One participant, Jennifer, depicted the professional developments as disjointed, describing the seating arrangement of staff at a local PD with the coaching staff on one side of the room with the content-specialist teachers on the other. She continued to

describe this disjointed description of her faculty throughout an interview. Melissa described this dissention as:

> Before school I know a lot of schools have huge get together and trying to get the teachers on board together to work together, like "hey this is going to be your colleague." But we don't really do that here. It's kind of like the week before school starts, it's like you just, these are the times you have to be in the library, other than that you are free to work in your room. It's not a lot of teamwork, and right here, there's a lot of dissention between teachers and coaches and I think that is part of the reason because we don't have development together. The first year here we did, and we went in town and we did it with [other school district in this region] and lots of other schools were out there like smaller schools. Since then we have not done that. That's kind of hard to answer because we don't do it out here.

Kerry asked her campus leadership for professional development about the legality and procedures of teaching special education. "We had no ideas what modifications or accommodations were…we were doing things against the law, but it wasn't on purpose."

Facilitators and teachers described themselves as professional development or conference "junkies." Meaning they have consistently attended professional developments or conferences, even though these opportunities were lacking in their

region outside of the TRC. The region center and the TRC represented the only PLC accessible for secondary math and science teachers in this region. The facilitators became involved with the TRC at separate times throughout their careers. Both of them agreed that the history of professional development at the region center, prior to the partnership with the TRC was also bleak. They described their teachers as receiving "turn and burn" resources or ideas with "little cognitive dissonance."

Parents and the community. Parents and community members influence teachers and school systems, including the professional development opportunities offered to teachers and their subsequent implementation. It is important that the community's views be considered, as gaining public support is critical towards reform in math and science (Loucks-Horsley, et al., 2010). The local community was a common theme throughout this study (65 instances) as it influenced teacher morale and represented a substantial portion of the context of the TRC in this rural region.

Extracurricular activities. Many participants described the importance amongst the local community of athletics or sporting events. As one facilitator said, "You don't want to be a losing coach here in November." [November is when high school football playoffs begin] (Piper, Interview, Sep. 2013). Melissa described her community as prioritizing sports over academics. Sporting events were described as prioritized by the community over education as well as other extracurricular activities. All participants sponsored at least one extracurricular activity outside of their teaching duties: Leanne

122

coached volleyball, basketball, and track; Kerry sponsored UIL events; Melissa sponsored the shooting team, horse judging team, and science UIL; and Jennifer sponsored the community youth bowling team as well as UIL activities. Melissa stated that the community's perception of her influenced her ability to sponsor her extracurricular activities

> It has been very, very difficult, I almost got fired over it [my teaching] three years ago, I know that. I have made so many people mad at me because I taught their kids and they won't talk to me. Funding for my stuff [extracurricular activities] has been cut off because of it, it is a very, very political game that I'm in the middle of and I'm just tired. (Melissa Interview, Mar. 2014)

Sports were not the only priority of the community; churches and religious views influenced the context of this professional development in a rural area. One of the schools, Central School, is located near the grounds of a church. The church pastor acts as the superintendent and his son acts as the athletic director. The participants at this school described a strong influence of the church community on the school community. In Ferdinand ISD, Melissa struggled teaching the concepts of natural selection and evolution because of pressure from the community. As a result, she asked a professor from a local college to visit and teach the concept to her students. As she described, "this essentially keeps me out of trouble. People here are very religious. We have atheist and others, but most people don't believe in evolution" (Melissa, Interview, Feb. 2014).

123

Perceptions of education. All participants believed that the level of education of the community influenced how they perceived education. These perceptions vary, as the facilitators said:

> Depends on which part of our region, because it's different. [Neighboring district] wants their kids to hurry up and turn 18 to go to work in the oil field. I know that the community in general, they aren't prioritizing education. That's probably true for several around here, they don't care if the kids go to college… think it depends on the kid though. There's a group of them that are going to go back out and be farmers and there's a group of them that are going to go to college...being that that is where my kids went to school. Most of those kids went off to college for a little while, even if they didn't finish, there was another group that went off into the military. (Beth, interview, Mar. 2014)

Insider-outsider. All participants, both teachers and facilitators, described the sense of feeling like an "outsider" in the rural community they are serving (15 instances). The facilitators, neither born in the areas they previously taught or the area they are currently working in, described this sense of being an outsider despite the amount of time spent in a location. Piper described her time as a teacher in an interview when prompted to discuss rural communities:

> P: I have something to offer. I grew up on the outskirts of a metropolitan area, and so, my whole life, until the last 12 years, I've been in more of a rural

124

environment, so I've seen the differences. One thing I noticed is that the community itself is tightknit and all of the little towns that we serve have their own personalities and priorities and economic scenarios and hierarchy and, you can usually tell in most of the communities that I visit, specifically the schools, who is a move-in.

A: What do you mean?

M: The teachers that moved in versus the teachers that are from there.

A: Can you explain that?

P: Natives, I'll call them, are way more comfortable in the environment and are defensive and fiercely loyal if they feel the town is being questioned or the school is being questioned, or the community.

M: Also, typically backed more by the community than a non-native.

P: Right, and so something that a native might do or say wouldn't be questioned at all, whereas if a move-in does or says something or asks the wrong question, then they're going to be questioned. Or…it could be complete isolation of the "in" group, like where you really, sitting down for lunch, you might be eating by yourself and I experienced that a little bit when I moved. I was there 10 years. I was still a move-in. It was very clear to me and my family. Now, not so much my kids, but definitely me and my husband.

This loyalty and sense of respecting their own was not unique to Piper's experience as a teacher and facilitator in a rural location. Melissa described the beginning of her career in her district as challenging because of the attitude of the community:

> …if you don't get support right away from a few of the major game players, then you're probably not going to make it there very long, just because their opinion weighs so heavily on everything and I didn't realize that, even coming from a small school. I didn't even realize that until probably two years into my teaching career, it was like a slap in the face. It was like, ok, so I do have to play this game if I want to stay out here. (Melissa, Interview, Sep. 2013)

The insider-outsider tension was a theme represented across all interviews. Teachers described feeling isolated or explicitly as an outsider in 43 instances of the interviews. Leanne and Kerry described the sense of outsider in respect to the church community near their campus, explaining that if teachers or administrators were members of the church community they were more likely to get promoted to a leadership position and less scrutinized by administration.

Influence of stakeholders: School board, administrators, parents. The stakeholders mentioned across the interviews were not the teachers and students, but the school board (2 instances) and parents (10 instances). Melissa identified these stakeholders in her interview, "Oh, like people in the community that can sway [school board] votes or decisions regarding school support…major parents who are very vocal,

126

very gonna tell you how it is." (Melissa, Interview, Apr. 2014). These stakeholders were described as a challenge more than a support during the interviews. Participants often felt threatened and the need to prove their pedagogy and efforts to these stakeholders, especially if they were outsiders.

The pressure from parents of students was also a prevalent theme throughout the study (10 instances in interviews). Melissa negotiated tense relationships with stakeholder parents during the first few years of her teaching because she "had a reputation as a hard teacher." However, this tension subsided after the parents "saw my teaching and they came to my side, because they saw how much their kids were learning, and that they were passing the EOCs and that I am doing what I should be doing. That is the rewarding part" (Melissa, Interview, Sept. 2013). This relationship between the parents and the students was important because no matter the location of community in this region, the participants identified the parents as a barrier to student success. In Jennifer's case, the lack of parental involvement or their transient nature influenced their students' success, or in Melissa's case, when they were too involved. When asked about barriers, Melissa hesitantly identified the parents of her students:

Honestly, I'm just going to be so honest, the biggest, and this is going to sound so controversial, it's the parents. The parents are the biggest hindering to their kids. There are so many examples. They just, you know how, like, when you have kids, or animals, or whatever, you want to protect them so much, you don't

127

want them to be hurt, you want to protect them. Some, these parents that we are

seeing, they are protecting their kids so much, that whenever they get out, when

they graduate, these parents, oh you got a failing grade because of blah, blah,

blah, I'm going to go get that changed, instead of making their kids learn and put

forth effort. Now they are getting passed so then when they graduate Ferdinand

and go on to college, we have a very low graduation rate from college. (Melissa,

Interview, Feb. 2014)

The stakeholders held a strong influence on the teachers and students in this study. This

community influence and perceptions of community were observed while I was waiting

in the front office of a campus for an observation. While interviewing the facilitators,

news arrived about death in the family. This was sensitive information and shared with

the facilitators by the teacher in confidence. By the time I visited a campus later in the

day, the front office was ripe with gossip about this situation. As I was present when the

facts were shared, I knew some of the words around the office were not true; however,

the administrators and parents of students volunteering were sharing their own stories as

well.

During Spring 2014, all teacher participants informed me that they were

attempting to move districts or resign from teaching in the classroom completely

specifically citing the influence of the church or community. As of the 2014-2015 school

year, all participants in this study relocated or switched jobs within the region, but were

not working at the same campus at the time of the study. It is important to note that the community members and school board members were not interviewed in this study as they were not part of the case.

Role of the Facilitator

Facilitator and teacher interviews, field notes from classroom observations and TRC Professional Learning Community meetings, and artifacts were used to inform the second research question of the study: *What is the role of the facilitators within a rural context of Texas Regional Collaboratives?*

The most often discussed component of context for the facilitators were the teachers and the teacher learning needs. They credited their continued effort towards supporting the teachers because this was a void for their participants. Teachers echoed this sentiment describing a lack of support from their campus administration and community stakeholders. Facilitators described their roles supporting the teachers in two ways: professionally and emotionally. Piper specifically described her role as "being a member of the learning community…helping people grow, not stand and deliver."

Professional support. The facilitators' professional support of teachers involved suggestions for effective teaching and connecting teachers via a list serv. For example, if one participant was in search of a lesson plan she would facilitate an email between the inquirer with a TRC member who had taught that course for an extended amount of time. Jennifer described facilitator support of her pedagogy as,

If I'm complaining that I've got way too much grading, then Piper is going to get that and then go, "ok, we need to think about how we are going to help our teachers…" They've [the facilitators] created this way where they can kind of bounce you back and bring you back too, ok, take a deep breath, things are going to be fine. (Jennifer, Interview, Sep. 2013)

Facilitators also focused on the importance and the continuity of the TRC for their participants. As former teachers in rural areas, they understood the importance of the professional learning community, pointing out the integral void the TRC fills for rural educators.

The fact that it [the TRC] is sustained, that it is focused, that it is collaborative in nature as its name implies, all of that is even more important in a rural setting, I think, than in a suburban or urban setting, because at least in a suburban or urban campus they have a team of teachers for each grade level or in high school, a team of teachers in one subject, they have that built in, our teachers don't. (Piper, Interview, July 2013)

The facilitators see their role as fostering the learning community to support teacher needs. Their commitment to the TRC resides in their personal belief that the TRC is a "game changer, a life changer for the teachers we serve." They feel so strongly about their participants that they "would pit them against teachers around the states, I think [the TRC] makes a difference in the quality of teacher that they become and it makes a

130

difference in the kind of instruction they provide their students" (Piper, Interview, Mar. 2013). This sentiment was echoed at the beginning of every PLC meeting observed, both facilitators opened the meetings complimenting teachers on their excellence and efforts.

Teachers in this particular rural region often taught more than one subject and requested lesson plans; however, because of some policies at the region center facilitators were explicitly instructed to restrict sharing lesson plans. In an interview exploring this subject both facilitators explained this limitations,

> We've also been told, even with our workshops, not to, we can share things with them that we found, not in the sense that this would be a good one to, you can give them examples of activities, but not lessons that would be great for this because, we're not in the lesson business. (Mary, Interview, Feb. 2014).

Rather than supplying lessons, the facilitators described support through this limitation as "best practices, but not in lesson plan form…we can facilitate lesson planning and we can facilitate best practices, but we can't present them with good lesson plans" (Piper, Interview, Feb. 2014). With the changing state standards and graduation requirements, the facilitators acknowledged this will be a huge change for their participating teachers and "Stretch them thin, but they're already stretched this because it's a challenge when personnel and background [knowledge] is limited" (Mary, Interview, Mar. 2014).

Importance of trainings. As discussed earlier, the facilitators acknowledged the importance of the trainings of the TRC in the context of rural education. The facilitators

131

in this study were very clear with their vision and expectations for training and subsequent professional development of their participants. Mary and Piper prioritize modeling instruction throughout their trainings,

> [The teachers] can see how we modeled all this stuff, and you're taking them through this and taking them through this. I mean, it shows how you can get that participation out of your kids and make it more about them and less about what you're presenting. (Beth, Interview, July 2013)

In order to address and fulfill the needs of their audience the facilitators renegotiated how they implemented their trainings and meetings. For example, the spring meeting of all participants was scheduled prior to the dates of the state standardized test. Rather than ask teachers of that course to leave their classroom at such a pivotal point in the year, they offered an alternative date to deliver the same information. Because of the history of professional development in the region, many members of the TRC desired an activity or a type of pedagogy they could take from the training and implement in their classroom. The facilitators made the decision to bring in a partner from a local university to share some short activities many participants could attempt in their classes with little preparation. Their rationale was to not only to deliver a "turn and burn" type of activity, but also to expose participants to a new resource and "his wisdom and expertise."

Not all interactions with participants were positive for the facilitators. When facilitating the aforementioned summer training, Piper described noticing "glares from certain teachers" and getting frustrated by teachers who "think they know everything they need to know about their subject or grade level or whatever." Facilitators described ignoring these attitudes during training and taking a more direct approach in the field. However, despite the presence of negative minded participants, the facilitators maintained a realistic vision for their trainings:

> Even though I still see the faces and I still see the zone out, they turn off their care button, I still see that, I don't feel as responsible for letting them down. Because just like students in my classroom there has to be some participation in the learning act, you know, I can't learn from this, I can't force them to engage. (Piper, Interview, July 2013)

Rather than forcing teachers to engage, the facilitators agreed that their future goals for their participants during trainings is to encourage teachers to "just learn to ask a question rather than sit and be grumpy."

Emotional support. Facilitators described emotional support for participants as "cheerleaders." Piper explained:

> I do think a lot of what we do, we are just a support system that stands behind them and says, what you're doing is great. They need someone to affirm what they are trying to do, what they are supposed to do, and even if it seems like it's

133

not working, because sometimes we have those moments, that you can do it and just keep going and get through this and get to the next one. (Piper, Interview, July 2013)

The facilitators placed an emphasis on building relationships with participants, and supporting those relationships across the TRC. After the spring meeting began over 15 minutes late, Mary explained her reasoning for this late start in an interview, "It didn't bother me to start late today because I felt like I needed to go speak to all those people, um, because…they need it." (Mary, Interview, Mar. 2014). This relationship piece did prove integral as one participant, Jennifer, who was planning on leaving the TRC because of the challenge of meeting the hours of mentor requirement on her small campus, had a chance to express her views and eventually renew her commitment to the organization after negotiating a way to earn those hours in another form. Mary described this moment,

If I had not talked to Jennifer today and had that conversation, you know, we are really going to miss you and I really know you are crazy busy, I would not have gotten to the point that I would have known if I would have just changed that one thing for her. (Mary, Interview, Mar. 2013)

Aside from building a community for the participants, facilitators described the importance of the professional learning community for them. Mary described her sentiments as we recapped the Spring training in an interview,

134

I said, "my people are here today." It was so much easier to come to work today

than it was Tuesday, when I was doing [her other responsibility at the region

center] because these are my people, these are the people that make coming to

work, worth it. This is where my passion is. My passion is science and helping

science teachers. (Mary, Interview, Mar. 2013)

Facilitator Interaction

In summary, the role of the facilitators in conjunction with other data provided

insight into the ways the facilitators interacted with the professional learning community

of the TRC to answer the third question: *How do the facilitators interact with the*

Professional Learning Community within a rural context of Texas Regional

Collaboratives?

The facilitators described a very personal and powerful relationship with the

TRC, even calling their membership of the TRC as a "blessing." They credit the TRC as

their sole source of professional development as facilitators. They perceived their region

of the TRC as an anomaly and characterize its specific identity as a rural and isolated

region. The facilitators also discussed the importance of social media and electronic

communication as components of the PLC and make suggestions for improvement.

Professional development. As members of the TRC, the facilitators were sent to

a variety of professional development experiences across the state and described these

trainings as the only professional development they received as facilitators and members

135

of the region center. When reflecting on this Mary said, "I'm scared what to think would happen to our professional development if we didn't have the TRC, it would be non-existent" (Mary, Interview, Mar. 2014). Piper described these trainings as "premier" and her responsibility to take the knowledge from the training and "then share 'em with our peeps." These "peeps" were not only the teachers of the TRC PLC, but also their colleagues at the region center. Mary and Piper believed their colleagues at the region center were jealous of Mary and Piper's experiences because as Piper described, "we get exposure to some pretty amazing trainings that our colleagues don't." Facilitators try to attend trainings together, "because we are always finding that when we go to a training and when we come back and she got one thing and I got something else."

Confidence. These trainings have inspired a sense of empowerment and confidence in the facilitators. In fact, they disregard their content knowledge and credit their training and experience in the classroom as giving them the "confidence to help any teacher." Piper explained this as,

> I don't think you have to be an expert in something to facilitate growth. And I feel like even as a teacher, it's ok if I'm not an expert in something. It's impossible to be an expert in everything and that's not what teachers should be thinking they are, nor should anyone else think they are. (Piper, Interview, July 2013)

Mary elaborated on this idea,

136

…you take all the pieces, I may not know social studies, but I can take formative

assessment, and I can help you figure out how to formally assess your kids even

though I don't know social studies. I mean, I think it all ties together. (Mary,

Interview, July 2013)

Piper credits the TRC with empowering her leadership ability,

The TRC has helped me to be a better leader…I feel like I have grown in my

ability to communicate what we do because of the TRC…as a human, that

happens to have this job, I think that I wouldn't have grown as quickly in this

particular role…I have been challenged. I have learned a lot more [about]

pedagogy in the TRC as far as understanding why things work, what they are. I

feel much more current on stuff. I've learned teaching trial and error. I feel much

more professional in my knowledge now and it's because of the TRC trainings.

(Piper, Interview, Mar. 2014)

Mary echoes a similar sentiment,

I would have never made a step out of the classroom if it wasn't for the TRC…It

was not until I started the TRC that teaching opened itself up to me… I would

have to say in my experiences that the TRC has done more for me than anything

else, because the trainings I have gotten here, the best trainings I have gotten

here are from the TRC. (Mary, Interview, Mar. 2014)

137

A specific identity. The facilitators also understood the importance of rural identity, more specifically, the importance of a rural Texas identity. When discussing the training delivered over the course of the summer this identity was emphasized, "We might have to go see if they [designers of PD] did it right, especially since it was California written and we're in Texas, there's a big difference there. Who's the audience?" (Mary, Interview, July 2013). In this same vein, facilitators often spent many hours and extra time to craft a training or meeting to their participants' needs. When the first day of their first summer training was met with much resistance from teachers, they spent a few hours "crying together" and then redesigning the training. The facilitators reported spending 12 hours a day to implement a 6 hour a day training, just to meet the needs of their participants because they

> …were asked to facilitate a professional development that was built and offered
>
> by someone else…it's not natural to because it wasn't my original thought, so –
>
> it's very difficult. We had to study. We study every night. We get here, every day
>
> of the week between 7:15 and 7:30 in the morning and don't leave until 6 or 7
>
> PM. (Piper, interview, July 2013)

Social media. Social media sites, such as Facebook, were integral to the facilitators' emotional support across the large rural distances. After reading a post from Jennifer lamenting her efforts as a teacher, Piper sent an email "just to let her know I think she's incredible," which was later addressed in a private in-person conversation at

a TRC meeting in which Jennifer said credited as the motivation to keep going. Piper believed this support looks like "building and encouraging, teachers aren't real good about doing that for each other anyways because we are so busy, but we [the facilitators] can do that" (Piper, Interview, July 2013).

In the spring of 2014, both facilitators noticed one participant's posts on Facebook were different. As Mary said, "something was going on, no idea what it was…even on Facebook, even though it's not here, you make a conscious effort to be supportive, how's it going, all those things" (Mary, Interview, Mar. 2013). It later came to light through a conversation with this participant's principal, that a parent was challenging her pedagogy in the classroom "because her baby girl didn't get to play volleyball as much as she wanted, and this particular teacher is the volleyball coach" (Piper, Interview, Mar. 2013). In this instance, the facilitators provided support when the community presented a challenge to the teacher.

What to change. Interactions between facilitators and teachers occurred frequently via email or Facebook and at the PLC meetings; however, the facilitators did not observe the teachers in their classroom. This is a point of regret for the facilitators and they were jealous of my ability to observe participants multiple times during the school year. Piper expressed her desire to observe teachers because

it makes me sad that you [the researcher] know more about our teachers' practice than we do because I want to be able to say with confidence in our reports of

139

what our teachers do and I want to be able to compliment our teachers about that,

but I don't have enough to say. (Piper, Interview, Mar. 2013)

This lack of teacher observations is a result of budgeting and time, as traveling to some

participant campuses would take an entire day and a significant amount of money in gas

or hotel room. Mary wants to observe teachers more than once to "avoid a dog and pony

show" and does not see it as possible with these budget constraints.

Role of the Teachers

Teacher and facilitator interview data as well as field notes and artifacts from

classroom observations and Texas Regional Collaborative Professional learning

community meetings were used to inform the fourth research question: *What is the role

of the teachers within a rural context of Texas Regional Collaboratives?*

Teachers emphasized the importance of their relationships with other teachers

across the collaborative as a way to mitigate their isolation and lack of colleagues who

taught similar subjects. All participants found the face-to-face in-person trainings to be

worth the time and sacrifice of leaving the classroom and traveling long distances to the

PLC meetings. Additionally, teachers described the importance of facilitators in

supporting their participation in the PLC.

Teacher relationships. The community formed by the TRC provided a space for

teachers to form relationships across the vast and isolating context of teaching science in

a rural area. Teachers felt comfortable sharing and asking for ideas because of the commonality of the context in which they teach as Leanne explained,

> I am able to identify with other people and knowing that they come from a similar place as far as resources go, multiple preps because they teach science. I think that ultimately comes from those similarities that we all share, that we bring to the table. We have our own experiences, but it's our similarities that bring us together in the first place… I think that we all come from similar teaching, but teaching in rural schools, not just limited resources, but everything else that comes with teaching in a small school. (Leanne, Interview, Sep. 2013)

Teachers described getting ideas from other teachers in person,

> That has been one of the things that I love about the Collaborative is that I get to see other teachers who are doing the things that I like to do and not stuff like textbook page one to textbook page end, with no hands-on experience. All of the teachers that are in the collaborative seem to have their kids active in their learning and that is something that I really do value. (Jennifer, Interview, Mar. 2014)

Teachers also received suggestions from their TRC colleagues using the listserv,

> I email [teacher in town 120 miles away] and say, I have no idea how to begin teaching this and she gives me her entire year. She says, "keep what you want, get rid of what you don't." How many people have that? So that's huge. And we

141

can send our ideas and I think that as a resource has been really important, being

able to rely on those people and their resources, and their knowledge. (Leanne,

Interview, Mar. 2014)

Teachers often described "seeking" other teachers at meetings or via email because of

the common interest and relationships formed at the TRC,

I can find something out even if I don't know it myself and that helps a lot…So

when I go to the TRC, I seek [Teacher in town 50 miles away] out because she is

very experienced and she has been teaching for a long time, in a small school,

and has been pretty successful at it. So when I ask her I know I am getting a lot

of years of experiences behind her answer and it just makes me feel like I am on

track. (Melissa, Interview, Mar. 2014)

Importance of face-to-face trainings. Despite needing to take a day off from

class and travel a long distance, no teachers described the TRC as a waste of time and

emphasized the importance of the in-person trainings. Jennifer credits these trainings

with creating a sense of trust,

I have learned to trust the people from the TRC mainly because of the sessions

and workshops that we've had, listening to what they have to say about what

they are seeing or what they have experienced over the years. (Jennifer,

Interview, Mar. 2014)

Leanne described the effort to attend the meetings as beneficial because, she is

142

absorbing everything I absolutely can. So any time I spend with someone who

can give me feedback or give me new ideas or things like that, I don't think

that's a hindrance. I think those are things you have to do as a teacher. (Leanne,

Interview, Feb. 2014)

Melissa described her reasoning for attending the TRC because it is the only time when

she gets to "interact with teachers who teach the same content" and she has opportunities

to be exposed to new materials and ideas that she, "didn't know existed." Ultimately,

Melissa enjoyed the meetings because as a rural teacher she is "spread thin" and these

in-person trainings provide,

An allotted time from nine to four, where I can collaborate. It's my time. If I

need to do this, I can. It's more relaxed and there are no interruptions. I have to

get away from my classroom sometimes for me to help my students sometimes to

grow. (Melissa, Interview, Apr. 2014)

Relationship with facilitator. The teachers described their relationship with the

facilitators as supportive, informative, personal, and "awesome." Participating teachers

described the emotional support provided by the facilitators as reassuring. Leanne

described an instance when Piper reassured her efforts in the classroom, "Yes, you are

doing this right, you're not completely messing up. That has been really instrumental for

me, especially being the only biology teacher on campus" (Leanne, Interview, Oct.

2013). Teachers were receptive to the support of the facilitators because it is viewed as

143

"positive." Kerry described this support as, "I don't ever feel like they're coming in or suggesting we aren't doing something right. I feel like they are very good at helping us evaluate ourselves, it's a positive reinforcement evaluation" (Kerry, Interview, Feb. 2014).

Aside from this emotional support, the facilitators provided the teachers with necessary classroom and pedagogical support. All teachers described the importance of the facilitators experience as classroom teachers in rural communities,

> I think what is most important is that the facilitators were once teachers also and they do a really good job communicating with us as to what is going on in the classroom and they listen to what we need…I think it all comes down to the type of facilitators we have and them having that experience. They are able to listen to us and know what we need to help our situation, our complaints, and what we're dealing with. (Kerry, Interview, Feb. 2014)

This teacher continued describing the ways in which the facilitators have provided ideas to "diversify her classroom" with a variety of learning strategies for the diversity of rural students.

Aside from their expertise, the teachers described accessibility and subsequent support from the facilitators as personal. All participants described the importance of the facilitators' ability to listen to the members of the TRC and then provide support based on specific teacher needs. As Kerry said,

They listen to our troubles and our things that we get excited about. If I'm

complaining I've got too much grading, then Piper is going to get that email and

go, ok, we need to think about how we are going to help these teachers. (Kerry,

Interview, Mar. 2014)

Leanne echoed this sentiment,

The facilitators are always willing to listen and offer advice on different

classroom situations you may run across, new ideas you may have, passing along

new information, and listening if you are stuck or hit a wall. They re-motivate

you to keep going. (Leanne, interview, Sept. 2013)

The facilitators were consistently available to support teachers via email. Melissa said if

she "sends an email [to the facilitators] it is replied to within a day" and this is not a rare

occurrence as she said she "uses them [facilitators] all the time."

All participants credited the facilitators with modeling collaboration. Kerry

described a common scene at TRC meetings and professional developments,

Piper and Mary are just really good at working together. They don't stand up

there and deliver a PowerPoint and say you need to do this….and lecture us on

how to work collaboratively. They don't do that. We learn collaboratively by

them collaboratively teaching us. That is how we learn collaborative modeling.

(Kerry, Interview, Mar. 2014)

Field notes confirmed this finding as I often described the facilitators "tag-teaming" or "finishing each others sentences" during each of the PLC meetings.

Teachers credited the facilitators as a primary reason for their continued participation in the TRC. Kerry said, "I do keep signing up for it, I love Piper and Mary."

Melissa shared the collaboration sentiment, "I love going to professional development, just for the collaboration of the facilitators, as well as the teachers."

Teacher Interaction

The role of the teachers in conjunction with data from observations and field notes were used to inform the final research question: *How do the teachers interact with the Professional Learning Community within a rural context of Texas Regional Collaboratives?*

Teachers described the importance of community when discussing their participation with the Texas Regional Collaboratives and see the collaborative as a resource. As a result of their participation, teachers had a sense of confidence because of a "push" from the TRC.

Community. Teachers described the importance of the community formed as a result of their membership of the TRC. All described a sense of "family" (Leanne, Kristie), "life-saver" (Melissa), or "home" (Jennifer) when discussing the TRC meetings. Facilitators understood this and described membership in the TRC for

teachers in rural communities as a "Life-saver." "It's worth it because of the relationships…when you get to go through this family experience, it makes a difference in your life" (Piper, Interview, July 2013).

This sense of community is especially important for rural educators as they feel alone and isolated. Jennifer summarized it best,

> The TRC is always there to help provide and give you that feeling that you're not alone on an island. You often feel that way and in a district my size. You feel alone on an island in the middle of the ocean and you need some help. (Jennifer, Interview, Feb. 2013)

Kerry echoed a similar sentiment,

> We feel like we are by ourselves in our classroom with a bunch of kids, a bunch of little turds (sic), but we are not, and that is what is helpful with the TRC, to be able to relate to another teacher and get ideas on how to relate to our students. (Kerry, Interview, Apr. 2014)

This sense of community and subsequent collaboration of teachers provided teachers with a sense of reassurance, outside of the emotional support from facilitators, especially when dealing with challenges.

> I feel like the Collaborative brings those relationships forward, it helps you understand, this is not just a district problem, this is something all teachers are seeing. (Jennifer, Interview, Sept. 2013)

147

Kerry described this sense of camaraderie because of similar struggles in the rural context,

> It [the TRC] supports us by just having someone to talk about, everybody that I can talk to and they can talk to me about what they are going through and knowing that there are problems everywhere, but it's not real until you hear it from someone else. (Kerry, Interview, Feb. 2014)

Teachers credited the time spent attending professional development over the summer and throughout the year as the foundation of this community building. All participants described a sense of common interest and work ethic amongst TRC members. Leanne said, "How many teachers will give up that much of their time to sit in workshops, I think that says a lot about the kind of people that are there." Melissa echoed a similar sentiment,

> It seems like when you see the teachers in the TRC you know each other. You connect because you are with each other for 40 hours during the summer and you see each other at the meetings I feel like it's more of a group of teachers who are dedicated to their students. (Melissa, Interview, Feb. 2014)

This investment of time provided and avenue for teachers to form a community when there was not one on their campus, because of the isolation of rural educators:

> There's a few I go to if I'm having questions or problems and I wouldn't have had those relationships outside of the collaborative…Whereas if you are

traveling to Austin and we are with each other for three days, you have a rapport

with those teachers. I kind of migrate to them because I feel like I know them,

even though I see them three times a year, because common interest helps.

(Melissa, Interview, Feb. 2014)

Collaborative as entity is a resource. Beyond the teachers and resulting

relationships, the teachers described the TRC as an entity, as a resource. Jennifer

summarized how she "uses" the collaborative,

I use the collaborative a lot to go, oh, we are really here. We are really struggling

here. I need help. I don't have anyone to ask for help. I can ask the high school

teacher, but she's still, she's here and my kids are here, and so…it's finding a

resource. Being on the collaborative for me was finding a resource that I could

get the help that I needed. (Jennifer Interview, Oct. 2013)

When asked to describe what using the collaborative looked like, Kerry continued,

I feel comfortable enough to go… "Hey, I need help!", or "I don't have an

activity for this, do you have something different?" I tried this activity; it totally

bombed. What do you do? It was a resource for me to get the things that I need to

help my kids and build that background. (Kerry, Interview, Sept. 2013)

TRC as a "push." All participants viewed the TRC as giving them a "push"

professionally and instilling a sense of confidence. Jennifer described the push as

149

moving her out of her comfort zone of an elementary reading specialist to a middle school math and science teacher,

> TRC pushed me professionally to make myself better and join that discussion other teachers are having…I would have never gotten to know some of the high school teachers. They would have been in a high school workshop and I would have been in elementary, if I would have just pulled that whole vertical team thing together for me. (Jennifer, interview, Sept. 2013)

Leanne described the push as an inspiration to change her pedagogy, "Being in the TRC has taught me to be better at taking those risks and doing what I would like to do, knowing better, or having better back up as to why it works." Melissa specifically noted the facilitators and their efforts to "push [the teachers] to collaborate."

Confidence. All participants, both facilitators and teachers, also described a sense of confidence as a result of their participation with the TRC. Piper noted this sense from a facilitator perspective, "You find your voice and you begin to feel confident enough to express it" (Piper, interview, Apr. 2014). Leanne described a sense of confidence as a result of the collaborative learning environment, "The more I have used what I have taken from the collaborative here, and we take it back, the more confidence I've built and they have building me" (Leanne, Interview, Apr. 2014). Her colleague, Kerry, described an "ego boost" when someone in the collaborative asks her how she would approach a challenge in the classroom. Melissa described a similar boost when an

150

administrator or superintendent asks them about a specific concern related to science content. "It means a lot that they would come and ask me that, and I'm sure it's because of my time in the TRC" (Melissa, Interview, Apr. 2014).

This empowerment was observed at a TRC meeting in February in which the teachers were discussing the upcoming science textbook adoption. For many participants, this was the first time they were able to discuss their opinions with their peers. The facilitators made it clear at the beginning of the discussion that they were not going to express an opinion, but rather take notes. Throughout the conversations Piper jotted down the pros and cons of each textbook and teachers were vocal. The textbook adoption was an important topic for teachers; they had to choose one publisher for all science subjects because of the small size of their campus. Making this decision alone was challenging for them because, "We are little districts. We don't have anyone else to talk to." (Jennifer, Interview, Apr. 2014). Comments about textbooks ranged from the type of paper used to print the books, the number of online resources, the amount of errors present in the context, and the consumables (foldables, etc.). One heated debate that occurred during this textbook discussion was about Pearson, the company that also designed and implemented the state subject specific standardized test, the STAAR.

> T1: The good thing about the Pearson one is the online resources. They have a lot of flipped video classrooms. It's like a Bill Nye group. The fusion one had an older creepy guy. He thought middle school kids would find this funny. Fusion-

felt like they were slapping a bumper sticker on it. I thought the online was more

user friendly, more generic feeling. But Pearson, you know, they made the

STAAR test, and I've been at TEA meetings, and in the Pearson books they have

the STAAR test questions and it looks like the STAAR test, we can be preparing

for success.

T2: Good God! We are limiting all of our instruction to one company's say so, if

all of these companies are going to adopt the textbook for Pearson test. Is that

what I want is for all my kids to learn what Pearson says about Science? (Field

Notes, PLC Meeting, February 2014)

After this discussion both facilitators described this as a very important discussion that

would not have occurred outside of the trusting and open environment and ultimate

collaborative environment established by the TRC community.

Summary

Resonant themes included the TRC as the bridge between isolation and

collaboration. Diversity of students resulted in a diversity of teacher learning needs,

which were met by the TRC. The only things participants said were lacking included

ways to observe each other's practice, more support from local administration, and

collaboration within campuses. Important findings included the strong influence of the

community on teacher morale and ultimately their decision to stay in their district.

Facilitators represented a crucial pillar of support for teachers. Also, the importance of

both face-to-face professional development versus online collaborative proved an

important component of this context for teachers.

Chapter Five: Discussions and Conclusions

Introduction

  Attention to the rural context of a professional learning community represents a gap in the current research on professional development for in-service educators. This study adds to the literature by investigating the rural context an understudied, yet important group of rural science educators and facilitators in a systemic, state-wide professional development. Over the course of one year of a professional learning community established by the Texas Regional Collaboratives, this qualitative research study explored the rural context of the PLC as well as participant roles and interactions. This dissertation addresses the context of PLCs in the often neglected and ill-understood setting of rural education (Burton et al., 2013; Arnold et al., 2005), specifically science education (Oliver, 2007). The overall purpose of this study is two-fold: First, to elucidate the context of a rural PLC, and second, to identify the roles of participants, specifically, the teachers and facilitators, within the rural context of a statewide professional learning community.

  The study participants included two facilitators and four teachers who were participants in the PLC of the Texas Regional Collaborative in a rural region during the 2013-2014 school year. Each participant was interviewed and observed throughout the course of the school year in addition to the researcher observing TRC meetings and collecting field notes and artifacts.

This chapter summarizes and discusses the results of the study's research questions, literature review, and conceptual framework. The chapter concludes with recommendations, implications, limitations, and further research.

Rural Context

The first research question explored the components of the rural context of the PLC as defined by Loucks-Horsley and colleagues (2010). Analysis of the data revealed that certain components of context were more prevalent in participants' descriptions than others. Each of these components is addressed with subsequent discussion. This discussion of context is explored with connections to literature with an emphasis on the rural context of this professional learning community.

Students, student standards, and learning needs.

Students. Students across this region represent a diverse mix of populations. The diversity represented across this region conjures a different image than the colloquial definition of rural represented across as "romantically simple" (Burton et al., 2013, p. 9). This finding confirms the work of Strange and colleagues (2012) and the importance of recognizing the diversity of rural students, instead of simplicity, when designing and implementing professional development for teachers to support these diverse students.

State standards and student learning needs. The shifting standards for high school graduation requirements across the state of Texas influenced the participants in the PLC throughout this study. The participants in the study did describe students taking

155

advantage of courses that were elective science courses or extracurricular activities (e.g. horse judging, wildlife management) that were embedded in the rural context. This finding is significant because Schaft and Jackson (2011) described the inability of students to obtain a deep understanding of STEM concepts within school because they obtain an understanding in the rural context outside of school. However, this finding indicates that the shifting and changing state standards, requiring a variety of course options, which might be a burden on the part of the teachers, but an asset to students allowing them to enroll and take courses that are more aligned with their rural life. This finding can also facilitate a discussion about the importance of teacher certification and ability to teach multiple courses in a rural environment to support the various student needs. A differentiated form of professional development would be optimal for these educators to support their variety of needs.

Although classroom observations were conducted, information gleaned about student learning stemmed directly from the teachers. Teachers reported a diversity of learning needs across their student population and this was reflected in the classroom observations. A variety of teaching practices were observed from inquiry based labs to student designed and implemented review sessions. Some teachers also reported a variety of emotional learning needs. Ultimately, this case represents a diversity of students and student learning needs across this rural region.

156

Teachers and teacher learning needs. The teacher and teacher learning needs were a dominant component of the context of this professional learning community. The specific roles and interactions of teachers within this PLC are discussed later in the discussion of research question three.

Influence of standardized testing. These teachers credited their success and their peers' success by standardized test scores. Participants described the standardized test as causing a significant amount of stress in their day-to-day pedagogy, course scope and sequence, and as a significant measure of their success. This reliance on test scores as a measure of success could stem from the fact that these teachers feel isolated and do not have any other way to measure success or make comparisons between teaching practices besides these test scores. In the current climate of standardized testing, this finding is significant as test scores are only one component of evaluating effective teaching (Kane & Cantrell, 2013). This finding is also significant because research exploring the influence of standardization of curricula and testing explores its influences on students (Petrin, Schafft, & Meece, 2011), but not educators. Test scores have been used in PLCs as a place to begin identifying areas of student learning needs (Murphy & Lick, 2005), but this study brings to light other ways test scores are used in PLCs` as they were used as a mechanism of common evaluation and understanding.

Participants cited specific and specialized learning needs such as opportunities to assist special education students and ways to diversify their pedagogy to assist the

157

variety of student learning needs. This finding is important for all teachers; however, it is specifically important for these rural educators because of their lack of professional development without the TRC. Participants require a diversity of learning experiences to support the diversity of their students.

"Spread thin." Teacher participants in this study had multiple responsibilities outside of teaching a variety of science courses on their campus. Both teachers and facilitators described the strain of multiple roles. Many participants reported spending more time on campus with their students than with their families. This finding is consistent with Scribner's (2003) finding that the work of teachers was "exacerbated by the small size of schools….teachers took on numerous curricular and extra curricular activities and often taught a wide array of subject area levels" (p. 10). This finding is also consistent with Harmon and Smith's (2012) work of characteristics of an "ideal" rural teacher, including: a) certification in more than one subject area or grade level, b) ability to teach a wide range of students in the same classroom, c) ability to supervise extracurricular activities, abilities to overcome student's cultural differences and understand the larger society, and d) adjustment to the uniqueness of the community in terms of social opportunities, lifestyles and continuous scrutiny.

Collaboration. Teacher learning needs were continuous throughout the course of the study, meaning the teachers consistently described being willing and wanting to learn and participate in professional development. All participants specifically cited the

158

importance of the professional development from the TRC. These learning needs included not only professional development opportunities, which will be discussed in more depth later, but the specific desire to practice collaboration. Although working at a small school, communication amongst teachers was minimal; they would work in much smaller "spheres of interaction" (Scribner, 2003, p. 12) or work in total isolation because of a lack of a science department and supporting personnel. Because of this isolation and lack of peers and colleagues on campus, these participants relied on the collaboration of the TRC professional learning community. This finding is significant because it explores the importance of collaboration for isolated rural educators who are members of a systemic professional learning community. Although Melville and Yaxley (2009) identified the ability of PLCs to break this barrier of isolation via a PLC, his work was through a PLC created for the purpose of research. In contrast, this study informs the gap of PLC characteristics in situ (Vescio et al., 2007) that break the barriers as well as PLCs that extend beyond school boundaries (Stoll et al., 2006).

Collaboration existed electronically or in-person and participants used both types of communication as a mechanism for collaboration. This finding is consistent with the concept of networked learning involving online materials and other people, as human-human interactions are essential (Goodyear, 2005). As professional development opportunities shift towards more online, virtual interfaces, this finding is important because these face-to-face opportunities provide a space to form relationships and build

159

trust (Spillane et al., 2003) among like-minded participants. In addition, this opportunity

to share ideas supports the notion of social capital and is consistent with Jones and

colleagues' (2013) finding that PLC participants emphasize the importance of sharing

ideas. This study provides insight into a secondary PLC and the notion of collaboration,

whereas Jones (2013) explored elementary educators.

Practices, curriculum instruction, assessment, and the learning environment.

Curriculum, instruction, assessment, and the learning environment.

Participants in this community were sufficient teachers throughout their instruction as

measured by the UTOP instrument. This data paints a different picture than did Burton

et al. (2013) of the rural teacher as "the problem" or underprepared. Despite their course

load and extracurricular responsibilities, the participants in this case used effective and

reform oriented teaching practices in their classroom. This finding adds to the literature

because it creates a different image of the rural educator, one that despite the challenges

of working in an isolated environment, if given access to viable professional

development, they can facilitate a quality instructional environment.

Curriculum. Aside from looking for specific lesson plans or curricula, teachers

reported specific science courses on their campuses that fit with the rural identity. This

disagrees with the findings of Schafft and Jackson (2011), as the change in graduation

requirements allows schools to implement curricula that are embedded with the rural

context. Despite the fact that the facilitators could not share curriculum with the

160

participants, they were able to find a way within the TRC to collaborate on pooling resources, specifically lesson plans. This ability to openly ask for curriculum resources across the PLC speaks to the trust and relationships facilitated within the Texas Regional Collaboratives. This trust was created because teachers were able to spend time with one another face-to-face and could interact in a professional, collegial learning environment, which would not have existed across this rural region (Talbert & McLaughlin, 2002; Whitcomb et al., 2009) without the establishment of a professional learning community. This finding is significant because in the changing climate of virtual and hybrid PLCs, participants must have time to interact in person before this level of trust can develop (Goodyear, 2005).

Instruction. This study used a valid and reliable observation protocol, the UTOP, to explore the teaching practices of science teachers who are members of a professional learning community in a rural context. The observations of teaching practices captured in field notes and characterized by the UTOP revealed three insights into rural science education: equity, resources, and use of content.

Equity was a dominant issue across teacher observations. There were not consistent inequitable moments observed; however, it was clear that these instructors were in need of extra support, specifically for special education and students with emotional needs. One teacher demanded professional development simply for clarification of the legalities associated with special education students, such as Annual Review and Dismissal

(ARD) meetings, modifications, and accommodations. Without her insistence on this professional development from her administration, she and her colleagues would have known little to nothing about these important and necessary supports for special education students. One particular instance included an additional teacher on campus who made derogatory remark about a student's ethnicity in one of the participants' classes. Although this does not reflect the culture of the TRC professional learning community in this study, it does represent an instance of cultural disparities in this region. These instances represent an important finding from this study; professional development should provide support and common training for rural educators. Also, school districts should provide necessary support for teachers who are teaching a diverse population of students in the form of extra staffing support (e.g. an inclusion teacher) and training and professional development.

Additionally, classroom observations revealed the importance of resources in rural science education. In each observation of teacher participants, resources provided by the TRC were in use in the classroom. Sometimes these were material resources in the form of technology, such as an AppleTV or wireless microscope and mini iPad. At other times, intellectual resources were in use, such as content knowledge when discussing velocity and acceleration or formative assessment. One teacher participant stated she used the formative assessment techniques she learned at a TRC training in the summer everyday. In a resource-deprived region, because of small school budgets or distance

162

from suppliers, the resources provided by the TRC were used and important to the educators in their classroom.

Finally, the science content used and taught in the classrooms represented a new characterization of rural educators. Despite teaching multiple preps and being "spread thin" these teachers were able to not only teach correct content, but at times connect it to other areas of math and science as well as connect this knowledge to history or current events as evidenced from the UTOP observations, representing pedagogical risk-taking in context. Teaching content in a manner that is beyond rote memorization or lecture requires a strong grasp of content knowledge as well as an effort to implement effective and engaging practices. One participant, Mrs. Deer even attempted a "flipped classroom" in which students were exposed to content knowledge prior to class via an online resource of reading, which was reinforced during class time.

Organizational culture.

Regional identity. This professional learning community had a rural and specifically Texas identity. This finding is unique to the literature as all participants reported a strong, uniquely rural identity. A common understanding of the way of life and the challenges of working as a rural teacher were important to all participants. This aspect of organizational culture, especially for designing a professional learning community should be considered. Participants and facilitators were wary and skeptical of outside curricula or training and even made efforts to redesign training curricula for

163

rural educators. This finding is significant because the importance of the identity of rural

communities and a sense of localism and value of place have been identified as

important components of rural communities and the relationships with schools

(Hartmon, 2013), but not of a rural professional learning community comprised of

teachers from different locales. This finding provides insight into Boylan's (1993) work,

which identified mistrust amongst rural teachers towards urban-based incentives that did

no fully take into account the nature of rural life.

 Culture of the TRC. The culture of the TRC as a statewide entity was also

influential on the culture of this region and its participation in the Texas Regional

Collaboratives. All participants credited the leaders at the University of Texas at Austin

with modeling a specific type of leadership and collaborative culture. This leadership

culture was observed when one of the members of the TRC leadership team visiting a

PLC meeting mid year. This finding is significant because when designing and

implementing a systemic professional development opportunity, leadership away from

the site influences the type of leadership and ultimately the type of culture at the site

(DuFour & Fullan, 2013), in this particular case, the region center. Participants

described a culture of collaboration within the TRC. This collaboration was modeled by

leaders from the University as well as by the facilitators. This collaborative culture was

demonstrated in classrooms and described by teachers as the foundation of their

teaching. This finding confirms Loucks-Horsley's (2010) emphasis of the importance of

de-privatizing teaching and "moving teaching out from behind closed doors so teachers share ideas and practice with one another" (p. 62). Although teaching the content is important, the collaborative component, especially for these rural teachers resonated. This collaborative culture represented a sense of responsibility across these networked districts within the TRC (Liebermann, 2000).

The culture of this PLC broke the tradition of isolation in the classroom and created an opportunity for teachers to build openness and trust amongst their colleagues (Fulton & Britton, 2011). This finding is significant because previous research (Goddard et al., 2007) explored the influence of the collaborative component in urban districts and this study emphasizes the importance of the collaborative culture in rural districts.

Aside from an identity and camaraderie there was a strong sense of pride across this region. Teachers were proud to be members of the TRC and facilitators were proud of their teachers. This immense sense of pride across a group of isolated participants is significant. Establishing a culture that understands the identity of a region, within the larger "whole" is an essential component of the context of this rural professional learning community. This finding adds to the research about the design of professional developments for rural regions. Understanding this rural identity was paramount in this study and should be important for others.

This finding contributes to the literature, as it is the first of its kind that includes qualitative data about the impact of a systemic professional development opportunity

165

across participants in a rural community. The goal of systemic professional developments is to "fundamentally alter the culture of a system" (DuFour & Fullan, 2010, p. 10) and in this case the TRC did fundamentally alter the culture of these rural educators as it broke their sense of isolation and provided them a forum to communicate and collaborate with peers and mentors.

Organizational structures and leadership. The social capital (Spillane et al., 2001) of the relationships across this PLC was a result of the relationships of individuals across the group. This professional learning community benefited from an organizational structure that extended over time and involved outside experts (Borko, 2004; Grossman et al., 2001), such as local University faculty, TRC leadership from the University of Texas at Austin and local community members. The facilitators within this structure were extremely important and responsible for the culture and leadership within the rural PLC (DuFour & Fullan, 2013).

Mentoring and time. One component of the TRC, the mentoring aspect was especially difficult for teachers in this rural community. There are few teachers across the region and within participating districts and campuses that this component of the TRC for this region should be reconsidered. This finding is significant because when designing and implementing a state-wide professional learning community, considerations should be given to the scarcity and challenge of finding not only science

166

teachers, but science teachers who want to participate in such a professional learning community.

The structure of the TRC is such that participants must leave their classroom to attend two meetings a year as well as the aforementioned mentoring hours across their campus. This time spent at meetings represents an important component of the structure of the TRC. Teachers believed that time, although a precious resource on their campuses was not wasted at these meetings, in particular, because the facilitators made many attempts for these efforts to be worth their while. This finding is significant because time is a well known commodity across all education, rural, suburban, or urban (Collinson & Cook, 2001), and despite this strain, the participants in this study are willing to put in the time to serve as members within the TRC. This finding is also important because it is known that professional development experiences that extend over time are meaningful teacher learning opportunities (Borko, 2004), and the TRC represents an example of a systemic PLC opportunity where teachers are willing to sacrifice one of their most precious resources, time, in order to continue learning. Even though rural educators had difficulty collaborating with others because of time of travel compared to urban counterparts (Cady & Reardon, 2009), this particular PLC was able to pull the participants out of their classroom for a meaningful professional development opportunity, the TRC team meetings.

National, state, and local policies. State and local policies were influential throughout this study, specifically state politics. This finding is consistent with the work of Thomas (2005) examining the influence of state standardized testing at a rural high school and subsequent strangling of teacher time. Although STEM education and therefore STEM teacher professional development are at the forefront of the national agenda (DuFour & Eaker, 1998; DuFour & Fullan, 2013; NCAT, 2011), all participants reported the influence of changing state policies and the influence those policies have on classroom practice and their view of teaching.

The changing of high school graduation requirements dramatically affected teachers and facilitators within this region. The Texas Board of Education was initially unclear with its expectations during the fall of 2013 for these upcoming courses during this study. Teachers were concerned about how "stretched thin" they would be in the upcoming year and facilitators were concerned how they would be able to support their teachers' needs. Facilitators used their teachers as an impetus for gathering information from entities that could clarify this misconception. In late Spring 2014, facilitators were able to meet with a member of the Texas Education Agency and engage in a dialogue about the changing curriculum, course requirements, and most importantly, teacher concerns. This finding is significant because the facilitators were able to assist teachers in their negotiation of the stress surrounding these changing standards and begin designing professional development experiences for the upcoming year that could fill in

168

any of the teacher learning gaps. This finding confirms one of Fulton and Britton's (2011) essential roles of facilitators, "facilitating knowledge, including helping to find relevant STEM or STEM education expertise" (p. 15). However, this adds an important role for facilitators of systemic PLCs–the role of identifying and translating state standards and political decisions that influence STEM educators. This finding is important for rural educators because they are not always able to attend meetings or identify relevant sources of information because of their isolation and heavy responsibilities on and off their campuses.

A prime example, the communication across the Collaborative regarding the upcoming science textbook adoption represented an important finding within this collaborative. Teachers had the opportunity to share their views and discuss what would be best for their students. This sort of open discussion and collaboration is significant because without the collaborative, teachers would not have been able to make holistically informed decisions. This finding confirms Fulton and Britton (2011), in that these teachers broke a tradition of isolation and built trust with their colleagues within the TRC PLC.

Resources. Resources are commonly cited as lacking across all contexts of education, urban (Richmond & Mankore 2011) and rural (Gjetlton, 1982; Harmon & Smith, 2012).

Lack of resources. Outside of the Texas Regional Collaboratives, participants cited a general lack of resources across this rural context. Participants felt a lack of professional development resources as well as material resources. One participant, Jennifer, echoed the findings of Gjelton's (1982) suggestion that the isolation of communities affects a school system's access to resources, when she described her main supplier of material for her classroom as Wal-Mart. Indeed she felt that her isolation as a rural educator because of geography influenced her distance and access to resources (Hartman, 2013).

Variety of resources. When discussing resources, participants described a variety of resources from support (emotional and professional) to material (lab supplies and ed. tech resources). This finding adds to the existing literature about the rural context as well as the notion of resources in classrooms. Exploring members of a PLC in situ uncovered the fact that teachers rely on knowledge as a resource as well as material objects. This finding is consistent with the work of Hamos et al. (2009) in that the network facilitated by a PLC can act as a resource for teachers. This finding also confirms the work in urban communities of Richmond and Mankore (2011), which cited "sufficient resources" (p. 544) were necessary for teacher support. However, this finding elaborates on the variety of resources, including social resources (King & Newman, 2011) required to support teachers specifically in a rural environment. This finding is important because it points to a similarity between urban and rural contexts, the sense of isolation and desire for a

170

variety and specific resources. Participants in this case did not cite the community as a curricular resource; which supports Burton and Johnson's (2010) singular narrative in the literature suggesting that the teacher's relationship with the community is not always positive and fluid. This study illustrates an alternative narrative, suggesting the particularly for in-service secondary science educators, the community might be a barrier and at times even detriment to their career.

   TRC provided resources. All participants cited the majority of their resources supplied by the TRC. Without their membership in the TRC PLC, the participants in this case would have been characterized as the resource lacking rural educator; however, the TRC was the primary source of resources for these participants. Teachers were able to use the material resources, such as an iPad and electronic microscope immediately after receiving them. This finding is significant because it represents the willingness and ability of rural teachers to use a variety of resources, including educational technology. The TRC also supplied participants with institutional resources, which has been previously discussed as lacking in rural communities (Burton et al., 2013; Roberts, 2014). The listserv represented a social resource: A place where teachers' individual knowledge was organized in a collective enterprise, forming a link between the individual and the collective (Kind & Newmann, 2011). Essentially the TRC made resources accessible to its rural participants and reduced the concept of "place as obstacle" (Burton et al., 2013) for the participants in this study.

This resource support is essential not only for the participants, but also ultimately for the students. Resources can constrain classroom practice where the resources do not support innovative ideas for pedagogy (Scribner, 2003). All participants described the challenge of working as a teacher in a rural context throughout the study with a heavy work load and cited time as a precious resource. This finding is consistent with work identifying the challenges educators face across the country (Collinson & Cook, 2001). However, all participants stated that the TRC was worth the time invested to attend trainings and facilitate the subsequent 100 hours of professional development. This finding is significant because it states that participants are willing to sacrifice their time, both professional and personal, to attend quality and sustained professional development opportunities.

History of professional development.

Lack of professional development opportunities. The history of professional development across this region represented a significant finding because there were minimal, if any, professional developments specifically for secondary science educators outside of the TRC. This finding is significant because it represents the importance of providing sustained and focused professional development opportunities for rural educators. Without entities such as the TRC and their systemic reform and consistent involvement across large areas, these teachers, who are hungry to learn would have been left in the desert of rural professional development opportunities. This professional

development also represented the only opportunity for these science educators to participate in science content specific professional development.

The TRC was the only professional development opportunity for both teachers and facilitators. This finding will be further examined when discussing the interaction between participants and the TRC established professional learning community.

Disconnected professional development opportunities. The professional development opportunities offered on the campuses of individual participants did not provide opportunities for collaboration across departments or amongst colleagues. This finding is significant because incorporating elements of collaboration across colleagues is an important component of professional developments (Hill, Beisiegel, & Jacob, 2013; Loucks-Horsley et al., 2010; Noyce, 2006) and in this case the TRC was the only opportunity for a collaborative professional development experience.

Desire for professional development. All participants, both facilitators and teachers expressed a desire and history of attending professional development events. This finding is significant because it paints a different image of the rural educator as opposed to the "ideal" teacher with qualifications (Harmon & Smith, 2012), to one that is inquisitive and able to identify areas of professional growth and seek opportunities to meet these "ideal" qualifications.

Parents and community.

Influence of "stakeholders." The parents and community represented an important component of the rural context of professional development. Participants were consistently negotiating the wants and needs of the community and stakeholders of rural education. This finding is consistent with Chance and Segura's (2009) finding that the small size of a rural school often promotes a connection with the social setting and the relationship between the school staff and community are interconnected. Indeed, in this study participants were connected with the community, but their influence was profoundly negative. At various points in this study, the influence of community members and stakeholders led to termination of extra curricular activities, decrease of funding, and in the most extreme example, termination of employment. This finding disagrees with Hartman's (2013) work concluding that an asset of communities includes the informal community decision-making mechanism. In this particular case, the community decision-making mechanism was a detriment for the participants in this study.

All teacher participants either resigned from the profession or switched school districts as a result of the influence of stakeholders. This finding is inconsistent with Boylan's (1993) finding that community appreciation and support of education encourages teacher retention in rural areas; this finding was indeed the exact opposite. The negative influence of community members and stakeholder confirms Bauch's (2001) observation that the parents and community partnerships are subject to abuse. In

174

this case the abuse the teachers experienced was personal and professional. This study

describes the types of abuse and power relationships (Foucalt, 1977) isolated science

educators experience in a rural setting, bringing to light specific examples of the

community pressures as described by Nachtigal (1982) and Peshkin (1978). The

influence of the church on Central School is one such example of this abuse of power in

rural schools. This study answers a call from Bauch (2001) to examine the ties between

churches and the schools they serve. In this particular case, the school was subject to a

budget crisis, which was suspected by participants because of heavy administrative

overhead and misappropriation of funds, such as opening satellite campuses when the

original campus still had dire needs.

Insider-outsider. Teachers felt like "outsiders" in their community, even if they

had been employed in the district for a significant amount of time. This finding is

inconsistent with previous literature, including Hartman's (2013) description of the

sense of localism amongst teachers and the communities they serve. In this particular

case, teachers were not framed as a "problem" (Burton et al., 2013) of the rural

community, rather they were framed as "different." This particular finding elaborates on

McIntosh's (1989) work stating that rural educators ranked support from parents and

community members as important. In this particular case, support in the form of

acceptance was important for educators. This finding supports the one case in the

literature of a teacher feeling like and outsider in her community (Burton & Johnson,

175

2010); however, this is the first case in which every teacher describes the sense of isolation as well as the first case exploring what this looks like in a secondary education setting.

The TRC professional learning community provided a setting for teachers to be "insiders" with their own peers and share similar experiences while working on their campuses as "outsiders." This finding adds a new dimension of isolation for the rural educator in addition to social and professional previously documented in the literature about rural educators (Burton et al., 2013; Hartman, 2013). This finding supports Garman and Alkire's (1992) research that emotional isolation is a reason not only young teachers leave rural settings, but experienced teachers as well.

Extracurricular activities. All teacher participants were responsible for sponsoring at least one extracurricular activity outside of their teaching practice. This finding is consistent with Harmon and Smith's (2012) that teachers have multiple responsibilities. The emphasis the community placed on extracurricular activities varied.

Role of Facilitators

The second research question explored the roles of facilitators within the rural context of the professional learning community established by the TRC. Analysis of the data revealed that the facilitators provided a variety of support and valuable trainings within the PLC. Each of these components is addressed with subsequent discussion of

176

the role of facilitators with connections to literature with an emphasis on the rural context of this professional learning community.

The two facilitators in this study, Mary and Piper, were active and integral (Borko, 2004; Hammerman, 1997) to the function and the culture (DuFour & Fullan, 2013) of the PLC. These results were consistent with Mundry and Stiles' (2008) findings that in this case the facilitators were the glue that held the PLC together across this rural context.

Support. The facilitators in this case provided professional support for teacher participants in this PLC. Support from leadership is well known as a key component of successful and effective professional learning communities (Borko, 2004; Hord, 1997; Maynor, 2010; Richmond & Mankore, 2011 Stoll et al., 2006). Pedagogical support from facilitators ranged from suggestions for classroom management, curricular recommendations, and networking for teachers via a listserv. This support was integral to the morale and mindset of participants, indeed, as Piper said the facilitator support was a "life saver" for participants. The role of facilitators in this study was consistent with the realms of essential supports as: knowledge facilitators, process facilitators, and focus facilitators (Kennedy, Slavit, & Nelson, 2009). Mary and Piper acted as knowledge facilitators (Kennedy et al., 2009), suggesting or directing participants to strategies or knowledge throughout the course of this study as well as sharing knowledge and interpretation of the shifting and changing state standards. In the summer science

content focused professional development, both instructors ensured that participants understood the pedagogical content knowledge required for teaching the concepts of speed and velocity at a middle school science level. During the school year, facilitators also directed participants towards resources, lesson plans, or colleagues who could assist their efforts in the classroom with content or pedagogy when they could not. In these instances, facilitators acted as *process facilitators* who attended to the interactions and structures of the group. Facilitators also acted as *focus facilitators (*Fulton and Britton, 2011), keeping the group on target, but this was a distant and small role of their positions within the PLC. Only Piper identified her role as keeping the group on task; however, there were no PLC meetings observed where an agenda was incomplete.

Additionally, the facilitators supported teacher risk taking and the continuous improvement of teaching practice (Lieberman, 2000; Putnam & Borko, 2000). Risk taking represents an elusive element of classroom practice to characterize; however, framing these classroom practices through the observations and innovative UTOP ratings the participants in this study were attempting classroom practice that was innovative and therefore taking a risk. Whether it was through their questioning techniques in the classroom, attempts at alternate forms of pedagogy outside of lecture (e.g. flipped classroom, inquiry based labs, personal health stories as an engagement tool), these educators were trying something different in their classroom despite their heavy work-load and extra-curricular responsibilities. Although the content domain

178

innovative indicators; content relevance, content interconnections, and content societal impact may seem to have scored rather low (few instances of ratings of three or higher), this is apart from the norm in classrooms as many educators do not attempt these practices with content at all in their classroom (Gates Foundation, 2012).

The importance of the content and trainings facilitated by Mary and Piper were important components of the role of the TRC. Both Mary and Piper thought carefully about their audience when facilitating trainings and made sure to incorporate elements that would contribute to the success of the in-person trainings throughout the year. Mary and Piper's experiences working in rural communities was paramount in the success of trainings as they understood the desperate needs of participants and the challenges they face in the rural context from professional and social isolation to the strain of multiple roles. This finding is a new facet to the literature surrounding the facilitation of professional learning communities in rural settings, adding the importance of a rural identity across all participants, including the facilitators.

Emotional support. One finding inconsistent with the existing literature was the importance of the facilitators' understanding of the difficulties of working in the rural context. Both facilitators had experienced hardships themselves and observed inequitable instances during their tenure and these experiences were essential in communicating with teachers and facilitating the PLC. However, in this case the facilitators' science content expertise and experience working in rural schools were

fundamental towards building trust and respect amongst participants. The importance of facilitator content knowledge and experience in the rural context should not be overlooked. Literature states that it is critical in early stages of the PLC to focus as much or more on development of relationships, trust and socio-emotional issues as on academic content (Hammerman, 1997; Puckner & Taylor, 2006); however the results of this study indicate that the relationships, trust, socio-emotional issues and academic context are essential throughout and contribute to the culture of collaboration across the PLC (DuFour & Fullan, 2013).

      Trust. Facilitators were also able to cultivate trust and remain in communication via electronic communication, primarily social media. In this rural PLC, this avenue of personal support was essential as facilitators gleaned important information and offered emotional support without visiting or observing the participants' classrooms. This finding confirms the work of Louis, Kruse, and Byrck (1995) who found that trust is critical from colleagues within a professional learning community. In previous examinations of trust in professional learning communities, the principal of a school was the key person in developing relational trust, both in demonstrating it and in the way he or she fostered relationships (Stoll et al., 2006); however, in this rural professional learning community, the facilitators were primarily responsible for establishing trust across a large community of previously isolated schools and teachers working within these locations. This finding also confirms the work of others (Hammerman, 1997;

180

Puckner & Taylor, 2006) that it is imperative for PLC facilitators to focus as much or more on development of relationships, trust, and socio-emotional issues as on academic content.

In this instrumental case study, facilitators' primary roles were providing professional and emotional support for teacher participants. This support created a culture of collaboration and trust across the PLC. In addition, the actual pedagogical and content training facilitated by Piper and Mary were essential components of their role as this was often the only training participants received and the only opportunity for science rural educators to interact across the otherwise isolating rural setting. Previous studies exploring effective professional learning communities (Richmond & Manokore, 2011) acknowledged the facilitators as important; however, this study identifies the roles of facilitators within a specific context.

Facilitator Interaction

The second portion of research question two explored how the facilitators interacted with the professional learning community established by the TRC. Analysis of the data revealed the professional learning community was a form of professional development and source of confidence for the facilitators. This discussion of the interaction is explored with connections to literature with an emphasis on the rural context of this professional learning community.

181

Professional development. The professional learning community established by the TRC was the only source of professional development for Mary and Piper. An emphasis is often placed on the teacher as participants in professional learning communities rather than facilitators (Fulton & Britton, 2011; Richmond & Manokore, 2011). In this case, the systemic nature of the TRC PLC allowed for facilitators to continue learning and improve their craft as well. This structure allowed the facilitators who currently function in an isolated rural context to be connected with others and bring valuable knowledge and innovative techniques not only back to the teacher participants in the PLC, but their peers at the region center as well. This finding is important because it indicates that the systemic design of the TRC truly is systemic, meaning the knowledge flowing through the PLC affects teachers and their peers.

This professional development influenced a feeling of confidence amongst the facilitators. They felt empowered to help any teacher with their participation, not only a science-content specific teacher in the TRC professional learning community. This finding is significant because increased participant confidence is one outcome of an effective professional learning community (Stoll et al., 2006) and collaborative, continued professional development; however, the participants are often described as teachers rather than the facilitators. Often, the facilitators are credited with encouraging a sense of confidence in participants. While this did occur in the rural context of the PLC for teachers, it also occurred for facilitators. In this case, the facilitators were

182

participants within the Professional Learning Community as well, and this increased sense of confidence suggests that PLCs can impact leadership in a similar manner as participants. As Stoll and colleagues (2006) pointed out in their literature review about PLCs, much of the literature considers only teachers and school leaders to be members of professional learning communities. However, for many communities, depending on the context, the role of other staff can be equally important, as in this case the facilitators.

A specific identity. The specific identity of working in Texas, and more importantly a rural region of Texas, influenced how the facilitators interacted with the professional learning community. For example, both Piper and Mary were hesitant to implement a training designed in another state because they felt it did not fit in the rural context. Indeed, they did modify the content to fit the rural context, even offering additional professional development experiences (professor lectures and guest speakers) to make the experience more authentic for participants. This finding is significant for two reasons: a) it attends to the importance of a flexible structure of a systemic professional learning community (Borko, 2004) and b) designing professional learning communities, including facilitators that identify with the participants as well as content expertise is essential. These findings are consistent with Loucks-Horsley and colleagues' (2010) recommendation that attending to the context of a professional learning

community is important when designing and implementing a science specific

professional development in this particular context.

Role of the Teachers

The third research question explored the roles of teachers within the rural context

of the professional learning community established by the TRC. Analysis of the data

revealed that the teachers relied on the relationships and subsequent collaboration

established by the TRC.

Teacher collaboration. Relationships between teachers were an important

component of this professional learning community. One reason these relationships were

important was because traditional professional learning communities exist within a

school or department (Siskin, 1994), which was not possible in this rural setting.

Teachers felt a sense of trust amongst their TRC participants, primarily because they

made the commitment to attend the PLC and dedicate an extensive amount of time to

participate in the training (Westheimer, 1999). This finding is consistent with the work

of Stoll et al. (2006) in an urban setting where teachers described a sense of community

and understanding between peers because of this commitment towards a professional

development opportunity. Although the findings of this case are similar regarding an

inherent sense of trust, it is the first to examine the sentiment across rural professional

learning community participants. In this case, the PLC membership was a vehicle that

184

supported teachers and created a safe space of teachers to share their practice and learn from each other, which are defining characteristics of PLCs (Stoll et al., 2006).

This camaraderie was established because of face-to-face trainings and continued with online communications via a listserv or social media. This finding is consistent with the work of Goodyear (2005), who found that in-person collaboration and trainings were necessary to establish a sense of trust amongst participants.

As a result of this trust, teachers were able to communicate outside of the PLC meeting times via a listserv established by the facilitators. Teachers shared ideas about their content, pedagogy, and other issues within the classroom, such as the new state textbook adoption. This finding confirms the work of Stoll et al. (2006) who found that teachers indicated that they shared more about their practice with their PLC colleagues than with their peers. These relationships and presence of like-minded colleagues with opportunities for collaboration around the issues of teaching and learning are critical for change to occur (Hargreaves & Goodson, 2006) and in the rural context where human and material resources are shrinking, this context relevant opportunity for learning is critical.

All teachers described the TRC professional learning community as the only meaningful source of professional development they received during the school year. This finding is consistent with the work of (Howley & Howley, 2000) who recognized the lack of professional development opportunities for rural educators in their districts

185

because of money and other resources. This finding emphasizes the importance of other avenues of professional development for the rural educator such as systemic professional development opportunities, such as the TRC.

Relationship with facilitator. The teacher's relationship with the facilitators resonated throughout the case from the role of professional advice to personal confidants. Often, the facilitator is identified as delivering content and facilitating relationships and the learning environment across participants (Borko, 2004), which was their role in this case; however, participants identified with facilitators because of their expertise and experience within rural settings. As previously discussed, attending to the expertise of facilitators is paramount when designing and implementing a professional learning community (Borko, 2004; Hammerman, 1997; Richmond & Mankore, 2011. Borko (2004) called for an exploration into the interaction of teachers and facilitators while attending to specific contexts. In this case, the relationship between facilitators and participants was the key ingredient of the learning community. Without expert facilitators who worked in the context of a rural PLC, the PLC would not have been successful and the teachers would have remained isolated. The facilitators were also responsible for modeling collaboration, a technique not foreign, but difficult for the isolated science educators to experience in this community. Collaboration is an essential characteristic of professional learning communities (Richmond & Manokore, 2011), and

186

would not have been possible without the opportunities to view collaboration in action at PLC meetings and experience it with other participants.

Teacher Interaction with the PLC

The second portion of research question three explored how the teachers interacted with the professional learning community established by the TRC. Analysis of the data revealed the professional learning community established a sense of camaraderie amongst participants as well as the importance of facilitators in the PLC. Additionally, teachers described their participations with the PLC as an impetus for challenging the status quo of their pedagogy. This discussion of the interaction is explored with connections to literature with an emphasis on the rural context of this professional learning community.

Community. The community and sense of community established amongst all participants was an important result of their interaction with the PLC. This sense of community developed because of a common desire to learn more and participate in a professional development experience where it was previously lacking. Teachers described this community dramatically, using terms such as, "family" and "life saver." This importance and aspect of community has been observed and recognized frequently in urban environments (Huberman, 1993; Lee, Smith & Bryk, 1993); however, rarely in rural (Howley, Howley, & Pendarvis, 2003). Often the rhetoric surrounding rural communities points to the ease of communication and the formation of a community

187

because of its size; however, as this case illustrates, it can be difficult to form a community in rural areas because of their small size.

It is not a shock that the *community* formed amongst members is an important component of a professional learning *community;* however, how this community was formed as well as how it continues to form and exist is important. The PLC established by the TRC represents a place where like-minded colleagues can interact with expert facilitators in a changing climate because of shifting policy standards (Stoll et al., 2006). This community was a place for participants to negotiate these reforms and make important decisions about how they would affect their pedagogy. This finding confirms the seminal work of DuFour and Eaker (1998) who stated:

> …In a professional learning *community,* educators create an environment that fosters mutual cooperation, emotional support, personal growth as they work together to achieve what they cannot accomplish alone. (pp.-xii)

Indeed the collaborative entity acted as a resource for participants in an ultimately resource deprived rural community. All participants cited the relationships and community that resulted from membership in the PLC as a resource; it was a "life-saver" for these educators. This finding is consistent with the work of others (Stoll et al., 2006) who posited that the community extending beyond teachers and the school and the notion of a school-wide, or in this case, region-wide network, creates a community of

openness, networks and partnership. In this case, the PLC represented a resource outside of departments and schools for sources of learning and ideas.

Participants described the investment of their time as "worth it" because they appreciated the opportunity afforded by the PLC to discuss their work with peers (Mindrick & Liberman, 2012). Time is a precious commodity for educators and this finding is significant because it represents a sacrifice teachers are willing to make for their continued professional development.

TRC as a "push." All teachers described the TRC as a "push." In this case, this "push" was manifested as a challenge for teacher pedagogy, teachers incorporating technology and inquiry based practices in their classroom. Teacher participants also incorporated collaboration in their classroom and cited the modeling of the facilitators at the PLC meetings as the reason for incorporating this practice in their classroom. This finding is consistent with others (Darling-Hammond, 1994; Hord, 2004; Thompson, Gregg, & Niskam, 2004) who have cited professional learning communities as an impetus and support system for risk-taking in pedagogy and it provides insight towards what risk-taking looks like in context, which is often missing from the cadre of literature.

Borko (2004) called for an investigation between the professional development and the teachers as participants. Although at times this was difficult to distinguish,

189

participants used the PLC as just that, a *community* of professionals and leaned on it for support, which in turn encouraged confidence and risk taking.

Implications

This study has made the case that the context of a rural professional learning community is unique and not as simplistic as previously thought, in addition to providing insights into the roles of both facilitators and teachers within a statewide professional learning community. The results of this study can inform the improvement and development of PLCs that extend beyond the school building across a large rural area. This study provided a unique opportunity to explore the context and study the facilitators as well as the participants in a rural PLC, creating a holistic interpretation of the key participants (Borko, 2004), facilitators, and teachers of a PD. Other insights gleaned from this study can inform strategies to connect rural teachers to their peers beyond district lines, thus reducing the feeling of isolation (Holloway, 2002). Although the rural educator is currently viewed as "romantically simple" (Burton et al., 2013, p. 9), lessons learned from rural education can inform the design and implementation of PD across all contexts. Results from this study can contribute to the knowledge base of high quality, large-scale professional development across a variety of contexts necessary to support teachers in acquiring the knowledge and skills necessary in the current climate of educational reform (Wilson, 2013).

190

Professional learning communities exist to support the call that "unless teachers are provided with more supporting and engaging work environments, they cannot be expected to concentrate on increasing their abilities to reach and teach today's students more effectively" (Louis, 1994, p. 4). This study provides insight into what an engaging environment for a notoriously difficulty to reach group of educators, rural educators, looks like. Further possible insights could inform strategies to connect rural teachers to their peers beyond district lines, thus reducing the feeling of isolation (Holloway, 2002).

This study contributes to the current literature base on in-service science specific professional development. It stands apart in that it focused on a professional learning community in a rural context. This study provides insight of a PLC *across* districts rather than *within* districts and answers a call from the literature (Fulton & Britton, 2011) to begin exploring PLCs in context.

Research question 1 implications. Although the rural educator is currently viewed as "romantically simple" (Burton et al., 2013, p. 9), lessons learned from rural education can inform the design and implementation of PD across all contexts. Possible results from this study can contribute to the knowledge base of high quality, large-scale PD across a variety of contexts necessary to support teachers in acquiring the knowledge and skill necessary in the current climate of educational reform (Wilson, 2013).

This in situ investigation across district lines represents the importance of a culture of collaboration across a rural context. Although working as an educator in rural

settings has long been characterized as isolating (Burton et al., 2013; Holloway, 2002), exactly what components of a professional learning community that can decrease this sense of isolation and increase collaboration have yet be uncovered in an in situ rural context. One primary component of collaboration in this case was online communication between the participants. This represented a social resource where individuals could form a collective body of knowledge (King & Newmann, 2011) and therefore feel less isolated. Implications of these findings include the importance of building trust in face-to-face meetings prior to online collaboration and networked learning in rural contexts. Also the teachers' reliance on standardized test scores as measures of success suggest that professional developments should incorporate a working definition of current teacher evaluation systems including observations and student surveys.

Consistent with the literature (Burton et al., 2013; Richmond & Manokore, 2011; Roberts, 2014) a variety of resources were lacking across the region. However, the resources that were supplied by the TRC were used in classrooms and not only supported teachers, but also in some instances encouraged risk-taking. Implications of this finding point towards the need for external entities and university partnerships to support and encourage the isolated and insulated rural educator, suggestion by Borko (2004); however, this instrumental case study explores what those resources look like in context.

As to what was actually occurring in classrooms, stark instances of inequitable circumstances were observed. Often, this was not the fault of the classroom teacher, but a result of the lack of resources in the form of special education support. Implications of this finding should include the importance of incorporating more consistent and reliable special education support in classrooms aside from the paper-pusher in the central office. Additionally, this studied explored the teaching practices of rural educators and attempted to identify the characteristics of pedagogical risk-taking. Other implications of this finding can reduce the place as obstacle or place as deficit notion of rural education (Burton et al., 2013; Roberts, 2014) if external supports provide the necessary resources to support the "place" of the rural educator.

The culture of the TRC professional learning community in the rural context had a strong sense of a rural Texas identity that was shared by members, both facilitators and teachers of this learning community. This finding confirmed the work of Loucks-Horsley and colleagues (2010) emphasizing the deprivatization of teachers. A strong sense of identity was shared amongst participants within the PLC, specifically the importance of understanding the challenges of teaching in a rural context. Implications of this finding provide insight into Boylan's (1993) work that identified a tension between rural and urban-based incentives and policies. Before designing, and most certainly before implementing these incentives and policies, the specific identity of a PLC given its location and participants must be considered.

193

The facilitators are a pervading theme across the organizational leadership of a professional learning community (Borko, 2004; McLaughlin & Talbert, 2006). Facilitators have been identified as potential leaders of professional learning communities, but often this leadership credential is awarded to administrators, such as principals (Mullen & Schunk, 2010; Hord, 1997, 2004). In this instrumental case study, the facilitators served as mentors, advisors, and leaders for participants. An implication of this work feeds Borko's (2004) suggestion that facilitators' roles must be explored to understand and eventually evaluate the effectiveness of a PLC. Implications of this finding include designing professional development opportunities to support the leadership role of facilitators.

Not surprisingly, policy decisions surrounding curriculum and graduation decisions affected this professional learning community because the Texas state department of education was changing requirements. Providing multiple pathways for graduation as well as many options for electives would be more work for the facilitators and teachers, but provide more opportunities for student to select courses that align with the rural context. Implications from this finding include the continued design of professional development as these science teachers will have many preps stretching across a variety of subjects.

There were few to no professional development opportunities relevant to the science educator's needs or expertise provided by their districts within this region. All

194

participants cited the TRC PLC time as their only content specific professional development. Some preconceptions of the rural educator characterize him or her as a "problem" (Burton et al., 2013); however, as illustrated in this case, it is the exact opposite. The teachers in this study were inquisitive, willing to learn, and give up their time to participate in the PLC. Potential implications of this finding are simple, if teachers are provided with an opportunity and sufficient support within a professional learning community they will engage in high quality professional development.

One of the most insightful implications of this study surrounds the rural community and the educator. Often the rural community is characterized as an asset and system of support (Chance & Segura, 2009; Howley & Howley, 2004), but that was not revealed in this instrumental case study. Teacher participants cited the community with their desire to change positions or leave the profession entirely. Facilitators described an insider-outsider experience throughout their careers. An important implication of this finding should note that rather than support, the community represents a new layer of the isolation of a rural science educator. These findings about the rural context answer Theobald and Nachtigal's (1995) call over 20 years ago to explore the differences associated with work in rural areas. These rural contexts are worth studying as "our nation's rural schools may be physically removed from urban areas, they are no longer isolated from policy makers" (US Department of Education, 2003, para. 5).

195

Research question 2 implications. Facilitators are understood as an important component of professional learning communities, but their roles, specifically within the rural context have yet to be explored. Facilitators in this instance served as leaders as well as mentors and supporters of the science rural educators. Both facilitators and teachers cited reasons for this, including: experience, content expertise, similar identity (rural Texas), and trust. In this case, the facilitators acted as knowledge facilitators- incorporating STEM expertise into the rural PLC experience, as well as informing teachers of the changing graduation and curriculum requirements; processing facilitators attending to the structure and interaction of the group both in person and across social media platforms; and focus facilitators keeping the group on target (Kennedy et al., 2009). However, in this case the facilitators were also able to cultivate a sense of trust across participants through their understanding of *science content* AND *rural context* adding another role to their responsibilities. This case also demonstrates the potential implications of a systemic PLC across a rural context, which can allow opportunities to professionally develop facilitators with a specific emphasis on trust, culture, and collaboration.

Borko (2004) emphasized exploring the role of facilitators as well as their interaction with the professional development itself. When exploring this interaction, key findings included the importance of the similar identity of facilitators and the PLC, their ability to support risk-taking, as well as the premise that this PLC was the only

196

source of professional development for the facilitators, which then instilled a sense of confidence in the facilitators. Implications of this finding suggest that professional learning communities can professionally develop all involved, including the facilitators; thus, creating professional educators. Also, this finding shines important light on risk-taking in a professional development setting, suggesting that the support of capable facilitators in conjunction with trust create an environment where teachers are comfortable taking risks.

Research question 3 implications. The role of teachers within a rural professional learning community created for the purpose of professional development, rather than research has yet to be explored in the literature. However, the role of educators within urban and suburban PLCs created explicitly for the purpose of research has been explored thoroughly (Fulton & Britton, 2011; Goddard et al., 2007; Mundry & Stiles, 2008; Wong et al., 2005). Other STEM PLC research was conducted in urban settings with a similar rationale. Therefore, the findings of this study can inform professional development for educators across a variety of contexts.

The first component of the third research question explored the role of teachers within the TRC professional learning community across this rural context. The importance of networked learning was paramount for these usually isolated educators. Their in-person interaction with other members of the PLC prior to asking questions and soliciting advice from their colleagues was critical to the sharing of information.

197

Implications of this finding should be considered when designing professional developments or attempting to implement an online professional development session in the age of networked learning. Teachers must establish a sense of trust (Richmond & Manokore, 2011; Spillane et al., 2003) and camaraderie prior to soliciting support from their peers. Also, teachers were willing to sacrifice their time, a precious resource, to leave their classrooms and attend PLC meetings. This finding is an important implication for rhetoric surrounding PLCs. Indeed, teachers are willing to share their time if a professional development is well designed and integral to their content specific support in the classroom.

Exploring the interaction between the teachers and the PLCs provided an insight into the importance of community within this rural setting. Without the PLC, these participants would have been isolated and devoid of content specific professional development opportunities as well as resources. These findings support the call for sustained professional development experiences for rural educators (Barufaldi & Reinhartz, 2002; Lieberman, 2000), such as the TRC. Implications of this finding suggest professional learning *communities* are pivotal and integral to the professional development of the rural educator because it is the community aspect that they rely on. Their reliance on peers, the resources ranging from intellectual to emotional support, as well as the content specific PD were important. One of these resources, the facilitators, suggests an implication for all PLCs. Teachers look to facilitators as leaders, not just a

198

mechanism for delivering the information surrounding a professional learning community. Research suggests that this reliance on facilitators could be detrimental (Garet et al., 2001); however, in this case it was an asset. Implications of this finding should point towards the importance of cultivating relationships between facilitators and educators as well as carefully selecting facilitators to implement a PLC. In a setting devoid of leadership for these rural science educators, these facilitators served as a leadership entity.

Contribution to Literature

These results contribute to the literature in a multitude of ways. First, researchers (Burton et al., 2013; White & Corbett, 2014) called for qualitative studies that elucidate the context of rural education in order to better understand the components and workings of rural communities, experience, and education. The first research question in this instrumental case studied identified salient and influential components of context. The results of this first research question can inform a theory of rural education, which can connect rural education to community through research framed in the context of rural models and values (Barter, 2008). For all its challenges and ultimate lack of a definition, science education in rural settings is an important context to study as, "Science education in rural settings may be able to provide the most conclusive and useful examples of successful reforms due to the ability of personal experiences to drive knowledge exploration in real life context" (Blunck et al., 1995, p. 90). This study

199

identifies the needs, cultures, strengths, and weaknesses of working within a rural

context to create a framework of rural identity that can provide insight and eventually

provide an explanation into the rural context which was previously ill-understood and

viewed as deficient or romantically simple (Arnold et al., 2005; Burton et al., 2013;

Corbett, 2007, Corbett & White, 2011; Oliver, 2007; Scribner, 2003).

This characterization of the rural context can inform the design of professional

developments, as this study confirmed, professional developments need to be tailored to

fit the context (Borko, 2004; Garet et al., 2001) in which the teacher teaches and the

students learn (Hill et al., 2013). Also rural education is not a solely American

phenomenon. It is an international issue; many countries are faced with the challenge

and are interested in ways to understand and support isolated rural communities (Yarrow

et al., 1999). Eventual comparisons of the unique needs, cultures, and strengths of

teachers, schools, and students in various rural areas could also add to the multi-

dimensional story of rural education.

Borko (2004) suggested that identifying and characterizing the context of teacher

learning is as important as what they learn during professional development.

Understanding the rural context of this specific professional development using an

instrumental case study approach can serve as an instrument (Stake, 2013) for informing

future Phases 1, 2, and 3 studies per Borko's (2004) suggestion. Indeed, a different

approach could be used; however, it is paramount to understand the interactions between

the participants, the professional development itself AND the various components of the context (see Figure 10). Also, as this study suggested, the context of professional developments should be thoroughly explored as it affects the interactions between participants and the context itself. When designing and implementing professional developments, a thorough investigation of context, using Susan Loucks-Horsley and colleagues' (2010) framework or other frameworks should occur. Collecting and analyzing local data on PLCs will help inform the design, development, and implementation of systemic professional development reform efforts (Fulton & Britton, 2011, Hill et al., 2013). Professional developments should differentiate, rather than homogenize professional development experiences, as specific components of the context, in this case the importance of a rural identity, are extremely important when designing professional developments. In addition, this study identified important components of culture for a systemic PLC geared towards science educators using a qualitative research approach, which represents a gap in the literature (Lawrenz et al., 2007).

In summary, this research investigated a PLC in the field, in a specifically rural context, rather than a PLC created explicitly for the purpose of research. Although this represents a growing component of the exploration of PLCs (Fulton & Britton, 2011; Vescio et al., 2007) this study has found the processes and mechanisms of context that

contribute to a rural professional learning community, a much needed insight in the era

of shifting policies and reform efforts (Bransford et al, 2000; Wilson, 2013).
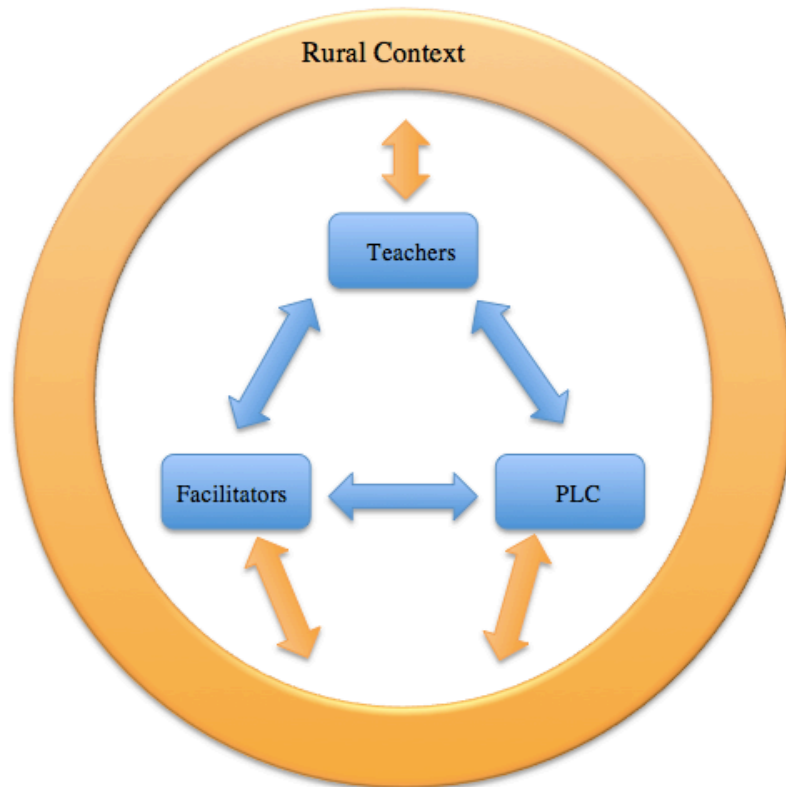
Figure 10. PLC and Participants Interacting with Context

       Although research has been conducted on the teachers as members of the PLC,

little has been conducted on the role of the facilitators, and the interaction between

facilitators and teachers (Borko, 2004), specifically in a rural context. As this study

illustrates the importance of various supports, as well as an understanding of the

environment teachers are working in, is essential to the success of facilitators. The TRC

professional learning community created an environment where facilitators could experience professional development themselves as well as support others, indicating it is truly systemic. Collecting and analyzing local data on PLCs will help inform the design, development, and implementation of systemic professional development reform efforts (Bransford et al., 2000; Fulton & Britton, 2011, Hill et al., 2013). An implication from this finding suggests that careful consideration of facilitators as well as continued professional development is key to their professional growth and the success of the community they facilitate within the PLC. Also, these facilitators were key to creating a supportive environment where teachers were comfortable taking risks in their classrooms. This study provides one key component to risk-taking in professional developments–adequate leadership, which adds to the small cadre of literature linking risk-taking and professional development opportunities.

Exploring the interaction between teachers and communities is important to understand in order to improve the systemic reform effort (Knapp, 1997; Wilson, 2013). This study provides insight into the interactions between the educators and community, resulting in a profoundly negative light. This finding paints a new dimension to the challenges of working in a rural community, which should be considered when preparing and supporting teachers who work in rural communities. Also, rural educators face a challenge when attending professional developments–traveling long distances and leaving their classroom. However, as this case illustrated, if a quality professional

203

development experience is designed and facilitated, teachers will attend and not consider it a waste of time.

Conclusion

This study explored Loucks-Horsley (2010) and colleagues' descriptions of context and explored the interactions between teachers, facilitators, and the professional learning community within this unique and understudied rural context. The findings described in this study suggest that the thoughtful consideration of the components of contexts is warranted and an examination of their characteristics is appropriate when designing a professional learning community. In addition, this dissertation provided insight into the roles and interactions of teachers and facilitators within this rural context of the PLC.

First, the findings of this work are consistent with other studies (Howley & Howley, 2000; Oliver, 2007) in the literature that revealed the uniqueness of a rural context and the importance of facilitators when implementing a sustained and focused professional learning community. Indeed, the rural context is not "romantically simple" (Burton et al., 2013, p. 9); it is complex and intertwined. Therefore, although difficult, carefully researching the context of rural education is necessary to develop an understanding of what it is like to work and teach in a rural locale.

One particular component of context, the community is often represented as an asset to working as an educator in rural communities (Hartman, 2013). A small cadre of

204

research has touched on how the community can hold a sort of power of educators (Bauch, 2001), but this study brings to light exactly what occurs between the educator and the community that makes it difficult to teach in rural settings. The fact that all participants wanted to resign or move schools because of the pressure or lack of support form the community paints a new image of rural education, particularly for science teachers.

The facilitators in this study filled a void of support and leadership for participants. Facilitators are acknowledged as an integral component of a professional learning community (Borko, 2004; Hammerman, 1997); however, their exact role, specifically in a PLC in situ in a rural context has yet to be explored. This study provided insight that facilitators act as both professional and emotional support as well as leaders for participants, acting as the glue that held the PLC together (Mundry & Stiles, 2008).

The combined support of the facilitators working within the rural context demonstrated that PLCs could break the long known isolated culture of rural educators (Holloway, 2002). Participants reported a strong sense of community when describing their PLC peers, when they did not have that feeling on their campus or even in their district. This has long been cited in urban districts (Hord, 2004) and in PLCs created for the specific purpose of research (Richmond & Manokore 2011); however, it has not been explored in situ specifically in rural settings (Melville & Yaxley, 2009).

The role of teachers working within the rural PLC revealed interesting findings. The teacher participants in this study were "outsiders" in their own community. Previous research paints the community and colleagues on campus as "family" (Chance & Segura, 2009; Howley & Howley, 2004), but this was not the case for these educators. Rather than their campus and community as support and family, participants described the TRC professional learning community as their family-like support. Previous work (Garmen, 1992) identified isolation as one of the issues hampering teacher retention in rural settings. This research adds a new dimension to isolation and that is from the participants own communities. As Hartman (2013) recently suggested, access to professional learning programs are one effort to reduce this sense of isolation in a region where professional development opportunities are often lacking (Howley & Howley, 2000).

Also, Burton and colleagues (2013) found that rural teachers were either framed as the "problem" or as working to address the "problem" of working in rural contexts. This case revealed the latter of these characteristics. As classroom observation data revealed, the teachers were not a detriment to their student learning and in some observations were able to integrate reform-based practices into their lesson plans, despite a challenging study population and lack of resources. These teachers fit the complicated and multi-dimensional description of the "ideal" rural teacher (Harmon &

206

Smith, 2012) with additional descriptions including actively participating in a sustained and quality professional development.

One of the most interesting findings from this insight into this particular rural context was the importance of a regional identity. Participants, both facilitators and teachers, possessed an instilled identity and pride in their rural region. This finding contributes to the literature in the realm of systemic PLCs and reveals an important component that should be considered when designing professional development experiences for educators.

In addition, the study showed that facilitators played an important role in this professional learning community, specifically, supporting teachers both emotionally and professionally resulting in a culture of trust. The facilitators also received professional development and a sense of confidence as a result of participating in the professional learning community established by the Texas Regional Collaborative.

The PLC as a sustained form of professional development requires guidance in the form of a facilitator. The facilitators of a professional development, amongst many other things, are charged with creating the culture of collaboration and responsibility between the participants (DuFour & Fullan, 2013). In this case, the facilitators supported teachers emotionally and professionally, which created the culture of risk-taking (Lieberman, 2000) and continuous improvement of pedagogy (Putnam & Borko, 2000).

One of the primary reasons a culture of collaboration and risk taking existed in

207

this professional learning community was the trust created between all participant

teachers and facilitators (Richmond & Manokore, 2011). The trust between the

participants and the facilitators resulted from the facilitators' expertise and

understanding of the rural regional identity. This trust, collaboration, and

professionalism of this PLC poised the facilitators, which are known to be keys to

building professional communities within schools (McLaughlin & Talbert, 2006). In this

instrumental case study, the facilitators were the professional development leaders for all

participants, as leadership was non-existent or minimal on their home campuses and

districts. Thus, the facilitators were a significant resource supported by the TRC aside

from the material resources and intellectual, content-specific professional development

experiences. The facilitators struck a fine balance (Garet et al., 2001) of support, which

did not act as a detriment to the PLC. In fact, the PLC professionally grew both

facilitators and teacher participants.

Communication as a form of interaction of all participants, both teachers and

facilitators was an important component of this rural professional learning community.

Without an online platform for participants to communicate outside of the PLC meeting

time, little information was shared professionally between the participants. This study

emphasized the importance of human-human interactions as a means to establish trust

during the PLC meetings. Once this trust was established, participants used emails as a

way to share information to promote connections to create one learner and others (Banks

et al., 2003). The key findings from this study suggest, a) the importance of human-human interaction prior to engaging in an online learning environment, b) the importance of trust before collaboration can be established, and c) the possibility of creating an environment in which participants can use a text-based medium to communicate and collaborate. Without the environment created by the facilitators and the trust established by the teachers during the PLC meeting time, the learning community would have lost momentum in the interim between the meetings and the sense of community would be null and void.

For rural science educators, this study demonstrates the importance of breaking the sense of isolation and participating in professional development opportunities across districts rather than within to interact with peers. For professional development designers, this study demonstrates the importance of not only considering the context of the PD, but also the culture of the participants and the communities in which they work, especially when implementing in a rural locale. For administrators, this study demonstrates the importance of attending to the complex relationships between teachers and the rural community as well as the importance of supporting professional developments across districts. For professional development facilitators, this study attends to the importance of relationships with individual participants as well as the professional learning community. For rural educators, this study demonstrates the importance of engaging in systemic, sustained, and focused professional development

opportunities to break the sense of isolation and continue evolving as a professional. Ultimately, this dissertation contributes to the knowledge base of high quality, large-scale PD with a rural context, to contribute to the knowledge of a variety of contexts. This understanding is necessary to support teachers in acquiring the knowledge and skills required in the current climate of educational reform (Wilson, 2013).

Unique opportunity. The results of this study will inform the improvement and development of PLCs that extend beyond the school building across a large rural area. This study provided a unique opportunity to study the facilitators as well as the participants in an in-situ rural PLC, creating a holistic interpretation of the key participants (Borko, 2004) of a PD. This study also provided greater insight, through observational data, into the teaching practices of teachers that are part of a rural PLC. In addition, this work explored a PLC designed for the purpose of supporting teachers rather than supporting research, a truly unique opportunity for an interpretivist qualitative research study.

Future Research Should Explore the Following Research Questions

- How do standardized versus context designed professional learning communities influence the culture of that professional learning community?
- How does teacher participation in a systemic professional learning community affect student learning in a rural context?

- What is the role of facilitators working within and across multiple contexts of professional learning communities?

- How can a professional learning community support place-based education in rural communities?

- What are community perceptions of rural secondary science educators?

- What is the urban context of the TRC professional learning community?

- How do facilitators and teachers interact in an urban context?

- What are similarities and differences resulting from a cross-cased analysis of an urban and rural professional learning community?

- Using a research based observation protocol, what reform based practices do science teachers implement in rural classrooms? What practices appear the most? What practices are least frequent?

- How can professional development designers create a PLC specifically to rural communities?

- What are social, political and economic issues affecting rural communities and educators?

Appendix A: UTeach Observation Protocol (UTOP)

UTeach Observation Protocol

Complete **AFTER** observation of lesson using field notes, teacher post-interview, and student work samples and/or comments (video if available).[1]

I. BACKGROUND INFORMATION

Teacher:
School:
Date of Observation:
Start and End Time of Observation:
Date of Post Interview:

Subject Observed:
Grade Level:
Course Level: **(Regular or Advanced/Accelerated):**
Observer:

II. LESSON OVERVIEW

Lesson Description

In a paragraph or two, describe the lesson you observed. Include where the lesson fits into the overall unit of study. Be sure to include enough detail to provide a context for your ratings of the lesson and also to allow you to recall the details of the lesson when needed in the future.

III. RATING SCALES

1 = Not observed at all / Not demonstrated at all	4 = Observed often / Demonstrated well
2 = Observed rarely / Demonstrated poorly	5 = Observed to a great extent / Demonstrated to a great extent
3 = Observed an adequate amount / Demonstrated adequately	

Note About Synthesis Ratings

The synthesis ratings are **not intended to be a mathematical average of the indicator scores** making up each section, but are designed to allow the rater to describe his or her overall impression, using a holistic view of the domain and providing a "human average" of the entire lesson. Evidence to support the score chosen can be typed in the open space after the Synthesis Ratings boxes.

---

[1] NOTE: The UTOP was adapted from Horizon Research, Inc., *2005–06 Core Evaluation Manual: Classroom Observation Protocol* by UTeach Natural Sciences, University of Texas at Austin.

1. Classroom Environment

Rating	Indicator
	1.1 Classroom Engagement: The classroom environment facilitated by the teacher encouraged students to generate ideas, questions, conjectures, and/or propositions that reflected engagement or exploration with important mathematics and science concepts. Description, Rubric, and Examples
	1.2 Classroom Interactions: Interactions reflected collegial working relationships among students (e.g., students worked together productively and talked with each other about the lesson). *It's possible that this indicator was not applicable to the observed lesson. You may rate NA in this case.* Description, Rubric, and Examples
	1.3 Classroom On-Task: The majority of students were on task throughout the class. Description, Rubric, and Examples
	1.4 Classroom Management: The teacher's classroom management strategies enhanced the classroom environment. Description, Rubric, and Examples
	1.5 Classroom Organization: The classroom is organized appropriately such that students can work in groups easily and get to lab materials as needed, and the teacher can move to each student or student group. Description, Rubric, and Examples
	1.6 Classroom Equity: The classroom environment established by the teacher reflected attention to issues of access, equity, and diversity for students (e.g., cooperative learning, language-appropriate strategies and materials, attentiveness to student needs). Description, Rubric, and Examples

Synthesis Rating for Classroom Environment

Classroom culture is *non-interactive* or *non-productive*.	Classroom culture is productive and interactive only *occasionally*.	Classroom culture is *adequately* productive and interactive.	Classroom culture is *often* productive and interactive, with some collegial interactions.	Classroom culture is *consistently* collegial, interactive, and productive.
1	2	3	4	5

2. Lesson Structure

Rating	Indicator
	2.1 Lesson Sequence: The lesson was well organized and structured (e.g., the objectives of the lesson were clear to students, and the sequence of the lesson was structured to build understanding and maintain a sense of purpose). Description, Rubric, and Examples
	2.2 Lesson Importance: The structure of the lesson allowed students to engage with and/or explore important concepts in mathematics or science (instead of focusing on techniques that may only be useful on exams). Description, Rubric, and Examples
	2.3 Lesson Assessments: The structure of the lesson included opportunities for the instructor to gauge student understanding. Description, Rubric, and Examples
	2.4 Lesson Investigation: The lesson included an investigative or problem-based approach to important concepts in mathematics or science. Description, Rubric, and Examples
	2.5 Lesson Resources: The teacher obtained and employed resources appropriate for the lesson. Description, Rubric, and Examples

214

	2.6 Lesson Reflection: The teacher was critical and reflective about his/her practice after the lesson, recognizing the strengths and weaknesses of his/her instruction.
	* This indicator may be rated NA if you do not have access to a teacher interview or teacher commentary.
	Description, Rubric, and Examples

Synthesis Rating for Lesson Structure

Lesson was *very poorly* structured to assist student learning.	Lesson was *poorly* structured to assist student learning.	Lesson was *adequately* structured to assist student learning.	Lesson was *well* structured to assist student learning.	Lesson was *expertly* structured to assist student learning.
1	2	3	4	5

3. Implementation

Rating	Indicator
	3.1 Implementation Questioning: The teacher used questioning strategies to encourage participation, check on skill development, and facilitate intellectual engagement and productive interaction with students about important science and mathematics content and concepts.
	Description, Rubric, and Examples
	3.2 Implementation Involvement: The teacher involved all students in the lesson (calling on non-volunteers, facilitating student–student interaction, checking in with hesitant learners, etc.).
	Description, Rubric, and Examples
	3.3 Implementation Modification: The teacher used formative assessment effectively to be aware of the progress of all students and modified the lesson appropriately when formative assessment demonstrated that students did not understand.
	Description, Rubric, and Examples
	3.4 Implementation Timing: An appropriate amount of time was devoted to each part of the lesson.
	Description, Rubric, and Examples
	3.5 Implementation Connections: The instructional strategies and activities used in this lesson clearly connected to students' prior knowledge and experience.

	Description, Rubric, and Examples
	3.6 Implementation Safety: The teacher's instructional strategies included safe, environmentally appropriate, and ethical implementation of laboratory procedures and/or classroom activities. **This indicator may be rated NA if there were no relevant activities during the lesson.* Description, Rubric, and Examples

Synthesis Rating for Lesson Structure

Very poor lesson implementation	*Poor* lesson implementation	*Adequate* lesson implementation	*Good* lesson implementation	*Excellent* lesson implementation
1	2	3	4	5

4. Mathematics/Science Content

Rating	Indicator
	4.1 Content Significance: The mathematics or science content chosen was significant, worthwhile, and developmentally appropriate for this course (includes the content standards covered, as well as examples and activities chosen by the teacher). Description, Rubric, and Examples
	4.2 Content Fluency: Content communicated through direct and non-direct instruction by the teacher is consistent with deep knowledge and fluency with the mathematics or science concepts of the lesson (e.g., fluent use of examples, discussions, and explanations of concepts, etc.). Description, Rubric, and Examples
	4.3 Content Accuracy: Teacher written and verbal content information was accurate. Description, Rubric, and Examples
	4.4 Content Assessments: Formal assessments used by teacher (if available) were consistent with content objectives (homework, lab sheets, tests, quizzes, etc.). **It's possible that this indicator was not applicable to the observed lesson. You may rate NA in this case.* Description, Rubric, and Examples

4.5 Content Abstraction: Elements of mathematical/scientific abstraction were used appropriately (e.g., multiple forms of representation in science and mathematics classes include verbal, graphic, symbolic, visualizations, simulations, models of systems and structures that are not directly observable in real time or by the naked eye, etc.).

*It's possible that this indicator was not applicable to the observed lesson. You may rate NA in this case.

Description, Rubric, and Examples

4.6 Content Relevance: During the lesson, it was made explicit to students why the content is important to learn.

Description, Rubric, and Examples

4.7 Content Interconnections: Appropriate connections were made to other areas of mathematics or science and/or to other disciplines (including non-school contexts).

Description, Rubric, and Examples

4.8 Content Societal Impact: During the lesson, there was discussion about the content topic's role in history or current events.

Description, Rubric, and Examples

Synthesis Rating for Lesson Structure

Students learning *inaccurate* content knowledge	Students learning *superficial* content knowledge	Students learning *adequate* content knowledge	Students learning *good* content knowledge	Students learning *deep, fluid* content knowledge
1	2	3	4	5

IV. SUMMARY COMMENTS

Information included in this section is a snapshot of your evaluation of the quality of the lesson. When filling in this section, consider all available information concerning the lesson and its context and purpose, as well as your own judgment of the relative importance of the ratings given. The summary is intended to be freeform and can also include comments that did not fit into any of the preceding sections.

FIELD NOTES

Use this space to take field notes, capture comments from student–student or student–teacher conversations, describe the physical, socio-emotional, or cultural environment of the classroom interactions, and so on. Field notes can be edited and inserted into the Evidence boxes under each indicator to illustrate your rationale for assigning a particular score for that indicator.

Be sure to REMOVE all notes prior to sharing with anyone!

Appendix B: Teacher Demographic Survey

Q1 Name

Q2 Years Teaching Experience

Q43Years Teaching at Current Position

Q4 Highest degree obtained
○ Bachelors
○ Masters
○ PhD

Q5 Area of Degree Concentration (Ex: Biology, Physics, Political science, etc.)

Q6 Type of Teaching Certification (please describe as college major, traditional, alternative)

Q7 How many years have you been a member of the Texas Regional Collaboratives?

Q8 How many other colleagues at your school teach science?

Q9 How many other colleagues at your school teach the same subject as you?

Q10 What percentage of the school year do you intend to implement the concepts covered in the making sense of science: force and motion professional development?

Q11 What do you hope to implement this year in your classroom practice from the making sense of science: force and motion professional development?

Appendix C: Teacher Interview Rationale Matrix

Overall Research Question: **What are characteristics of the context of a rural secondary science PLC?**

Concept/Theory/Idea from literature review to affirm or extend.	Questions you will ask your informant.	Triangulation via documents and/or observations
Shared Sense of Purpose (Louis and Marks, 1998)	What are your beliefs and values about the central mission of education?	PLC meeting observations, emails across PLC participants
Collaborative Activity (Loucks-Horsley et al., 2010; Louis and Marks, 1998; Liebermann, 2000)	How would you describe collaboration inside and outside the TRC? What does it look like? Why is it important? (or not important?) How does collaboration contribute or not contribute to your development as a teacher?	PLC meeting observations, emails across PLC participants
Risk Taking (Liebermann, 2000; Vescio et al., 2007)	Would you characterize yourself as a risk taker in your profession? (ask for specific examples, if mention risk taking in ways of working with students, probe for more specific examples)	Classroom observations
Support (Liebermann, 2000)	What characteristics of the TRC would you classify as supportive? Who provides this support within the TRC structure? How do they provide that support? (further probing questions if necessary of detailed descriptions of support)	PLC observations, classroom observations, artifacts
Rural Context (general)	What is it like to teach in a rural district? Culturally? Collaboratively? How does or does not the TRC support your efforts to teach in a rural district? How does the TRC not support your efforts to teach in a rural school district?	PLC observations, classroom observations, artifacts
History of Professional	What has been your experience with	PLC observations

Development (Loucks-Horsley et al., 2010)	professional development in the past? How has have these experiences shaped how you view professional development. What has been tried and abandoned and why? What was the nature and scope and who was involved in past efforts, both successful and unsuccessful? Who initiated them?	
Resources (Loucks-Horsley et al., 2010)	Previous resources mentioned include the technology, the fellowship, advice, forums, the facilitators, any others? Why do these resources matter/what role do they play in a rural PLC? How would you describe the culture of the TRC? Who creates and facilitates this culture? How do they do that? How does being in a rural area influence this culture? Are there any clear leaders in the TRC? How would you describe the structure of the TRC? How does that play into the rural context of the TRC, meaning what does leadership look like or need to look like when it is spread out? This PLC is a statewide initiative, across all different types of communities. What are strengths and tensions with a state wide initiative in a region like this one?	PLC observations, classroom observations, artifacts
Students, standards, and student learning needs (Loucks-Horsley et al., 2010)	Please describe the learning needs of your students. Please describe the characteristics of your students. What helps your students be successful learners? What is a barrier to your students learning needs?	Classroom observations, PLC observations
Teachers and teacher	Please describe a professional development	

learning needs (Loucks-Horsley et al., 2010)	that you enjoyed. Please describe a professional development that you did not enjoy. What subjects or topics are of interest to you? What would you like to learn more about?	
Practices, curriculum instruction, assessment, and the learning environment (Loucks-Horsley et al., 2010)	Please describe your general approach to curriculum and pedagogy Essentially, how do you teach? Please describe the learning environment of your classroom.	Classroom Observation
Organizational structures and leadership (Loucks-Horsley et al., 2010)	Let's discuss the leadership in your region, who are leaders here? What makes them a leader, what kind of leadership roles do they fulfill? What about other leaders within the TRC?	PLC Observations
National, state, and local policies (Loucks-Horsley et al., 2010)	We have discussed and I have observed the discussion of the changing state policies in some of the PLC meetings. However, we have not discussed what is occurring in the district locally. What local policies or even norms influence how and what you teach in your classroom? What about state and national policies? How do these influence your facilitation of the PLCs? How do you discuss these constant changes with the participants of the TRC?	PLC observations, classroom observations, artifacts
Parents and community (Loucks-Horsley et al., 2010)	Please explain the role of community in your classroom and teaching. What types of interactions do you have with parents? What is it like to be a member of a rural community?	PLC observations, classroom observations, artifacts

Content (Loucks-Horsley et al., 2010)	Of the aspect of professional development that you like and dislike, where does the specificity of content come in to play? Does it matter that the content of a professional development is science specific? If so, why? What about content specificity that is out of your area of expertise?	PLC observations, classroom observations, artifacts
Summary/Conclusion	In summary and to conclude our time together, how has your experience of working in this school setting intersecting with your time at the TRC influenced or not influenced you? How do rural communities experience education? Anything Else?	

Appendix D: Facilitator Interview Rationale Matrix

Overall Research Question: **What are characteristics of the context of a rural secondary science PLC?**

Concept/Theory/Idea from literature review to affirm or extend.	*Questions you will ask your informant.*	*Triangulation via documents and/or observations*
Shared Sense of Purpose (Louis and Marks, 1998)	What are your beliefs and values about the central mission of education?	PLC meeting observations, emails across PLC participants
Collaborative Activity (Loucks-Horsley et al., 2010; Louis and Marks, 1998; Liebermann, 2000)	How would you describe collaboration inside and outside the TRC? What does it look like? Why is it important? (or not important?) How does collaboration contribute or not contribute to your development as a teacher?	PLC meeting observations, emails across PLC participants
Risk Taking (Liebermann, 2000; Vescio et al., 2007)	Would you characterize yourself as a risk taker in your profession? (ask for specific examples, if mention risk taking in ways of working with students, probe for more specific examples)	PLC meeting observations
Support (Liebermann, 2000)	What characteristics of the TRC would you classify as supportive? Who provides this support within the TRC structure? How do they provide that support? (further probing questions if necessary of detailed descriptions of support)	PLC observations, artifacts
Rural Context (general)	What is it like to facilitate teachers who work in a rural district? Culturally? Collaboratively? How does or does not the TRC support your efforts to support teachers in a rural region? How does the TRC not support your efforts to support teachers in a rural school region?	PLC observations, artifacts

History of Professional Development (Loucks-Horsley et al., 2010)	What has been your experience with professional development in the past? How has have these experiences shaped how you view professional development. What has been tried and abandoned and why? What was the nature and scope and who was involved in past efforts, both successful and unsuccessful? Who initiated them?	PLC observations
Resources (Loucks-Horsley et al., 2010)	Previous resources mentioned include the technology, the fellowship, advice, forums, the members of the TRC, any others? Why do these resources matter/what role do they play in a rural PLC? How would you describe the culture of the TRC? Who creates and facilitates this culture? How do they do that? How does being in a rural area influence this culture? Are there any clear leaders in the TRC? How would you describe the structure of the TRC? How does that play into the rural context of the TRC, meaning what does leadership look like or need to look like when it is spread out? This PLC is a statewide initiative, across all different types of communities. What are strengths and tensions with a state wide initiative in a region like this one?	PLC observations, artifacts
Students, standards, and student learning needs (Loucks-Horsley et al., 2010)	Please describe the learning needs of students in the region. Please describe the characteristics of students in the region. What helps these students be successful learners? What is a barrier to student learning needs?	PLC observations

Teachers and teacher learning needs (Loucks-Horsley et al., 2010)	Please describe a professional development that you enjoyed. Please describe a professional development that you did not enjoy. What subjects or topics are of interest to you? What would you like to learn more about?	
Practices, curriculum instruction, assessment, and the learning environment (Loucks-Horsley et al., 2010)	Please describe your general approach to curriculum and pedagogy Essentially, how do you or did you teach?	PLC Observation
Organizational structures and leadership (Loucks-Horsley et al., 2010)	Let's discuss the leadership in your region, who are leaders here? What makes them a leader, what kind of leadership roles do they fulfill? What about other leaders within the TRC?	PLC Observations
National, state, and local policies (Loucks-Horsley et al., 2010)	We have discussed and I have observed the discussion of the changing state policies in some of the PLC meetings. However, we have not discussed what is occurring in the district locally. What local policies or even norms influence how and what you do to support teachers here? What about state and national policies? How do these influence your facilitation of the PLCs? How do you discuss these constant changes with the participants of the TRC?	PLC observations, classroom observations, and artifacts
Parents and community (Loucks-Horsley et al., 2010)	Please explain the role of community. What types of interactions do you have with parents? What is it like to be a member of a rural community?	PLC observations, artifacts
Content (Loucks-Horsley et al., 2010)	Of the aspect of professional development that you like and dislike, where does the specificity of content come in to play? Does it matter that the content of a professional development is science specific? If so, why? What about content specificity that is out of your area of expertise?	PLC observations, artifacts

|		
Summary/Conclusion	In summary and to conclude our time together, how has your experience of working in this school setting intersecting with your time at the TRC influenced or not influenced you? How do rural communities experience education? Anything Else?	

Appendix E: District Demographic Data

		State of Texas	Singleton ISD	Ferdinand ISD	Central School
Attendance Rate (%)		95.9	97.3	96.4	97
Drop Out Rate (%)		2.4	0	0	0.6
Race Ethnicity (%)		12.7	0.9	0.4	3.1
African American		51.3	29.8	17.6	45.8
Hispanic		30	65.1	75	47.1
White		0.4	2.1	1.6	0.1
American Indian		3.6	0.4	0.8	1.3
Asian		0	0.4	0	0
Pacific Islander		1.8	1.3	4.7	2.6
Two or More Races					
Enrollment by Group (%)		60.4	63	18	42.3
Economically Disadvantaged		17.1	1.3	0	1
English Language Learners		8.5	9.8	3.9	7.4
Special Education		19.7	31.1	13.2	20.7
Mobility Rate					
Expenditures per Student (USD)					
Total Operating Expenditures		8276	6523	7418	4774
Instruction		4766	5235	4521	3428
Instructional Leadership		11	0	0	58
School Leadership		476	455	461	523

Source: Texas Education Agency 2013

UTOP Indicator Report for Robbins
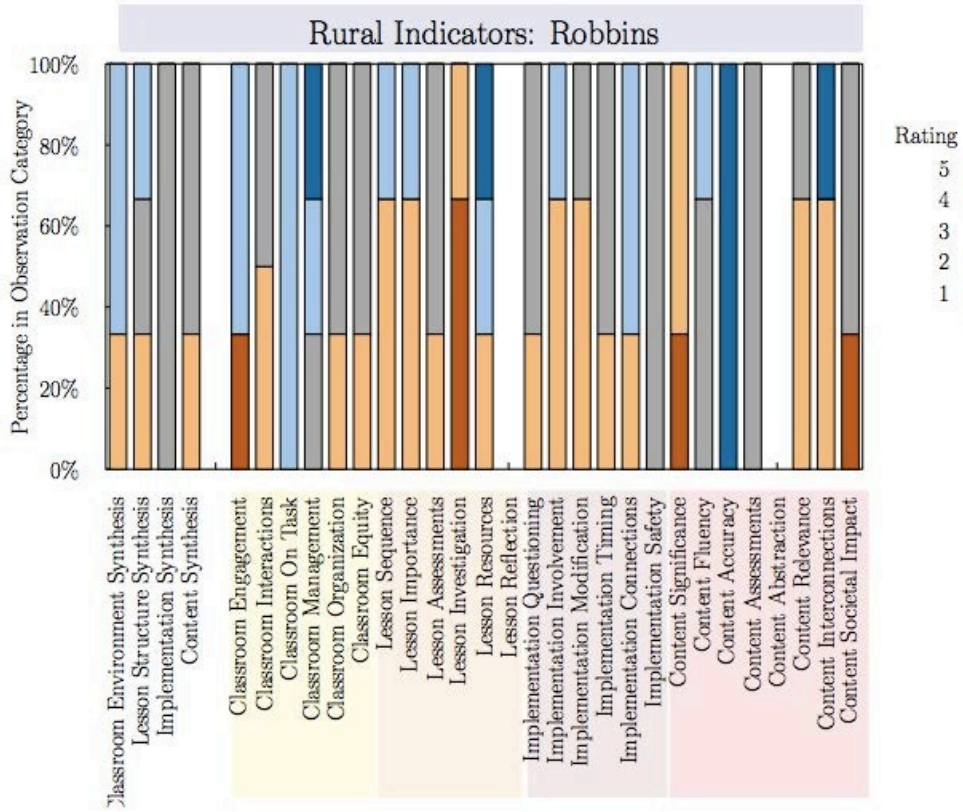
Robbins: Lesson Description

UTOP Indicator Report for Edwards

Rural Indicators: Edwards
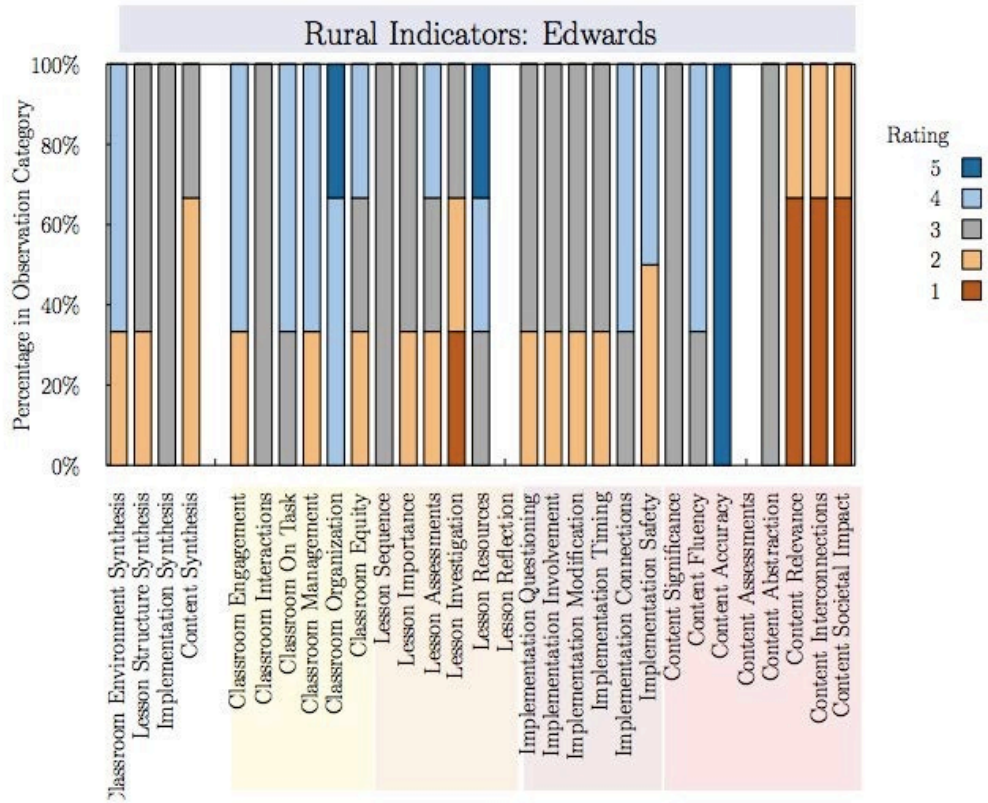
UTOP Indicator Report for Deer

Rural Indicators: Deer
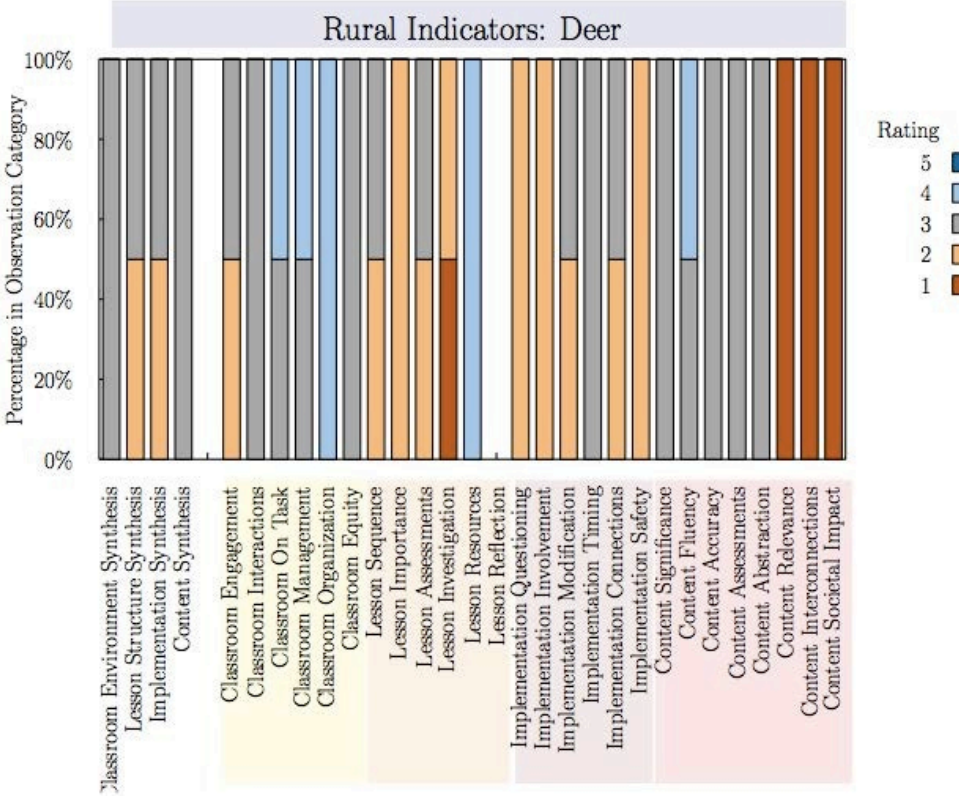
Deer: Lesson Description

UTOP Indicator Report for Rice

Rural Indicators: Rice
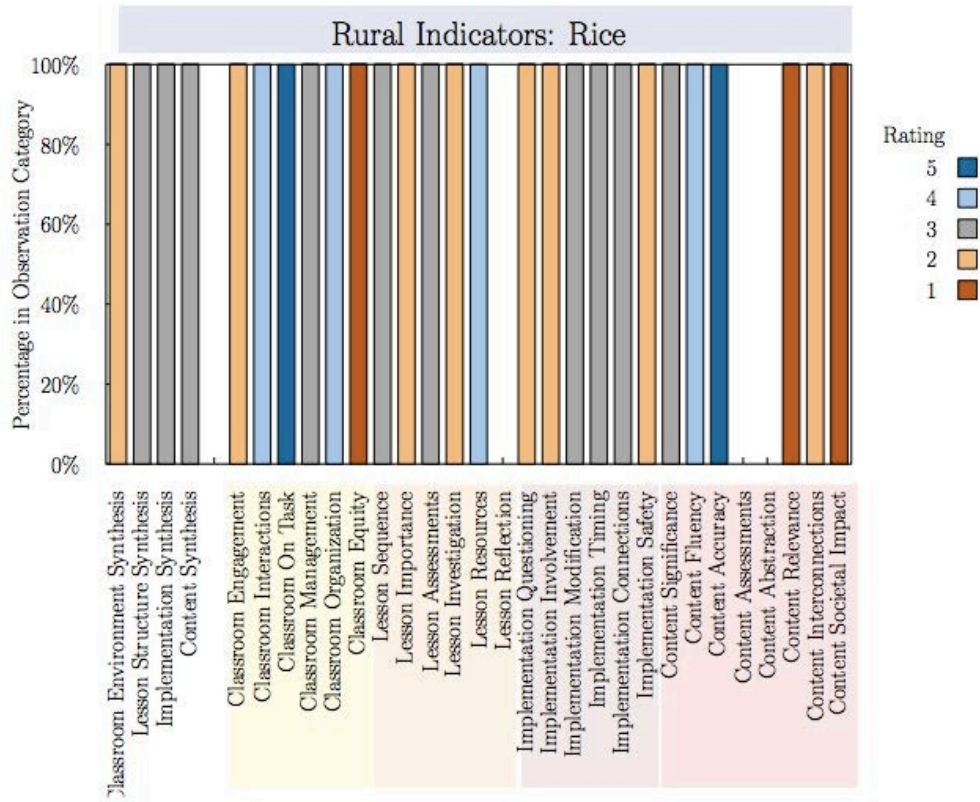
Appendix G: nVivo Codes and Description

Code (instances)	Description
Administration (13)	Administration administrator role
Assessment (3)	informal, formal, formative, and summative measures of student learning
Autonomy (1)	teacher describes working independently
Belief & Attitude (11)	Personal viewpoint or attitude
Burnout (9)	not wanting to teach or reasons why teaching is difficult
Campus (12)	description of home campus of campus within region
campus colleagues (3)	participant mentions a relationship with campus colleagues
Challenges or constraints (16)	Difficulties encountered by teachers or students or staff related to the collaborative

Change (3)	Participant identifies a change or transition
Classroom management (1)	Of or relating to classroom management of students' behavior. Managing students; grouping approaches; reprimanding students; checking on
Cognitive Transfer (4)	Participant mentions how an idea or lesson learned "transfers" from the TRC to the classroom
Collaboration (14)	Working with others in a collegial manner, explicit mention of collaboration (Loucks-Horsley et al, 2010)
Collaborative (6)	teachers/admin learn through collaboration.
Collective pronoun (4)	When asked a question about themselves (individual pronoun-you), participant answers with a collective pronoun (we, us, etc.)
Communication (9)	Communicating with others
Community (15)	description of a community
complaint about time (4)	participant describes time as a challenge or complication to their practice
Confidence (2)	participant expresses feeling of confidence

Content knowledge (10)	knowledge of the subject and it's organizing structures; Shulman, 1986)
Correct content (1)	teacher delivering accurate and correct content information
Culture (13)	norms, attitudes, traditions and beliefs
Curriculum (3)	the content teachers teach
Design (2)	Describes design of PD
Difference (10)	between communities, students, etc.
Differentiation (2)	providing different students with different avenues for learning
Discussion (10)	class-based discussion; may involve students (and teacher) are engaging in oral discussion, or online discussion, in which they pose questions and
electronic collaboration (4)	participant mentions collaboration via an electronic source (e.g. email, skype, texting, phone calls, etc.)

ELL (2)	English Language Learners
Emotional (7)	describes emotional support such as listening
Empathy (8)	the ability to understand and feel for another
enrolled in TRC (3)	a teacher enrolled in the TRC
Experienced (14)	Teacher with 2 plus years experience
Extracurricular (7)	Extracurricular Activities
Facilitator (15)	can be an attribute code, but mentions a facilitator
Facilitator (3)	participants mentions a relationship with TRC facilitators
Flipped Classroom (3)	Mention of learning materials or videos or other being provided to students BEFORE the class so students can review and learn prior to attending

Formal Assessment (4)	Formative and Summative assessment activities that are graded
Foster Care (3)	Students presently or previously under foster care
general characteristic (2)	broad description of students
Group work (1)	students working/collaborating in small groups or dyads
Growth (2)	mentions growth of a community
Guided Practice (2)	teacher and students work simultaneously on a problem, where the teacher oftentimes demonstrates a process or elucidates metacognition. Example: teacher helps students
Hands On or Lab (10)	teaching via a experiential lesson; such as a lab
high school (2)	participant describes high school facilitator
High-Stakes Testing (10)	Mentions issues with high-stakes testing (AP, STAAR, or other)

237

Homelife (4)	student life outside of the classroom
Identity (4)	specifically identifying with all or part of a rural location
incorrect content knowledge (2)	teacher uses incorrect content knowledge or knowledge that could lead to a misconception
Informal Assessment (2)	Formative assessment activities that allow teacher to gauge student progress/learning/knowledge in an informal way that does not contribute to a formal grade but helps teacher decide on next
Insider (1)	participant describes feeling part of the community; accepted
Interventions (1)	teacher efforts to assist or extend student learning
Isolation (10)	alone, separated, lonely
Lack (8)	not enough resources
Leadership (10)	Person taking leadership role in school. Example: admin identifies a teacher who was a leader in some way; teacher identifies admin/students who

Learning (7)	could be conceptualized as behaviorist, cognitive, constructivist, socio-constructivist; students verbalize new understandings "ah ha" moments &
Leaving students (9)	participant describes tension or incident leaving student
Lecture (1)	Teacher reading / lecturing about topic. May include teacher-directed questions to class with one student responding with correct answer or until a student correctly answers question. Little to no student-questioning. Does not involve any "activity" beyond lecture and teacher-focused
Lesson Planning (1)	the process in which teachers organize and plan the content they will teach their students
Local (3)	rural and local politics
Many (0)	
Math (3)	participant mentions math
middle school (1)	participant describes middle school facilitator

239

Money (9)	financial- salary, budget, etc.
Motivation (8)	relation to teaching or pedagogy, desire to teach in region/on campus
Motivation (1)	student motivation (extrensic or intrinsic)
National (2)	national politics; specifically relating to education; including initiatives and standards
Negative (10)	description of a negative event, feeling
New (4)	Teacher with 1 or less years experience
Obstacle (1)	describes community as an obstacle or something to overcome in relation to teaching and pedagogy
other subjects (7)	participant mentions a subject area outside of math and science
other TRC members (7)	participant mentions a relationship with other members of the TRC

Outsider (3)	feeling outside of the community, not included in local culture
Parent (8)	parents of students
Pedagogical support (10)	Mentions pedagogical support. For example, teaching techniques or suggested activities)
personal collaboration (5)	participant mentions collaboration in person (e.g face to face meetings, team meetings) (Loucks-Horsley, et al 2010)
Physical Transfer (5)	physical movement, for example: students transfer from one place to another
Politics (3)	elected officials and subsequent dynamics
Positive (10)	description of a positive event, feeling
power and or control (2)	perceptions or direct observation of an individual or entity influencing the actions of others
Professional Development (14)	"any activity that is intended partly or primarily to prepare paid staff members for improved

	performance in present or future roles in the school districts (Little, 1987, p. 491). Moving beyond discrete activities such as workshops, local
Professional learning (14)	any adult at school site or district that engages in learning experiences related to their profession
reading specialist (1)	participant describes reading specialist facilitator
Reflection (2)	participants thinking about their teaching and/or students
Relationships (7)	relationship with other individuals
Released (2)	teacher asked to leave the profession
Research (1)	Mentions the importance of educational research or references ed research
researcher ideas or notes (2)	Any research may write notes about their ideas, questions, comments as they code the data. Add your ideas to the file in which it was inspired or in a
Resources (16)	participant mentions resources (electronic, pedagogical, etc.)

Respect (4)	participant senses a feeling of respect and acknowledgement of their profession
Review (2)	reviewing previously learned concepts
Risk Taking (5)	Participant describes issue or experience in which he/she takes risks in relation to 'norms' (societal, disciplinary, routine, time).
Rural (10)	not urban or suburban,
Rural (8)	participant describes attributes of a rural community
Scaffolding (2)	Teacher supporting student learning. Teachers use expertise to guide students toward learning using questioning, prompting, matching students
School board (5)	specific members or entire entity of the local school board
School needs (2)	what schools require in order to succeed
Science (14)	participant mentions science as a content area

Service Center (7)	Local Region Service Center
Similarity (5)	identify common aspect
space and distance (6)	the physical location of a rural location
Special Education (4)	Special Education students and their needs
State (5)	state politics; specifically relating to education; including initiatives and standards
State Standards (11)	describes state standards
Student (13)	Mentions student role (when needed within data - remember all documents will have an Attribute code for Teacher, Student, Admin)
Student-Inspired (2)	An adult engages in learning based on the suggestion from a student
Subject area (6)	A discipline area/role within the high school. Example: admin talks about math teachers; math teacher talks about admin

Suburb (2)	community is a suburb or description of a suburb
Support (15)	Describes or mentions support
Teacher (9)	Mentions teacher/instructor role (when needed within data - remember all documents will have an Attribute code for Teacher, Student, Admin)
Teaching or pedagogy (16)	Mention of general teaching, pedagogical practices that are not more specifically described below.
Technology (4)	technology used in any way
Tension (16)	description of a tension in pedagogy
Time (16)	mentions time expenditures
time investment (5)	participant describes time as an investment in their classroom
Transition (6)	a shift or transition from one mindset to another, could also be a shift in technique

TRC (17)	TRC referenced as an entity
TRC meetings (1)	Mention of participants attending TRC meeting.
Trust (3)	trusting other members of the TRC
unique characteristic (2)	characteristic unique to a specific teacher or group of teachers
unique characteristic (3)	characteristic unique to one student or a group of students
Urban (8)	participant describes attributes of an urban community
West Ed (2)	Participant describes an incident that was a goal of west ed.

References

Anderson, M., & Lonsdale, M. (2014). Three Rs for rural research. *Doing Educational Research in Rural Settings: Methodological Issues, International Perspectives and Practical Solutions*, 193.

Arnold, M. L., Newman, J. H., Gaddy, B. B., & Dean, C. B. (2005). A Look at the Condition of Rural Education Research: Setting a Direction for Future Research. *Journal of Research in Rural Education, 20*(6).

Augustin, N.R. (2005). Rising above the gathering storm: Energizing and employing America for a brighter economic future. Committee on Prospering Global Economy of the 21st century. Washington, DC: National Academies Press.

Avery, L. M., & Kassam, K. A. (2011). Phronesis: Children's local rural knowledge of science and engineering. *Journal of Research in Rural Education, 26*, 1–18.

Avery, L. M. (2013). Rural Science Education: Valuing Local Knowledge. *Theory Into Practice, 52*, 28-35.

Banks, J. A. (1998). The lives and values of researchers: Implications for educating citizens in a multicultural society. *Educational Researcher*, 4-17.

Banks, S., Goodyear, P., Hodgson, V., & McConnell, D. (2003). Introduction to the special issue on "advances in research on networked learning." *Instructional Science, 31*, 1-6.

Barter, B. (2008). Rural education: learning to be rural teachers. *Journal of Workplace Learning, 20*(78), 468-479.

Barufaldi, J.P., & Reinhartz, J. (2002). The Dynamics of collaboration in a State-Wide Professional development program for science teachers. In *Models of Science Teacher Preparation* (pp. 89-105). Springer: Netherlands.

Bauch, P. A. (2001). School-community partnerships in rural schools: Leadership, renewal, and a sense of place. *Peabody Journal of Education, 76*(2), 204-221.

Berg, B. (1995). *Qualitative research methods for the social sciences.* Needham Heights, MA: Allyn & Bacon.

Blunck, S., Crandall B., Dunkel, J., Jeffryes, C., Varella, G., & Yager, R.E. (1995). Rural science education: Water and waste issues. In P.B. Otto (Ed.) *Science education in the rural United States: Implications for the twenty-first century* (pp. 79-92). Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

Borko, H. (2004). Professional Development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3-15.

Boylan, C. (1993). Educational change in New South Wales: Rural teacher reactions and rural development. In C. Boylan, & M. Alston (Eds.) *Rural education issues: An Australian perspective*. Wagga Wagga, NSW: SPERA.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school*, 55.

Briggs, A. R., Morrison, M., & Coleman, M. (Eds.). (2012). *Research methods in educational leadership and management*. Thousand Oaks, CA: Sage Publications.

Brown, D. L., & Schafft, K. A. (2011). *Rural people and communities in the 21st century: Resilience and transformation*. Cambridge, United Kingdom: Polity.

248

Brown, D., & Swanson, L., eds. (2003). *Challenges for rural America in the twenty- first century.* University Park, PA: Pennsylvania State University Press.

Burton, M., Brown, K., & Johnson, A. (2013). Storylines About rural teachers in the United States: A narrative analysis of the literature. *Journal of Research in Rural Education, 28*(12), 1-18.

Burton, M., & Johnson, A. S. (2010). "Where Else Would We Teach?": Portraits of Two Teachers in the Rural South. *Journal of Teacher Education, 61*(4), 376-386.

Cady, J., & Rearden, K. (2009). Delivering online professional development in mathematics to rural educators. *Journal of Technology and Teacher Education, 17(3),* 281-298.

Carlson, M. P., Moore, K., Bowling, S., & Ortiz, A. (2007). The role of the facilitator in promoting meaningful discourse among PLCs of secondary mathematics and science teachers. In T. Lamberg & L.R. Wiest (eds.), *Proceedings of the 29th annual meeting of the North American Chapter of the International Group for Psychology of Mathematics Education* (841-848). Reno, NV: University of Nevada.

Center for Public Policy Priorities. (2013). *Children in Foster Care (0-17)* [data file]. Retrieved from http://dataceneter.kidscount.org

Chance, P. L., & Segura, S. N. (2009). A rural high school's collaborative approach to school improvement. *Journal of Research in Rural Education, 24(3),* 1-1.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Pine Forge Press.

Clark, C. O. (1972). A determination of commonalities of science interests held by intermediate grade children in inner-city, suburban, and rural schools. *Science Education,* 56, 125-136.

Cochran-Smith, M., & Lytle, S. L. (Eds.). (1993). *Inside/outside: Teacher research and knowledge*. New York, NY: Teachers College Press.

Collinson, V., & Cook, T. F. (2001). "I don't have enough time"-Teachers' interpretations of time as a key to learning and school change. *Journal of Educational Administration*, *39*(3), 266-281.

Corbett, M. (2007). *Learning to Leave: The irony of schooling in a coastal community* Black Point, NS: Fernwood.

Creswell, J.W. (2012). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.

Crotty, M. (1998). *The foundations of social research. Meaning and perspective in the research process.* Thousand Oaks, CA: Sage.

Darling-Hammond, L. (Ed.). (1994). *Professional development schools: Schools for developing a profession.* New York: Teachers College Press.

Denzin, N. K. (1978). *Sociological Methods*. New York: McGraw-Hill.

Desimone, L. M. (2009). Improving impact studies of teacher' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181-199.

DeYoung, A. J. (1995). Constructing and staffing the cultural bridge: The school as change agent in rural Appalachia. *Anthropology & Education Quarterly*, *26*(2), 168-192.

DuFour, R., & Eaker, R. (1998). *Professional learning communities at work: Best practices for enhancing student achievement*. National Educational Service, 1252 Loesch Road, Bloomington, IN 47404-9107.

DuFour, R., & Fullan, M. (2013). *Cultures built to last: Systemic PLCs at work*. Bloomington, IN: Solutions Tree.

Epstein, J. L. (1995). Perspectives and previews on research and policy for school, family, and community partnerships. In A. Booth & J. Dunn (Eds.), *Family–school links: How do they affect educational outcomes?* (pp. 209–246). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Finson, K. D., & Beaver, J. B. (1990). Rural science teacher preparation: A re-examination of an important component of the educational system. *Journal of Science Teacher Education,* 1, 46-48.

Firestone, W. A. (1993). Alternative arguments for generalizing from data as applied to qualitative research. *Educational Researcher 22*(16), 16-23.

Fletcher, C. L. (2013). *Texas Regional Collaboratives: Final Report to TEA 2012-13* (pp. 48). Austin, Texas: The University of Texas at Austin.

Foucault, Ma. (1979). *Discipline and Punish*. Hammondsworth: Penguin

Fulton, K., & Britton, T. (2010). *STEM teachers in PLCs: A knowledge synthesis.* Washington DC: National Commission on Teaching and America's Future West Ed.

Fulton, K., & Britton, T. (2011). *STEM teachers in PLCs: From good teachers to great teaching.* Washington DC: National Commission on Teaching and America's Future.

Fulton, F., Doerr, H., & Britton, T. (2010). STEM teachers in professional learning communities: A knowledge synthesis. *National Commission on Teaching and America's Future*.

Fulton, K., Yoon, I., & Lee, C. (2005). *Introduction into learning communities*. Policy Paper of the National commission on Teaching and America's Future, Washington, DC. http://www.nctaf.org/documents/NCTAF_Induction_Paper_2005.pdf

Gallo-Fox, J. (2010). Risk-taking as practice in a coteaching professional learning community. In *Coteaching in International Contexts* (pp. 105-124). Amsterdam, Netherlands: Springer Netherlands.

Gardner, D. P. (1983). *A nation at risk*. Washington, DC: The National Commission on Excellence in Education, US Department of Education.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Garman, D. M., & Alkire, P. (1992). The teacher selection process in rural Ohio. *Rural Educator*, *14*(2), 16-19.

Gates Foundation (2012). *Gathering feedback for teaching: Combining high quality observation with student surveys and achievement gains*. (Research paper) Retrieved 13 April 2013 from http://www.metproject.org/downloads/MET_gathering_feedback_research_paper.pdf

Gjelten, T. (1982). *A typology of rural school settings.* Washington, DC: U.S. Department of Education.

Glaser, B. G. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory* (Vol. 2). Mill Valley, CA: Sociology press.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory.* London, United Kingdom: Weidenfield & Nicolson.

Goddard, Y. L., Goddard, R. D., & Tschannen-Moran, M. (2007). A theoretical and empirical investigation of teacher collaborative ration for school improvement and student achievement in public elementary schools. *Teachers College Record,* 109(4), pp. 877-896.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, *21*(1), 82-101.

Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *The Teachers College Record*, *103*(6), 942-1012.

Guba, E.G., & Lincoln, Y.S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research,* 2 (163-194).

Gulamhussein, A. (2013). Teaching the teachers: Effective professional development in an era of high stakes accountability. *Center for Public Education. September*.

Guskey, T. R. (2000). *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.

Hammerman, J. K. (1997). Leadership in Collaborative Teacher Inquiry Groups. Paper presented at the annual conference of the American Educational Research Association, Chicago, IL.

Hamos, J. E., Bergin, K. B., Maki, D. P., Perez, L. C., Prival, J. T., Rainey, D. Y., & Vanderputten, E. (2009). Opening the classroom door: PLCs in the math and science partnership program. *Science Educator, 18*(2), 14-24.

Hargreaves, A., & Goodson, I. (2006). Educational change over time? The sustainability and nonsustainability of three decades of secondary school change and continuity. *Education Administration Quarterly, 42*(3), 3-41.

Harmon, H. L., & Smith, K. C. (2012). Rural Systemic Initiatives: Innovation, Leadership, Teacher Development, and Lessons Learned (pp. 136). Nashville, Tennessee: National Science Foundation Report.

Hartman, S. (2013). Math coaching in a rural school: Gaining entry: A vital first step. *Journal of Education, 193*(1), 57-67.

Herzog, M. J., & Pittman, R. (1999). The nature of rural schools: Trends, perceptions, and values. In D. M. Chalker (Ed.), *Leadership for rural schools: Lessons for all educators* (pp. 11-24). Lancaster, PA: Technomic.

Higham, J., Haynes, G., Wragg, C., & Yeomans, D. (2004). 14-19 Pathfinders: An evaluation of the first year. Research Report RR504. London: DfES.

Hill, H., Beisiegel, M., & Jacob, R. (2013). Professional development research: Consensus, crossroads, and challenges. *Educational Researcher, 42*(9), 476-487.

Hilty, E. B. (1999). Southern schools, southern teachers: Redefining leadership in rural communities. In D. M. Chalker (Ed.), *Leadership for rural schools: Lessons for all educators* (pp. 157-172). Lancaster, PA: Technomic.

Holloway, D.L. (2002). Using research to ensure quality teaching in rural schools. *Journal of Research in Rural Education*. 17 (3), 38-153.

254

Hord, S. M. (1997). *Professional learning communities: Communities of continuous inquiry and improvement*. Austin, TX: Southwest Educational Development Laboratory.

Hord, S. M. (Ed.). (2004). *Learning together, leading together: Changing schools through professional learning communities*. New York, NY:Teachers College Press.

Hord, S. M., & Sommers, W. A. (2008). *Leading PLCs: Voices from research and practice.* Thousand Oaks, CA: Corwin Press.

Howley, A. A., & Howley, C. B. (2000). The transformative challenge of rural context. *The Journal of Educational Foundations, 14*(4), 73-85.

Howley, A., Howley, C., & Pendarvis, E. (2003). The possible good gifted programs in rural schools and communities might do. In J. Borland (Ed.), *Rethinking gifted education: Contemporary approaches to understanding giftedness* (pp. 80–104). New York: Teachers College Press.

Howley, C. B., & Howley, A. A. (2004). School Size and the Influence of Socioeconomic Status on Student Achievement: Confronting the Threat of Size Bias in National Data Sets. *Education Policy Analysis Archives*, *12*(52), n52.

Howley, C., & Howley, A. (2014). Making sense of rural education research. *Doing Educational Research in Rural Settings: Methodological Issues, International Perspectives and Practical Solutions*, 7.

Huberman, M. (1993). The model of the independent artisan in teachers' professional relations. In J. W. Little & M. W. McLaughlin (eds), *Teachers' Work: Individuals, Colleagues and Contexts*. New York: Teachers College Press.

255

Israel, B. A., Eng, E., Schulz, A. J., & Parker, E. A. (Eds.), (2005). *Methods in community-based participatory research for health.* San Francisco: Jossey-Bass.

Janesick, V. J. (2000). The choreography of qualitative research design. *Handbook of Qualitative Research*, 379-399.

Jeynes, W. H. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban Education*, *40*(3), 237-269.

Jimerson, L. (2004). Teachers and teaching conditions in rural Texas. Arlington, VA: Rural school and community trust, Arlington, VA. *Rural Education, 13*(2), 79-100.

Jones, M. G., Gardner, G. E., Robertson, L., & Robert, S. (2013). Science PLCs: Beyond a singular view of teacher professional development. *International Journal of Science Education, 35*(10).

Cantrell, S., & Kane, T. J. (2013). Ensuring fair and reliable measures of effective teaching: Culminating findings from the MET project's three-year study. *MET Project Research Paper.*

Kane, T. J., & Staiger, D. O. (2012). Gathering Feedback for Teaching: Combining High-Quality Observations with Student Surveys and Achievement Gains. Research Paper. MET Project. *Bill & Melinda Gates Foundation*.

Kennedy, A., Slavit, D., & Nelson, T. H. (2009). Supporting collaborative teacher inquiry. *Perspectives on Supported Collaborative Teacher Inquiry*, 166.

256

Khattri, N., Riley, K. W., & Kane, M. B. (1997). Students at risk in poor, rural areas: A Review of the research. *Journal of Research in Rural Education, 13, 79-100.*

King, M.B., & Newmann, F.M. (2001). Building school capacity through professional development: Conceptual and empirical considerations. *International journal of educational management,* 15 (2), 86-94.

Knapp, M. S. (1997). Between systemic reforms and the mathematics and science classroom: The dynamics of innovation, implementation, and professional learning. *Review of Educational Research*, *67*(2), 227-266.

Lambert, L, Walker, D., Zimmerman, D., Cooper, J., Lambert, M., Gardner, M., & Szabo, M. (2002). *The constructivist leader, second edition*. New York: Teachers College Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. London, England: Cambridge University Press.

Lawrence, B.K. (2009). Rural gifted education: A comprehensive literature review. *Journal for the Education of the Gifted,* 32(4), 461-494.

Lawrenz, F., Huffman, D., & Gravely, A. (2007). Impact of collaboratives for excellence in teacher preparation programs. *Journal of Research in Science Teaching, 44*(9), 1348-1396.

Lee, V. E., Smith, J. & Bryk, A. S. (1993) The organization of effective secondary schools. Review of Research in Education, 19:171-268.

Lieberman, A. (2000). Networks as learning communities: Shaping the future of teacher development. *Journal of Teacher Education, 51*(3), 221-227.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Lippman, L., Burns, S., & McArthur, E. (1996). *Urban schools: The challenge of location and poverty* (NCES 94-184). Washington, DC: U.S. Department of Education. National Center for Education Statistics.

Loucks-Horsley, S., Stiles, K. E., Mundry, M. S. E., Love, N. B., & Hewson, P. W. (2009). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

Louis, K. S. (1994). Beyond ''managed change'': Rethinking how schools improve. *School Effectiveness and School Improvement* 9(1), 1–27.

Louis, K. S., Kruse, S. & Bryk, A.S. (1995). Professionalism and community: What is it and why is it important in urban schools? In K. S. Louis, S. Kruse & Associates (1995) *Professionalism and community: Perspectives on reforming urban schools*. Long Oaks, CA: Corwin.

Marshall, C., & Rossman, G. B. (2006). *Designing Qualitative Research*. Thousand Oaks, CA: Sage Publications.

Maxwell, J.A. (1992). Understanding and validity in qualitative research. *Harvard Educational Review,* 62 (3), 279.

Maynor, C. E. (2010). *The Development and perpetuation of professional learning communities in two elementary schools: The role of the principal and impact on teaching and learning.* (Doctoral dissertation). Western Carolina University (3397854).

Mcintosh, D. K. (1989). Retention of teachers in rural areas. *The Rural Educator, 11*(1), 26-29.

McLaughlin, M. W., & Talbert, J. E. (2006). *Building school-based teacher learning communities: Professional strategies to improve student achievement* (Vol. 45). New York, NY: Teachers College Press.

McSwan, D., & Stevens, K. (1995). Post secondary school education and vocational issues facing families in Rural North Queensland. *Education in Rural Australia, 5*(1), 47-49.

Melville, W., & Yaxley, B. (2009). Contextual opportunities for teacher professional learning: The experience of one science department. *Eurasia Journal of Mathematics, Science and Technology Education, 5*(4), 357-368.

Merriam, S. B. (1998). Case study research in education: A qualitative approach. San Francisco, CA: Jossey-Bass.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Merriam, S. B., & Simpson (2000). *A guide to research for educators and trainers of adults*. Malabar, FL: Krieger.

Merriam, S. B., Johnson-Bailey, J., Lee, M. Y., Kee, Y., Ntseane, G., & Muhamad, M. (2001). Power and positionality: Negotiating insider/outsider status within and across cultures. *International Journal of Lifelong Education*, *20*(5), 405-416.

Mindich, D., & Lieberman, A. (2012). Building a learning community: A tale of two schools. *Stanford Center for Opportunity Policy in Education*. Stanford, CA.

Monk, D. H. (2007). Recruiting and retaining high-quality teachers in rural areas. *Future of Children, I7,* 155-17.

Mullen, C. A., & Hutinger, J. L. (2008). The principal's role in fostering collaborative learning communities through faculty study group development. *Theory Into Practice, 47*(4), 276–285.

Mullen, C. A., & Schunk, D. H. (2010). A view of professional learning communities through three frames: Leadership, organization, and culture. *McGill Journal of Education/Revue des sciences de l'éducation de McGill*,*45*(2).

Mundry, S., & Stiles, K. E. (2008). *PLCs for science teaching: Lessons from research and practice*. Arlington, Virginia: National Science Teacher Association Press.

Murphy, C. U., & Lick, D. W. (2005). *Whole-faculty study groups: Creating professional learning communities that target student learning*. Corwin Press.

Nachtigal, P. (Ed.). (1982). *Rural education: In search of a better way.* Boulder, CO: Westview.

National Center for Education Statistics. (2013). *District Directory Information*. Retrieved from http://www.nces.ed.gov/ccd/districtsearch/district_detail.asp?start=0&ID2=4810 380Fo

National Commission on Teaching and America's Future. (2003). *No dream denied: A pledge to America's children.* Washington, DC: Tom Carroll.

Nelson Mandela Foundation (2005a), "Emerging voices: policy considerations," working document presented at the Ministerial Seminar on Education for Rural People in Africa: Policy Lessons, Options and Priorities, Addis Ababa, 7-9 September.

Nelson Mandela Foundation (2005b), "Emerging Voices: a report on education in South African rural communities," available at: www.hsrcpress.ac.za (accessed December 23, 2013).

Nickerson, S. D., & Moriarty, G. (2005). Professional communities in the context of teachers' professional lives: A case of mathematics specialists. *Journal of Mathematics Teacher Education*, *8*(2), 113-140.

Noyce, P. (2006). Professional Development: How do we know if it works? *Education Week, 26*.

Oliver, J. S. (2007). Rural science education. In S. K. Abell & N. G. Ederman (Eds.), *Handbook of research on science education* (pp. 345-372). New York: Routledge.

Osborne, J., Simon, S., Christodoulou, A., Howell-Richardson, C., & Richardson, K. (2013). Learning to argue: A study of four schools and their attempt to develop the use of argumentation as a common instructional practice and its impact on students. *Journal of Research in Science Teaching*, 50 (315).

Pendarvis, E. & Wood, E.W. (2009). Eligibility of historically underrepresented students referred for gifted education in a rural district: A case study. *Journal for the Education of the Gifted,* 32 (4), 495-514.

Peshkin, A. (1978). *Growing up American: Schooling and the survival of community.* Chicago: University of Chicago Press.

Petrin, R. A., Schafft, K. A., & Meece, J. L. (2014). Educational sorting and residential aspirations among rural high school students: What are the contributions of school and educators to rural brain drain? *American Educational Research Journal, 51*(2), 294-326.

Puckner, L. D., & Taylor, A. R. (2006). Lesson study, collaboration and teacher efficacy: Stories from two school-based math lesson study groups. *Teaching and Teacher Education, 22*(7), 922-934.

Putnam, R., & Borko, H., (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational researcher,* 29 (1), 4-15.

Richmond, G., & Manokore, V. (2011). Identifying elements critical for functional and sustainable professional learning communities. *Science Education, 95*(3), 543-570.

Roberts, P. (2014). Researching from the standpoint of the rural. In S. White & M. Corbett (Eds.), *Doing educational research in rural settings: Methodological issues* (pp. 215). New York, NY: Routledge.

Sahin, S. (2004). The relationship between transformational and transactional leadership styles of school principals and school culture (The case of Izmir, Turkey). *Educational Sciences: Theory and Practice*, *4*(2), 387-396.

Schafft, K. A., & Jackson, A. (Eds.). (2011). *Rural education for the twenty-first century: Identity, place, and community in a globalizing world.* University Park, PA: Penn State University Press.

Scott, D., & Morrison, M. (2005). *Key ideas in educational research*. London, England: Bloomsbury Publishing.

Scribner, J. P. (2003). Teacher learning in context: The special case of rural high school teachers. *Education Policy Analysis Archives,* 11(12).

Seal, K.R., & Harmon, H.L. (1995). Realities of rural school reform. *Phi Delta Kappan,* 77, 199-24.

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization.* New York: Doubleday.

Short, P. M., Miller-Wood, D. J., & Johnson, P. E. (1991). Risk taking and teacher involvement in decision making. *Education, 112*(1), 84–89.

262

Sipple, J. W., & Brent, B. O. (2008). Challenges and opportunities associated with rural school settings. In H. F. Ladd & E. B. Fiske (Eds.), *Handbook of research in education finance and policy* (pp. 612– 629). New York: Routledge.

Siskin, L. S. (1994). *Realms of knowledge: Academic departments in secondary schools*. London: Falmer Press.

Sparks, D. & Hirsh, S. (1997). *A new vision for staff development.* Alexandria, VA: Association for Supervision and Curriculum Development and National Staff Development Council.

Sparks, W. G., III, & Wayman, L. L. (1993). Multicultural understanding in physical education: A comparison of urban and rural perspectives. *The Physical Educator, 50(2),* 58-68.

Spillane, J. P., Diamond, J. B., Walker, L. J., Halverson, R., & Jita, L. (2001). Urban school leadership for elementary science instruction: Identifying and activating resources in an undervalued school subject. *Journal of Research in Science Teaching, 38,* 918 – 940.

Spillane, J. P., Hallett, T., & Diamond, J. B. (2003). Forms of capital and the construction of leadership: Instruction leadership in urban elementary schools. *Sociology of Education, 76*(1), 1-17.

Spitzer, D. R. (1975). Effect of group discussion on teacher attitudes toward risk taking in educational situations. *The Journal of Educational Research, 68,* 371–374.

Stake, R. E. (2013). *Multiple case study analysis*. Guilford Press.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). PLCs: A Review of The Literature *Journal of Educational Change, 7*(y), 221-258. doi: 10.1007/s10833-006-0001-8

Strange, M., Johnson, J., Showalter, D., & Klein, R. (2012). *Why rural matters 2011–12.* Retrieved July 10, 2011 from http://www.ruraledu.org/articles.php?idD2820

Strauss, A. L. (1987). *Qualitative analysis for social scientists.* New York: Cambridge University Press.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research.* CA: Thousands Oaks.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change, 7*(4), 221-258.

Talbert, J. E., & McLaughlin, M. W. (2002). Professional communities and the artisan model of teaching. *Teachers and Teaching: Theory and practice,* 8(2/4), pp. 325-343.

Theodori, G. (2003). The community activeness– consciousness matrix. *Journal of Extension, 41*(5), 1–3.

Theobald, P., & Nachtigal, P. (1995). Culture, community, and the promise of rural education. *Phi Delta Kappan,* 77(2), 132-35.

Thomas, G. (2011). *How to do your case study: A guide for students and researcher*. Thousand Oaks, CA: Sage.

Thomas, T. G. (2005). Teachers' decision-making about place-based education and state testing. *The Rural Educator,* 26(3), 19-24.

Thompkins, R., & Deloney, P. (1994). *Rural students at risk in Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.* Austin, TX: Southwest Educational Development Laboratory.

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry,* 16 (10), 837.

Unites States Census Bureau (2010). *United States summary: 2010 population and housing unit*. Retrieved from https://www.census.gov/prod/www/economic_census.html.

U.S. Department of Education. (2003). Paige announces grants to improve rural education. Retrieved December 18, 2013, from http://www.ed.gove/news/pressreleases/2003/11/1132003b.html

United States Department of Education, National Center for Education Statistics. 2012. *Common Core of Data, Public School Universe*. Retrieved from https://www.ruraledu.org/articles.php?id=3181.

Why Rural Matters, *2011–12. Data source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data, Public School Universe, 2008–09*

Versypt, J. J., & Versypt, A. N. (2013). *Mapping rural students' STEM involvement: Case studies of chemical undergraduate enrollment in the states of Illinois and Kansas*. Paper presented at the 120th ASEE Annual Conference & Exposition, Atlanta, Georgia.

Vescio, V., Ross, D., & Adams, A. (2007). A review of research on the impact of PLCs on teaching practice and student learning. *Teaching and Teacher Education, 24*(80-91).

Walkington, C., & Marder, M. (2013). Classroom observation and value-added models give complementary information about quality of mathematics teaching In Kane, T.J; Kerr, K.A, Pianta, R.C (Eds.); *Designing Teacher Evaluation Systems: New*

265

Guidance from the Measures of Effective Teaching Project. (pp. 234-277). San Francisco, CA: Jossey-Bass.

Wenger, E. (1998). *Communities of practice: Learning, meaning, identity* (First ed.). New York, NY: Cambridge University Press.

Westheimer, J. (1999). Communities and consequences: An inquiry into ideology and practice in teachers' professional work. *Educational Administration Quarterly*, *35*(1), 71-105.

Whitcomb, J., Borko, H., & Liston, D. (2009). Growing talent. *Journal of Teacher Education*, *60*(3), 207-212.

White, S., & Corbett, M. (2014). *Doing educational research in rural settings: methodological issues, international perspectives and practical solutions*. New York, NY: Routledge.

Wilson, S. M. (2013). Professional development for science teachers. *Science, 340*(6130), 310-313.

Wong, H. K., Britton, T., & Ganser, T. (2005). What the world can teach us about new teacher induction. *Phi Delta Kappan,* January 2005, 379-384.

Yarrow, A., Ballantyne, R., Hansford, B., Herschell, P., & Millwater, J. (1999). Teaching in rural and remote schools : a literature review. *Teaching and Teacher Education,* 15, 1-13.

Yin, R. T. (2012). *Applications of case study research*. Thousand Oaks, CA: Sage Publications.