2019

Mathematics Teacher Perceptions of Lesson Design, Data Reflection, and Achievement in Professional Learning Communities

Vicki Mashelle Bridges
Walden University

Walden University

College of Education

This is to certify that the doctoral study by

Vicki Bridges

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Cathryn White, Committee Chairperson, Education Faculty
Dr. Kathryn Swetnam, Committee Member, Education Faculty
Dr. Timothy Lafferty, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2019

Abstract

Mathematics Teacher Perceptions of Lesson Design, Data Reflection, and Achievement in Professional Learning Communities

by

Vicki Bridges

MA, Texas A&M Commerce, 2000

BS, East Texas State University, 1992

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Leadership

Walden University

December 2016

Abstract

In a north Texas school district, district administrators were concerned that mathematics scores at the target middle school have fallen below the state average since 2010. Despite professional development (PD) provided by the district, administrators believed that teachers were not using professional learning community (PLC) data reflection practices to improve mathematics performance. The purpose of this qualitative case study was to explore middle school teachers' as well as the administrative dean's perceptions of the levels of depth regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data analysis of student performance, and lesson design within PLCs. The conceptual framework for this study centered on the characteristics of Senge's learning organization theory, Hord's PLC characteristics, and DuFour's model of collaboration for improving student achievement within PLCs. Six participants from the target school included 5 Grade 7 mathematics teachers and 1 administrative dean. Data were triangulated from interviews, observations, and archival documents and analyzed using comparative and inductive analyses. Themes supporting the findings indicated the teacher need for additional PD in the areas studied. Recommendations in the position paper include the evaluation of PLCs. The resulting project may deepen understanding of PLC needs related to data discussion, lesson planning, and may contribute to PLC or PD policy-related changes in the district. Enactment of the recommendations will improve PLC implementation strengthening teachers' collaboration and instructional skills resulting in positive social change and increased student mathematics performance.

Mathematics Teacher Perceptions of Lesson Design, Data Reflection, and Achievement in Professional Learning Communities

by

Vicki Bridges

MA, Texas A&M Commerce, 2000

BS, East Texas State University, 1992

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

April 2019

Dedication

First and foremost, I thank God for giving me the determination to complete this study. The emphasis of my study is the result of colleagues, parents, and students in my professional life who inspired me to question student achievement outcomes under my leadership as a campus principal, and as a leader of principals. In part, this study is dedicated to family members who supported me to pursue my dream of becoming an educator. I also dedicated this research to my family who instilled the importance of work ethic, integrity, and honoring your word in my life. Thank you for always believing in me and the many prayers you voiced for my life and completion of this journey. To my lifelong friends, LeAnn, Ruth, Missy, Linda, and Suzy – just being able to pick up the phone and have a chat provided the perfect encouragement I needed to keep going. You have been there for every milestone, thank you for always supporting me. I am blessed to be called to be an educator with student-centered leaders involved in my life and a family built on a foundation of faith.

Acknowledgments

I would like to acknowledge my doctoral chair and hero, Dr. Cathryn White. Her guidance and direction has been a constant variable in this journey; without her I could have never completed my study. She demonstrated insight, patience, compassion, and wisdom as my coach providing continuous motivation. Additionally, I want to acknowledge Dr. Kathryn Swetnam, my committee member for her review, perspective, and suggestions to strengthen my study. Finally, I would like to recognize Dr. Timothy Lafferty, University Research Reviewer committee member, my editor Dr. Cody Arvidson, and all of my classmates at Walden University. I would also like to acknowledge my local district leadership for allowing me to complete this study. Members of the PLC at the study site provided the opportunity for this study to occur.

I began the EdD journey with one of my best friends and an amazing educator, Missy. She has been there for me every step. Endless conversations during the completion of courses at Walden and our dissertation process will be forever remembered as we discussed challenges that tested our resolve. We both faced significant personal and professional challenges and I'm so glad we have each other. Most of all we did it together and I'm so proud of us for hanging in and finishing. Thank you, Dr. Steger.

Table of Contents

List of Tables

Section 1: The Problem

Professional learning communities (PLCs) are among the most promising educational reform efforts. The benefits of PLCs for educators include reduced isolation of teachers as well as well-trained, informed, more committed teachers, and significantly, gains in academic achievement for students (DuFour, DuFour, Eaker, & Karhanek, 2004; DuFour & Mattos, 2013; Horton & Martin, 2013; Schlechty, 2011). When teachers and administrators effectively implement PLCs, faculty can shift the emphasis in schools from teaching to student learning (Horton & Martin, 2013).

Although the No Child Left Behind Act of 2001 (NCLB, 2002) continues to be one of the most significant and comprehensive education reforms that influences instructional decisions in schools. NCLB required implementing high levels of accountability by public school entities. NCLB established the goal for every student in the United States to perform at or above grade level on state benchmark tests by late spring of the 2014 school year. Mehta (2013) noted that NCLB legislation caused school administrators to search for systems to improve student achievement and narrow achievement gaps among student groups. Because of this national challenge, school district administrators sought to help teachers strengthen their teaching practices so that students could demonstrate achievement gains in every classroom. School districts' leaders also implemented systems for teachers' knowledge and skills acquisition and professional development (PD) programs, including PLCs (McGee, Wang, & Polly, 2013).

Because of the expectations included in NCLB (2002), Hill, Charalambous, and Chin (2018) explored how teachers devoted more time to core area subjects and searched for more effective teaching and instructional strategies. Hill et al. discussed the influence that NCLB had on district administrators and teachers in the areas of student achievement and teacher attitudes related to increased classroom expectations. With the implementation of NCLB, new legal mechanisms were created that became known as the accountability era among educators, and as a result, school district leaders were required to gather data and use the information to increase student achievement and to report data to state and federal governments (Darling-Hammond & McLaughlin, 2011; Imms & Byers, 2017; Walker, 2017). Standards within NCLB legislation required holding school administrators accountable by using a data sources, such as district benchmark assessments, beyond state-driven assessments of student learning as a more thorough process to monitor student achievement (Walker, 2017).

PLCs offer a structure for PD through which reform efforts, such as those outlined in NCLB (2002), have been implemented (Easton, 2016; Harris, 2011; Marzano, 2016). PLCs represent a school improvement initiative intended to increase student achievement by providing a structure to implement PD practices on any area the PLC deems is needed based on student data analysis in order to design to improve, and enhance teacher knowledge and practice (Huguet, Marsh, & Farrell, 2014; Wells & Feun, 2013). In an effective PLC environment, teachers have the opportunity to collaborate and examine issues influencing their students' learning (DuFour & Mattos, 2013; Hord & Sommers,

2008; Muñoz & Branham, 2016). Such issues include instructional planning, delivery and refinement of content, and reflection on student data to increase students' academic successes.

Leading strategic change in organizations is a difficult and time-consuming balancing act for campus administrators (Daly & Finnigan, 2010). Peurach (2016) suggested educators must learn to innovate change processes if they are to survive. As an organizational reform structure, PLCs are one avenue for PD in which large-scale school change and improvement can be achieved because students of teachers involved in PLCs tend to have improved scores on assessments (Wells & Feun, 2013). PLCs represent innovative change toward improving PD efforts in school districts (Teague & Anfara, 2012). This change to the use of PLCs represents a disruption to a traditional teaching model in which teachers act as independent contractors in their classrooms, and they plan and teach in isolation void of collaboration and daily focused communication and planning with other teachers (DuFour, DuFour, Eaker, & Many, 2010b; DuFour, 2014; Sappington, Pacha, Baker, & Gardner, 2012; Steeg, 2016).

Educational leaders implemented PLCs in schools as a conduit for school reform efforts (Reed & Swaminathan, 2016; Teague & Anfara, 2012). DuFour and Mattos (2013) defined PLCs as a group of educators who work together interdependently in collaborative teams. These educators share the commitment to achieve results with their students (DuFour, 2014). DuFour and Marzano (2011) identified four areas to represent the core principles of a PLC that include the following: (a) focus on learning ensuring

students learn to their fullest extent, (b) focus on working collaboratively, (c) use of student data to make continuous improvements to support student learning, and (d) use of accountability systems within the PLC for student results. Despite varying PLC definitions and structures, student-centered PLCs have a primary focus on striving for academic success for all students as well as creating opportunities for PD among teachers involved (Liberman & Miller, 2011; Schechter & Feldman, 2013).

Hall and Hord (2015) as well as Hong and Yehuda (2010) described the significant change K-12 students experience because PLC structures are implemented at a campus, which are considered a shift in the day to day culture of a campus. Such change initiatives, like PLCs, require organization members to break with past practices and acquire new skills and knowledge. PLCs provide a transformative experience that requires complex, nonlinear thinking and cognitive and pedagogical change from participants (Marzano, Warrick, & Simms, 2014). By design, PLCs may conflict with prevailing norms and values in schools. In a PLC, Huffman (2011) reported that members work together rather than in isolation to accomplish the following: (a) specify exactly what they need each student to learn, (b) monitor progress the students make toward learning what they need to learn, (c) assure students receive supplementary time and assistance via interventions for learning when they struggle, and (d) supplement students' knowledge when they become skilled at what they need to learn. This collaborative model offers an alternative set of practices to the isolation of teachers planning alone, within the walls of their classroom, in the absence of multiple perspectives regarding

approaches to instructional planning, delivery, and reflection on student outcomes.

DuFour, DuFour, and Eaker (2008) and DuFour and Mattos (2013) described the collaborative culture as the cornerstone of a PLC, where members of different content subjects and grade levels meet often to analyze student-learning data. For such a culture to exist, Hall and Hord (2011) and DuFour (2014) suggested that during the early implementation phase of PLCs, learning among participants could build the bridge between research and practice leading to the development of a collaborative culture. Change requires learning, and change cannot occur without professional learning (DuFour & Mattos, 2013; Hall & Hord, 2011). This study explored the implementation of PLCs in Green Hill Independent School District (GHISD [pseudonym]), located in North Texas, as a reform effort to support mathematics teachers' instruction and to improve Grade 7 mathematics student achievement.

The Local Problem

Background of Local Problem

The district in this study was a mid-sized North Texas suburban setting in a large metropolitan area serving a diverse student population of over 28,000 students. The ethnic makeup of the district consisted of 65% Hispanic, 18% African American, 12% Anglo American, 3.5% Asian, and .5% native Indian students (Texas Education Agency [TEA], 2017). Seventy-two percent of the students are on the free and reduced-price lunch program and classified as economically disadvantaged (TEA, 2017). At three campuses, students' mathematics scores trailed behind the passing rates exhibited by the

state. Table 1 represents the percentage of students meeting minimum state requirements (passing) in Grade 7 mathematics over the past 7 years as measured by the State of Texas Assessment of Academic Readiness (STAAR), which were administered to students in specific grades at the end of each academic year.

Data in Table 1 depict a STAAR passing range of 48% to 72% for Grade 7 students at the district's three underperforming middle schools tested for the years 2011 through 2017. Campuses A, B, and C were each significantly below the district and state passing averages. In addition, the overall percent of mastery for these target schools ranged between 8% to 16% below the average for other middle schools in the district's comparison cohort (TEA, 2011, 2012, 2013, 2014, 2015, 2016, 2017). Campus A was the middle school target site. Campus A implemented PLCs beginning in 2011, as did each of the district middle schools, but Campus A's Grade 7 mathematics achievement represented the lowest level of performance among the three underperforming middle schools.

Table 1

Texas Academic Performance Reports for GHISD's Underperforming Middle Schools on the Grade 7 Grade State Performance for 2011-2017

Year	State %	District %	Campus A %	Campus B %	Campus C %
2016-2017	70	68	50	68	51
2015-2016	69	67	58	68	51
2014-2015	68	69	59	72	50
2013-2014	68	67	48	64	56
2012-2013	72	69	60	65	61
2011-2012	71	64	62	67	49

Note. Data from the TEA (2012, 2013, 2014, 2015, 2016, 2017).

At the Grade 7 level in Texas, this lack of student achievement equated to an approximate 39% to 52% failure rate, with this same number anticipated to be labeled as dropouts in high school, without significant intervention occurring. The Grade 7 mathematics failure rate might be a symptom of a larger problem associated with PLC implementation and a failure to effectively collaborate and dialogue regarding student achievement within the PLC environment. All ninth-grade students were required to meet end of course (EOC) testing expectations in Algebra 1 to graduate (TEA, 2011). The district mathematics facilitator stated that the scale of remediation for Grade 7 mathematics skills in eighth and ninth grade was evident in the number of students enrolled in remediation classes. Three local campuses included Campuses A, B, and C, and each campus earned lower percentages of mastery for the state mathematics assessment compared to other campuses in the district, as seen in Table 1.

Feedback provided by district consultants stated teachers and campus administrators in GHISD appeared to be embracing the concept of PLCs with their application of training based on observation data provided to district administrators by consultants. Two months following the completion of the initial PLC training, campus PLC walk throughs were conducted with the outside consultants, district administrators, and campus administrators, resulting in the generation of baseline assessment data used to compile a district level report of progress. Walk-through observations indicated the following elements were present in four of seven middle school mathematics PLCs: (a) adherence to professional norms, (b) adherence to agenda by PLC facilitator, (c)

attendance by all team members, (d) and a focus on instructional planning. The three underperforming campuses, particularly Campus A, lacked evidence of instituting all of these elements. My study focuses specifically on the needs of Campus A.

The benefits of PLCs to both students and teachers were sufficiently recognized in the literature (DuFour, DuFour, Eaker, & Karhanek, 2010a; DuFour, Eaker, & Many, 2010; Harris & Jones, 2010; Hord & Sommers, 2008; Huffman, 2011; Jones & Thessin 2015; Spanneut, 2010; Trust, 2012; Wells & Feun, 2013). The noteworthy benefits of PLCs for teachers included PD (Linder, Post, & Calabrese, 2012; Woodland, 2016) and the establishment of collaborative supportive school cultures (Bay-Williams & Speer, 2012; Garrett, 2010; Kearney & Peters, 2013; Wong, 2013). For instance, in the local district, mathematics PD might occur during a PLC meeting and affords teachers the opportunity to embed PD activities, and new learning into their lesson plans in a collaborative planning environment. The collaboration afforded to teachers in such a setting allowed for deep descriptive content and pedagogy conversations to emerge as new learning for teachers in the PLC (Hunter, 2010; Jones & Dexter, 2014).

Teachers need an environment supportive of collaborative inquiry, the value difficult work, openness to risk taking, and professional growth. In such an environment, the processes within a PLC encouraged members to share their professional practices with each another as they sought the best outcomes for their students (McDonough, 2013; Slavit, Kennedy, Nelson, & Deuel, 2011; Winkelmes, 2013). A review of campus master schedules showed that GHISD district structures were geared toward supporting

organizational change afforded teachers a conference period and a common PLC content planning period as part of the mathematics teachers' academic day. During PLC sessions, GHISD teachers planned horizontally at the same grade level and worked on student goals as a PLC team to align curriculum, to plan lessons, and to reflect on content-specific student data, such as content for mathematics.

According to McLaughlin (2011), when administrators provided a setting for teacher collaboration, teachers acquired the confidence to address student needs in teacher planning processes, which ultimately yielded increased student achievement. The administrators in GHISD believed providing PLC time for teachers to collaborate would: (a) increase the quality of lesson design, (b) increase the effectiveness of delivery, and (c) provide time for teacher reflection and refinement of lessons (B. Jacobs [pseudonym], personal communication, January 8, 2011). Bruce, Flynn, and Stagg-Peterson (2011) suggested that the individual development of teachers alone does not empower them to engage in working together on ways that improve student achievement. Collaboration among teachers was a key concept for teachers in PLCs needing to share insights into best practices, independent struggles with content knowledge, and teaching practices based on analyzing student performance data (DuFour et al., 2010; DuFour & Mattos, 2013). Following 4 years of PLC implementation and PD, GHISD district administrators sought to understand why student achievement scores in Grade 7 mathematics at Campus A had not increased as reflected in the state and local district accountability measures (TEA, 2011, 2012, 2013, 2014, 2015, 2106, 2017).

In 2011, the GHISD made a significant financial investment in staffing ratios to provide additional PLC time as well as extensive PD prior to the new PLC program launch in 2012. In order to provide teachers time during the day for collaboration, district leaders approved adjustments to campus master schedules. In previous years, campus-staffing ratios did not include staff to cover this period during the instructional day. Additionally, beginning in 2012, each of the district's middle school campuses received continuing PLC PD based on district and individual campus needs. The PD continued in 2013 and 2014).

PLCs were introduced in GHISD's seven middle schools in each of the four core content areas of mathematics, English language arts (ELA), social studies, and science. The district's administrators expected the result would increase student achievement for each of the core content areas because PLCs would improve teacher knowledge and practices through collaborative settings. Recognizing the previous district structure of teachers' planning in isolation, district leadership provided PD and support for teachers and campus teams while they launched the PLCs as a reform effort to support teachers' instruction and improve student achievement.

The district also provided additional resources in the form of personnel through adding a campus dean of instruction at each middle school to support and facilitate the design of the new PLCs. The academic deans are administrators and a participating member of each grade level PLC. Each of the seven campuses had this personnel unit in place prior to the initial PD that was provided to the campus teams GHISD cultural

norms expected by the district superintendent of teachers at each campus were to incorporate the following when teaching middle school children. The cultural norms were conveyed to GHISD teachers at new teacher training each August and included the following:

- Implementing a vertical and horizontally aligned district curriculum
- Using the 5E model of instruction that involves engaging, exploring, explaining, elaborating, and evaluating
- Using student data to drive the decision-making process for student support and interventions
- Offering a deep focus on collegial relational capacity building through the implementation of PLCs
- Developing intentional leadership development

Six days of PD were provided to every district secondary campus PLC team by outside consultants who focused on the protocols for the operation of PLC meetings and the processes that encouraged teacher collaboration with a focus on data reflection within a PLC environment. The outside consultants hired by GHISD recommended that the administrators introduce PD elements that included the elements of PLCs to be used as guidelines and grounding practices for the successful implementation of PLCs in GHISD schools. These PLC components were comprised of the following: (a) shared values for a shared vision, (b) application of collective learning, (c) supportive conditions, (d)

collaboration leading to collective practices, and (e) shared and supportive leadership (Hord, 2004).

GHISD also addressed the need for a designated space or area on campus for PLCs to be able to collaborate and conduct their PLC meetings. Principals were asked to find a room to ensure that not only time was provided but also space were provided to plan and develop lessons in a collaborative setting allowing for participation among PLC members. At four of the seven middle school campuses in GHISD, the PLCs produced data suggesting teachers focused on improving student learning (B. Jacobs [pseudonym], personal communication, May 15, 2011). These four middle schools continued to perform at academically acceptable levels on the Grade 7 STAAR mathematics assessment (TEA, 2012, 2013, 2014). However, the three underperforming middle schools, including Campus A, failed to generate the same level of academic results on the state mathematics assessment (TEA, 2012, 2013, 2014, 2015, 2016, 2017).

Despite the districts administrators' reform efforts using PD and PLC implementation to improve mathematics instructional strategies, lesson design, and data reflection regarding student mathematics achievement, scores remain unchanged at the three underperforming middle schools. Based on feedback from district facilitators and strategists visiting the underperforming campuses, Campus A's PLC missed the following structural elements: (a) use of agreed upon professional norms during PLC meetings, (b) consistent use of and adherence to agendas in PLC meetings, (c) engagement of all team members in lesson design during PLC meetings, (d) focus on

student data reflection during PLC meetings, (e) team members' preparation for PLC meetings, and (f) preparation and availability of materials for PLC meetings. GHISD leaders believed these PLC elements, if structured correctly within PLCs, and implemented PLCs according to the district's expectations, would provide the means for teachers to improve student learning, thereby positively affecting student achievement on STAAR (Wells & Feun, 2013). Thus, the focus of the study was addressing the problem at Campus A, which demonstrated the lowest Grade 7 mathematics achievement among all of the district's middle schools.

Definition of the Local Problem

There is a problem in GHISD with the implementation of mathematics PLC processes at Campus A. The underperforming middle school campus' students have not produced adequate Grade 7 mathematics achievement scores. This problem has occurred despite the district administrators' efforts to support and grow PLCs as a resource for middle school mathematics teachers. Despite adequate district training regarding the implementation of PLCs, the low performing middle school campus might not effectively use the mathematics PLC to improve student achievement (personal communication, April 14, 2011). Campus A, in particular, demonstrated the lowest Grade 7 student mathematics performance and was the focus of this study.

A symptom of the problem of poor PLC implementation was, perhaps, the high percentage of Grade 7 students failing to pass the state mathematics assessment over the previous 5 years at Campus A. Thirty-eight percent of the Grade 7 students at Campus A

in 2011-2012 failed the state mathematics assessment (TEA, 2013). In 2012-2013, Campus A had 40% of Grade 7 mathematics testers fail the state assessment (TEA, 2013). In 2013-2014, 52% failed; in 2014-2015, 41% failed; in 2015-2016, 41% failed; and in 2016-2017, 50% failed (TEA, 2014, 2015, 2016, 2017).

Challenges faced by those desiring to implement PLCs included lack of administrative support (Gulamhussein, 2013; Lunenburg, 2010), a lack of teacher leadership (Harris & Jones, 2010; Morrison, A., 2013; Werts & Brewer, 2015), and resistance to collaboration. Each of these challenges represented barriers to PLC implementation and success as described by (Jones, & Thessin, 2017; Lujan & Day, 2010). The development of data reflection and lesson development processes between teachers within PLCs was intended to increase student achievement within the district's seven middle schools (personal communication, January 8, 2011).

A qualitative case study that explored teachers' and the administrative dean's perceptions of a mathematics PLC targeting Campus A, an underperforming middle school allowed me to more deeply understand the challenges that the seventh grade mathematics PLC is having related to PLC implementation. Consequently, I studied teachers' and the administrative dean's perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at Campus A, which had displayed the lowest performing mathematics achievement in GHISD's middle schools.

Rationale

In this study I explored concerned teachers' and the administrative dean perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at Campus A. In order to discern the nature of the PLC implementation, I needed to develop an understanding of how PLC members implemented PLC processes at Campus A. I used data reflections, lesson design, dialogue processes, and the components of effective PLCs. I followed the execution of the PLC as modeled by the consultants during initial PLC district-wide PD. Campus A demographics and AEIS data are listed in Table 2 in comparison to the district and the state.

GHISD data were analyzed by consultants and district administrators to understand the progress of PLCs within the district (PLC consultants, personal communication, 2012). The six structural elements of effective PLC implementation, as demonstrated by the consultants upon initiation of this innovation, were not observed in Campus A PLC meetings (personal communication, January 8, 2011). However, GHISD leaders lacked information about the Campus A teachers' perceptions related to PLCs and how they used collaboration time within the PLC structure. A case study using the lowest performing among the three underperforming middle schools provided data to help to improve the effectiveness of mathematics PLC implementation as a valuable effort for the district administrators seeking to prepare Grade 7 mathematics teachers to increase

student knowledge in mathematics, which improved student achievement scores on the STAAR test.

Evidence of the Local Problem

Increased accountability for student learning across the nation has caused for administrators in school districts to seek out systems of improvement to increase student learning (Drago-Serverson & Blum-DeStefano, 2012; Drago-Serverson, Blum-DeStefano, & Asghar, 2014). One such method of systemic improvement has been the implementation of PLCs within local schools. The rationale for this study was the need to explore teachers' perceptions of PLC collaboration and depth of understanding regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data reflections of student performance, and lesson design within PLCs.

Table 2
Target Campus A's AEIS and Demographic Data

Indicators	State %	District %	Campus A%
Attendance	95.9	95.9	95.4
Mobility	18.2	22	25
Student Teacher Ratio	14:1	15:6	15:1
Avg. Years of Teacher Experience	11.4	9.2	7.8
Economically Disadvantaged	59	72	81
English Language Learners	16.9	25	22
At-Risk	46.3	59	59.9
Hispanic	50.3	62	62
African American	12.9	16	21
White	31.2	14	14

Asian	3.4	3.1	0.7

Note. Data from the TEA (2011-2016).

Teams of professionals who collaborate with each other improve students' chances for earning higher scores on state assessments (Bausmith & Barry, 2011; DuFour, 2014; DuFour et al., 2010a; Ermeling & Gallimore, 2013; Hord & Tobia, 2012; Reed & Swaminathan, 2016; Senge, 2006). Stewart and Aldrich (2015) and Cherkowski, Hanson, and Kelly (2015) argued that collaboration among professionals in an organization is necessary to leading an organization and achieving extraordinary results. Senge (2006), Hord and Tobia (2012), and Wells and Feun (2013) referred to such collaboration as learning teams and one of the core disciplines needed for an organization to succeed.

GHISD administrators sought improvement reforms to increase teacher collaboration and to focus on lesson design dialogue using student achievement as the focal point of this research in a response to meet accountability requirements by increasing student achievement as outlined by the state and requirements specified in NCLB (2002), GHISD administrators thought that the implementation of PLCs district wide would promote more teacher and student-centered PD to address the gaps in student learning as found in research by DuFour (2014) and Ermeling and Gallimore (2013).

Given the underperformance by middle school Campus A, district officials had concerns about the effectiveness of collaboration and levels of collaborative dialogue within the mathematics PLC at the Campus A. Creating a positive teacher-driven collaborative change within PLCs at the local level could lead to long-term growth for

students and teachers (Reed & Swaminathan, 2016; Taylor, 2010; Wells & Feun, 2013). The problem I sought to explore in this study concerned teachers' perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment including the implementation components as introduced in district PLC PD. Campus A, the middle school target site, implemented PLCs beginning in 2011, as did the other remaining six district middle schools; however, Campus A represented the lowest Grade 7 mathematics achievement among the three middle school mathematics PLCs, which had low Grade 7 mathematics achievement scores.

Evidence of the Problem Within the Larger Population

At the national level, teachers bear primary responsibility for meeting standards as measured on standardized tests in mathematics, science, and ELA (Bruce & Flynn, 2013; Reed & Llanes, 2010; Reed & Swaminathan, 2016). At the local level, irregularities in PLC practices, which Campus A demonstrated, affected not only stakeholders within the immediate school community, but also the larger community, state, and nation as a whole (DuFour & Marzano, 2011; DuFour & Mattos, 2013). DuFour (2014) suggested that data should be collected, analyzed, discussed collaboratively, and used to improve teaching. Wells and Feun (2013) found in their researchy teachers participating in PLCs have the passion and desire to work together planning lessons and sharing resources. However, during PLC sessions, Wells and Feun observed middle school teachers failing to analyze data effectively within the collaborative process or see it as a priority.

Many of the challenges faced by those desiring to implement PLCs included lack of administrative support (Lunenburg, 2010; White, 2014), a lack of teacher leadership (Harris & Jones, 2010; Morrison, A., 2013), and resistance to collaboration. Each of these elements represented barriers to PLC implementation and success as described by (Swearingen, 2014). Hall and Hord (2011) found that understanding the efforts of teachers to create a new culture of how schools should function is important to promoting change but is often an overlooked step during implementation of the change process.

A recurring theme regarding PLC implementation is the challenge of changing a schools' culture so the work of teachers in PLCs can create meaningful transformation (Huffman, 2011; Jennings & Bearak, 2014; Wells & Feun, 2013). Senge (1990) argued for the tenets of systems thinking and applied those tenets to the needs of organizational management to create a seamless change model that emphasized an intrinsic connection to the larger whole. In this seminal work, Hord (1998) emphasized that collaboration between PLC members must be both constant and consistent, as the highest priority of a PLC, so the staff has time to develop relational trust and depend on the group's effort.

The benefits of PLCs to both students and teachers have been well documented in the literature (DuFour et al., 2010b; Ermeling & Gallimore, 2013; Harris & Jones, 2010; Hord & Sommers, 2008; Huffman, 2011; Schechter & Feldman, 2012; Spanneut, 2010; Trust, 2012; Wells & Feun, 2013). The significant benefits to teachers include embedded PD (Linder et al., 2012) and the establishment of a collaborative, supportive, school culture (Garrett, 2010). Morgan (2015) noted that demonstrating high levels of

collaboration among teachers focused on improving instructional planning led to increased student achievement.

GHISD local administrators have worked to provide a supportive collaborative environment for teachers to improve their instructional planning and data reflection processes at three underperforming middle schools based on the state's student achievement data. A case study was conducted to determine the effectiveness of the Grade 7 mathematics PLC at the lowest performing middle school, Campus A. In this study, I sought to more deeply understand the processes being used in the PLC in order to improve the PLC's functioning and thereby possibly result in improvement of student learning in Grade 7 mathematics as measured by state and local assessments, such as STAAR.

Definition of Terms

The following definitions provide the specific meaning of key terms used in the context of this project.

Achievement gap: When one group of students (e.g., Hispanic) outperforms another group (e.g., White), such as when the difference in scores on the same assessment between the two groups is statistically significant ($\pm$ 5 pts), an achievement gap is prominent (TEA, 2010).

Relational trust: Cranston (2011) defined relational trust with detail in the following:

> In the discourse of learning communities, the notion of trust is articulated as being relational in its orientation and developed around group norms of safety, risk-taking, and change orientation. The existence of relational trust appears to have the effect of fostering collaboration and promoting willingness among staff to grow professionally. Because relational trust appears to be critical to the functioning of a professional learning community, it may be unlikely that substantive school improvement can be achieved without close attention. (p. 59)

Student achievement: Student achievement in this study refers to the quantity of academic content students learn each year as measured on STAAR (TEA, 2013).

State of Texas Assessment of Academic Readiness: STAAR is the assessment used by the state of Texas to determine if public school students meet the academic performance standards at grade level. The academic performance standards are represented as the minimum passing scores on the STAAR test that result in placing students into exceeding, meeting, or not meeting standard based on student achievement scores, school progress, and closing the gaps in student achievement in terms of socioeconomic status and ethnicity (TEA, 2017).

Significance of the Study

This study is significant because the problem being studied is the implementation of mathematics PLC processes at Campus A. Students have not produced adequate Grade 7 mathematics achievement scores. Leadership staff efforts to buttress and cultivate PLCs as a resource for middle school mathematics teachers have not been successful as

assessment scores have remained low. Identifying teachers' perceptions of PLC collaborative processes as related to their professional knowledge and skills regarding middle school mathematics instruction may enable the district to adjust its PLCs' processes in order to improve teachers' ability to facilitate increases in Grade 7 students' mathematics achievement. I explored teachers' perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment. The PD offered for data reflection and lesson development processes between teachers within PLCs was expected to lead to an increase in student achievement within the district's seven middle schools (personal communication, January 8, 2011). The problem with Campus A, as observed by district administrators, was perceived as resistance to change on Campus A. Other explanations for this problem may have included a gap in teachers' understanding about how to benefit from PLC participation or trust of each other within the PLC environment, lesson design development, or a data reflection process that incorporates a systemic 9-week approach within the PLC (district consultants, personal communication, 2012). Meirink, Imants, Meijer, and Verloop (2010) and Wells and Feun (2013) pointed out that the structure and implementation of PLCs effectively facilitates the kind of collaboration and communication that nurtured reflective practice and continuous learning.

Through the collection of these data, I was able to identify several themes associated with PD needs as expressed by the members of the mathematics PLC at the target site. Exploring teachers' perceptions regarding effectiveness of PLC efforts

provided insight into how teachers at the underperforming middle schools reflected on student data and engaged in continual cycles of inquiry in their efforts to improve student performance (DeMonte, 2013; Gulamhussein, 2013; Tanner, 2011; Thomas, 2011). Exploring teachers' participation in a Grade 7 mathematics PLC through observations led to a deeper understanding about how PLC processes and practices can engage in data reflections and about how teachers engage in PLC participation when focusing on student data dialogue discussions in order to facilitate student learning.

Data collected from participants revealed their perceptions were positive toward the benefits of collaborating professionally and the impact collaboration had on student achievement. However, teachers also indicated their processes could be refined to improve their effectiveness. Teachers suggested needing more training in the areas of lesson frame components, ownership of the data reflection processes, and learning focused on using data to recognize student-learning gaps. The participants' PD suggestions helped to shape a project benefitting both GHISD leaders and future PLC members. Their suggestions led to the development of a menu of PD options based on the individual learning needs of teachers, which differ from common PD methods that tend to be prescribed and universal. The use of a research-proven, systemic-diagnostic evaluation model focused on individual teacher concerns/needs to aid and support all district PD offerings.

Research Questions

The following questions guided this case study about teacher perceptions related to lesson design and data reflection practices in a mathematics PLC environment for supporting the review of data and dialogue in the PLC. More collaboration leads to greater specificity on what students need to learn and how teachers need to deliver content. This in turn leads to student improvements in learning of mathematics by students that could possibly result in improving students' performance on the state mathematics assessment. The following research questions (RQ) guided this study:

RQ1: How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement?

RQ2: What processes do PLC members perceive they use to reflect on student mathematics data in their PLC?

RQ3: How do members participating in PLCs respond when data reflect a gap in student learning based on PLC observations?

Review of Literature

PLCs represent a school improvement initiative intended to increase student achievement by improving the professional practices designed to improve and enhance teacher knowledge and practice (Huggins, 2016; Lee, 2010; Lewis, 2009; Williams, & Johnson, 2013). In an effective PLC environment, teachers have the opportunity to collaborate and examine issues influencing their student learning (DuFour & Mattos, 2013; Hord & Sommers, 2008). Such issues include instructional planning, delivery of

content, refinement, and reflection on student data. In this literature review, I reviewed evidence of the benefits of organizing schools as PLCs. Support exists among researchers and educators to organize schools in a process aligned with the foundational structures and characteristics of PLCs (DuFour, 2004, 2014; Easton, 2016; Prytula & Weiman, 2012).

This section's conceptual framework includes the characteristics of Senge's (1990) learning organization theory and the seminal work of Hord's (1997, 2004) PLC characteristics, providing support for the use of PLCs as a school reform effort. The conceptual framework for this project also includes the research and implementation of Hord's research as well as DuFour et al. (2010b) PLC models, supporting collaboration within PLCs as an initiative to increase student achievement. I also used Hord and DuFour's work to address the broader problem of student learning associated with the local problem of PLC implementation as a means of school improvement.

Conceptual Framework

The beginnings of PLCs are based on the early works of Senge (1990). Senge's (2006) work on learning organizations had a profound effect on the business community, which led to substantial changes in the structures of many corporate organizations. Both Senge's learning organization paradigm as well as Hord's (1997, 2004) conceptual models of PLCs fit within the framework of Vygotsky's (1978) constructivist theory. These connections are discussed below because the research questions for this project

were structured to gain insight into teacher perceptions and data reflection practices as part of the PLC collaborative process to improve student learning and achievement.

Senge (1990) defined learning organizations as environments that allow members to expand their capacity, to take risks and dream, develop patterns of thinking as a team, and see the vision together. Senge (2006) added that "the environments of learning organizations enable individuals to take risks and expand individual capacity to think comprehensively, seeing the whole picture as a collective group achieving the results they desire" (p. 4). The PLC offers this type of dynamic learning organization to participating teachers in a social setting.

Vygotsky (1978) hypothesized that learning is a social activity. Educators work within a social environment to share and develop new ideas with one another. Thus, learning as an exchange among individuals reflects the constructivism aspect of learning. Burnett (2010) asserted that studies in the neuroscience field substantiate the claims of constructivist theory. In particular, the human brain needs exposure to experiences that are interesting and stimulating; when this stimulation of the brain occurs, individuals increase knowledge and understanding as they construct an understanding of the world through purposeful interactions with the environment and others (Ippolito, 2010). From the social constructivist perspective, learners are not only students, but also teachers who must also continue to learn, shifting from isolationism and teaching to collaboration and student learning. One of the commonly noted school cultures is isolationistic, in which teachers teach in the same building but seldom communicate about their professional

practice (Liljenberg, 2015; Lippy & Zamora, 2012). One aspect of Vygotsky's theory, the zone of proximal development (ZPD), is described as the distance between what a learner can do unaided and what the learner can do when directed by others. PLCs provide the setting for teachers to guide each other as learners in a social group (Jones & Dexter, 2014; McDonough, 2013; Purzer, 2011).

Social development theory provides a framework in which teachers can develop a shared vision and values, collaborate and have shared practice, and experience environmental changes through supportive leadership. This framework directly supports the implementation of PLCs. Senge (1990) described this kind of professional leadership as a team of professionals working in a learning organization. Learning organizations, where members pledge to learning and acting with new knowledge, can create change and influence the organization and its individuals. Bruce and Flynn (2013) suggested that collaboration has not typically been a common method for lesson planning. Such collaboration through the structure of the PLC requires a change in how teachers view their work.

Senge understood that change within any organization is difficult and change must be embraced by those within the organization. Moreover, changing a complex entity like the educational system of the United States is an overwhelming task (Senge, 1990). Senge (2006) suggested that "empowering people to generate creative solutions to problems as teams" led to solutions that increased effectiveness over having them perform in isolation (p. 11). "Teaming is vital because teams, not individuals, are the

fundamental learning unit in modern organizations" (p.12). Senge argued that "early in the life of a learner, experiences within society encourage the learner to break problems apart and work independently to complete tasks" (p.4). While working alone on complex tasks makes the task manageable, Senge believed that when working in isolation, people do not see the consequences of their actions and are disconnected from the larger whole. Fwu and Wang (2012) discovered in their qualitative study of teachers from different experience levels that collaboration did not occur naturally. Instead, they found that collaboration among teachers was a process that needed development with a consistent focus on using processes and dialogue to guide their collaboration (Fwu & Wang, 2012; Yin, Lee, & Zhang, 2013).

For the purposes of this literature review, the works of Senge (1990), Hord (1997, 2004), and DuFour (2004, 2003; & DuFour & Eaker, 1998) were examined as three models of PLCs. The characteristics of each included a comparison of five conceptual topics and commonalities in each model. Hord's (2009) research as well as that of DuFour and colleagues (2010a, 2011, 2013) provided information for a critical review of the broader problem associated with PLC implementation as a school improvement effort in the local district.

Senge's learning organizations and team learning. Senge (1990) focused on corporate America workers and their professional desire to be part of nurturing and supportive environments conducive for collective and shared visions in business models. Learning organizations allowed members to expand capacity, take risks and dream,

develop patterns of thinking as a team, and achieve the vision together (Senge, 1990). Senge (1990) used the principles of systems thinking and related them to the learning structures organizational management needs in order to create a uniformed business model that emphasized an inherent relation to the larger whole. Senge conducted research-using systems thinking as a starting point for change in educational institutions and asserted that schools can benefit from this model as well. Striving toward a common objective, stakeholders are interdependent, and intrinsically motivated to achieve success, as the success of the group is equivalent to individual and personal success.

Learning organizations differ from other typical corporate organizations because the learning tends to be higher and to occur frequently in learning organizations (Erdem, & Ucar, 2013). The intent of learning organizations, as a management approach, is to create a structure or team that is self-managed (Balay, 2012). Therefore, members in learning organizations can learn from oversights and practices and consider inquiry and knowledge as the generator of change and development (Erdem, & Ucar, 2013). The processes found in learning organizations appear to be similar to Senge's constructs of shared vision and team learning.

Senge (2006) theorized that learning organizations attain success when they adhere to the five disciplines of a learning organization. Each discipline depicts, as quoted from Senge (2006), understanding of the learning organization as extended to learning communities and PLCs as follows:

- personal mastery

- mental models
- shared vision
- team learning
- systems thinking. (p. 6)

Because learning takes place in environments where change and improvement are embraced, a learning organization must be willing to adopt the fundamental philosophical principles that support continual improvement as a measure of organizational success (Senge, 2006). Learning organizations recognize and value the personal mastery each individual brings to the team. In the next section, I discuss the individual importance of the five disciplines.

Personal mastery. Personal mastery is greater than developing and refining a skill set; individuals within the organization who strive for personal mastery have a deep sense of purpose based on their personal vision, and they continue to develop their practice to improve the current reality (Senge et al., 2000). Senge (2006) indicated that successful learning organizations involved individuals who strive for personal mastery and share their knowledge with others in order for the organization to move forward in continuous improvement. Mustafa and Ibrahim (2013) discovered that in the personal mastery dimension, teachers recognized individuals who wanted to develop professional practice within their school. Mustafa and Ibrahim (2013) also found teachers willing to share their experience and personal knowledge with others in a collaborative setting. These findings align with Senge's (2006) argument that striving for personal mastery through lifelong

learning is less a reactive response than a spiritual, relationship-sharing action involving seeking knowledge and understanding. One other important factor of personal mastery is the willingness of each individual and groups of individuals to feel safe in confronting issues, asking questions, and exploring information to (Bloom & Vitcov, 2010). Personal mastery may often influence the mental models developed by members in a learning organization (Bloom & Vitcov, 2010; Imms & Byers, 2017).

Mental models. The mental models describe how individuals interpret the world based on their own mental maps, which cover the landscape of deeply ingrained assumptions (Senge, 2006). People tend to create mental portraits and images that affect their understanding of the world and how individuals decide to react to their perceptions (Senge, 2006). Senge recommended that individuals' mental models, beliefs, and perceptions be shared and tested by others in an organization environment. In the education setting, teachers described the dimension of mental models as feeling comfortable sharing their views with the individuals throughout their schools and asserted that sometimes they make enhancements with a purpose toward personal growth and PD (Mustafa & Ibrahim, 2013). The process of sharing beliefs, perceptions, and mental maps encourages dialogue and challenges individuals' thinking to expand meaningful conversations that balance inquiry and advocacy (Senge, 2006). Mental models or maps are incorporated in building the vision in a learning organization.

Shared vision. Building a shared vision inspires organizations to develop a collective vision where personal mastery and mental models of each member adds depth

to the learning organization. A shared vision provides members with the opportunity to create a mental picture of what could be, which causes members to aspire to Senge's (1990) vision that claimed a shared vision is necessary for a learning organization to exist. Hipp and Huffman (2010), and Liljenberg (2015) argued that a school is not a true PLC school without a shared vision. As the shared vision becomes clearer and individuals within the team internalize the vision, members are apt to take risks for the sake of achieving the vision (Senge, 2006). Organizational leaders build capacity in an organization by getting their members to learn and work together. Mustafa and Ibrahim (2013) found personnel who are dedicated to the organization create added assets to achieve team goals by spending additional time in the organization and developing positive relationships that increases performance allowing them to make professional contributions to the organization.

Daly, Moolenaar, Liou, Tuytens, and Del Fresno (2015) and Moolenaar, Daly, and Sleegers (2010) argued for organizations to have clear hopes, beliefs, and commitments to the organization in addition to skills in order to transform the organization into a competitive and high-performing entity. In the shared vision dimension, teachers found their organization to clearly state goals and actions in their schools. When members of the organization internalize the vision, see their connection to it, and adopt it as their own, deeper commitment to the vision grows. The members of the PLC possess the shared vision.

A shared vision allows teachers to communicate the goals of the organization clearly and accurately (Mustafa & Ibrahim, 2013). Sometimes implementation and application of PLCs are put into action after teachers' opinions are gathered, often leading to the development of actions needed before problems surface rather than after problems occur. Senge (2006) further observed that a strong, compelling shared vision connects people and creates the togetherness to pursue goals toward realizing the organization's vision.

Teaming. When individuals learn together, they add depth to the organizational structure and increase the intelligence of members within the organization (Senge, 2006). Senge (1990) defined team learning "as the activity of bring into line and increasing the ability of a team to generate results members desire and to build on the discipline of developing the shared vision identified team learning as involving sharing insightful thoughts about complex issues, innovation and coordinated actions, and roles with team members" (p.10). Without the team members learning together, the organization's vision, values, and mission as well as individuals' personal mastery and mental models add little to organizational success (Senge, 2006). Teams of people working together create the learning and action needed to empower the organization (Senge, 1990).

Senge (2006) narrowed the importance to one characteristic needed in teams: ongoing learning. When the team is learning and producing results collaboratively, its members increase their personal mastery much faster than growth could have occurred otherwise (Senge, 2006). Not only is the team learning new information at a faster rate,

but also the individual team member is increasing his or her knowledge and is benefiting from the team experience. Researchers asserted that learning communities are resourceful opportunities for professional staff development (O'Malley, 2010; Jimerson & Wayman, 2015). In many schools throughout the United States, a lack of professional collaboration among teachers is a recognized problem limiting teacher effectiveness and ultimately affecting student achievement (Imms & Byers, 2017; Patel, Franco, Miura, & Boyd, 2012). The learning of professionals is focused on student data and future steps, such as new professional learning, to bring about desired student and school outcomes (Condron, Tope, Steidl, & Freeman, 2013; Ermeling & Gallimore, 2013; Hipp & Huffman, 2010). Erdem and Ucar (2013) suggested that quality teacher growth and development cannot occur individually, but that teacher growth must take place in a collaborative environment with other teachers focused on working together to increase student achievement.

Consistent teacher interaction is needed if collaboration is to improve student achievement. Moolenaar, Sleegers, and Daly (2012) found PLCs to be effective means to study teacher collaboration. Strong connections among educators are as important to school reform and school components as a trusting and innovative climate (Daly, Liou, & Moolenaar, 2014a; Imms & Byers, 2017; Santagata & Guarino, 2012). Researchers found the depth of a teacher's network is linked to the degree to which the following occur: (a) teachers take chances to improve their school, (b) teachers continuously study and try to improve their lesson planning and delivery, and (c) during reform, teachers communicate

daily, making decisions about instruction (Cherkowski et al., 2015; Daly, Moolenaar, Bolivar, & Burke, 2010; Moolenaar et al., 2012; Stewart & Aldrich, 2015).

Woodland, Lee, and Randall (2013) applied a quantitative survey to the connection between student achievement, teachers' communication networks, and teachers' perceived collective efficacy in 53 elementary schools. Teachers' perceptions of effectiveness were influenced by professional and personal advice networks, which resulted in increased student achievement. Woodland et al.'s findings supported the probability of robust teacher interactions within a work atmosphere designed to benefit student achievement. "As such, teaming serves as an intervening variable that may explain how dense social networks (PLCs) among educators may ultimately benefit student achievement" (p 253). "Although collective efficacy beliefs may not be the sole mechanism through which teachers' networks affect student achievement, it is indeed a significant mechanism" (p 259) (Moolenaar et al., 2010). Erdem and Ucar (2013) "found in the team-learning dimension, teachers surveyed stated that they are usually eager to take responsibility in a team and would be pleased to do so" (p. 1531). Teachers stated that instructional activities such as planning are often carried out through teamwork in their schools. Teaming is necessary for a group to establish a systems' thinking approach to their work.

Systems thinking. Systems thinking is the final structure of Senge's framework. Systems thinking, also referred to as the "fifth discipline, is the fundamental structure that integrates the other four disciplines that fall under the umbrella of core disciplines: (a)

personal mastery, (b) mental models, (c) shared vision, and (d) team learning" (Senge, 2006, p. 12). Systems thinking entails viewing the organization as a whole because an organization's facets are interconnected and make up the entire system. Senge (2006) claimed people in organizations often focused on segments of the system rather than the entire system dynamic, a common mistake in management.

Review of the Broader Problem

Using the framework of Senge's organizational learning structure, Hord (1997) was credited with conceptualizing and coining the term PLC in educational settings. In the next section, I reviewed current literature supporting the research of Hord and DuFour's work related to effectively implementing PLCs and the possibility of PLCs increasing student achievement. The search strategy for this literature review began with an initial focus on educational organizational theory grounding characteristics of effective PLC implementation. I used the following databases to locate peer-reviewed articles published in the last 5 years in the Walden library were used: EBSOhost, ProQuest, Google Scholar, Education Research, SAGE, dissertations, and multiple books. Additionally, peer-reviewed articles from scholarly journals, reports and public data from state organizations, and books were the primary sources I sought. Search terms were *accountability*, *collaboration*, *constructivism*, *data reflection*, *learning organizations*, *middle school, PLC*, *school improvement*, *student achievement*, *teacher collaboration*, pedagogy of lesson design, and *teacher planning.* The literature review that follows

includes an examination of the peer-reviewed literature related to PLC implementation, DuFour's PLC model, and accountability.

Hord's five dimensions of PLCs. Since Senge's (1990) introduction of innovative, systems-thinking organizations, other researchers have added credibility and influence on the constructs of learning organizations through the creations of PLCs. Hord (1997, 2004) built a PLC model extending the work of Senge's learning organizations to classroom environments. Hord (1997) received the credit for conceptualizing and coining the term PLC in educational settings. Hord (1997, 2004, 2007) identified and defined the following five structural dimensions as necessary in effectively functioning PLCs: "(a) shared beliefs, values, and vision; (b) shared support and supportive leadership; (c) collective learning, including the application of learning; (d) supportive conditions; and (e) shared professional practice" (Hord, 2007, p.1). Hord (2004) based the definition of educational PLCs on empirical research.

Fulton and Britton (2011), Hall and Hord (2014), as well as Reed and Swaminathan (2016) additionally identified characteristics such as shared values and goals, collective responsibility, and strong administrative support as crucial roles in the success of a PLC. Other characteristics generally associated with the term PLC include: (a) an organization that facilitates collaboration (Elbousty & Bratt, 2010; Stewart & Aldrich, 2015), (b) a perception of mutual support among faculty (Sleegers, Thoonen, Oort, & Peetsma, 2014; Woodland et al., 2013), and (c) a pedagogical change from teaching to learning (DuFour, 2014; Reed & Swaminathan, 2016). Descriptions of

successful PLCs around the world support the belief that shared leadership is important for successful PLC implementation (Elbousty et al.,2010; Hauserman & Stick, 2013; Sleegers et al., 2014). The following five subsections address Hord's (1997, 2004) five characteristics which facilitate effective PLCs.

***Shared beliefs, values, and vision*.** Shared beliefs and values guide the teachers in a school organization either implicitly or explicitly. An elementary characteristic of a PLC involves the staff identifying with a shared mission that is achieved by the staff sharing vision (Hord & Sommers, 2008; Liljenberg, 2015; Owen, 2015). According to Hord and Sommers (2008), "when the staff members come together to hold conversations about teaching and learning, the participants demonstrate higher commitment to the goals, mission, and vision of the school" (p. 19). Ideally, the administrators and teachers in a school organization create a shared vision for their school, work toward attaining it, and reevaluate what they expect for the shared vision as the students achieve.

In a PLC, student achievement of all students is the focus. Each member of the PLC recognizes the school's vision, purpose, core tenets and recognizes his or her role in aligning the PLC-related efforts to fullfill the mission for the school. The staff works collectively to improve instructional practices causing the vision to evolve and to develop methods for achieving success with all students (Hord & Sommers, 2008; Steeg, 2016).

In the shared vision of a PLC, beliefs and values include particular attributes to set the PLC apart from traditional school structures. Hord (2004) indicated that communal vision entails "a particular mental image of what is important to an individual

and to an organization; it is a preferred image of the future that compels staff to work toward that image" (p. 8). The members should have an "unrelenting responsibility to ensure the learning of all students to success as a vision" (p.10). Student success is the core vision of a PLC. Hord and Sommers (2008) wrote, "values and beliefs guide the behavior of individuals no matter where they work or what endeavor" (p. 8). Members of the learning organization use their shared vision as their focus for collaborating with colleagues and with planning and delivering instruction (Hord & Sommers, 2008; Steeg, 2016).

Shared and supportive leadership. In a PLC, the stakeholders in the school share leadership, decision making, and problem solving. The principal's role is that of an instructional leader and less of a supervisor. The stakeholders share the power, and therefore have ownership in the process creating an environment built on trust as relationships emerge within the PLC (Hord & Sommers, 2008; Morrison, A., 2013). "Sharing leadership in a school is not common in the traditional school setting" (Hord, 1997, p. 2). Hord and Sommers (2008) concluded that by implementing PLC practices in a school the school environment becomes a place of continuous learning that fosters collaboration, collective participation, and a culture aligned with creating learning cycles. They cautioned that principals and teachers might experience new challenges because of sharing control and influence as part of the PLC.

While everyone involved in the PLC collaborates, the PLC members establish boundaries about who maintains leadership. "Transforming a school organization into a

learning community can be done only with sanction of the leaders and active nurturing of the entire staff's development as a community" (Hord, 1997, p. 2). In a learning community, the traditional roles of administrators and teachers are linked, allow free-flow of solutions to problems, and benefit student learning (Hord & Sommers, 2008).

Collective learning. PLC participation offers the members of a learning group an experience structured with collaboration focused on situations needing attention. A prominent benefit of PLCs to teachers is the opportunity for teachers' professional learning (Hill, 2009; Linder et al., 2012; Raman, Ying, & Khalid, 2015). The PLC process is student positioned and it is a constant action-orientated process. The members of the PLC recognize problems within their learning community. Plans are developed, and action takes place based on new learning (Hord & Sommers, 2008). Together, the members of the PLC learn as they study, reflect, and act on the identified problems. Huggins, Scheurich, and Morgan (2011), and Liu, Miller, and Jahng, (2016) found that schools demonstrating effective PLC characteristics practices, that specifically include collaboration, have teachers who were able to use improved authentic pedagogical activities and to influence increases in student achievement. Such discussions include student data, teaching and learning, student needs, and other school-related areas (Mandinach, Parton, Gummer, & Anderson, 2015; Marsh, Bertrand, & Huguet, 2015). Richmond and Manokore (2011) found that teachers in an urban Title I school district supported collegiality as an essential element in their professional growth after voluntarily participating in a PLC.

According to Hord and Sommers (2008), every member of a school's staff should be part of the learning process. Working collaboratively ensures the learning is a collective action (Jones & Thessin, 2017; Wells & Feun, 2013). Hord and Sommers (2008) stated collective learning is the goal because individuals can gain independence in learning more so than when they attempt to learn individually without the presence of peers. Hord (1997) defined PLCs as "more than just collaborative working arrangements or faculty groups that meet regularly. A PLC is a way of working where staff members engage in purposeful, collegial learning" (p. 5). The focus of learning in this environment is one where professionals engage in reflection focused on solutions that benefit their students (Hord & Sommers, 2008).

Supportive conditions. Hord and Sommers (2008) identified two conditions necessary to support PLCs. The first condition is logistics or physical and structural needs. A structured daily time allotment, a meeting place, and agenda items needing attention be arranged within the school day. Darling-Hammond and McLaughlin (2011) stated the importance of teachers meeting during the school day without interruption. This uninterrupted time allows teachers to remain focused their vision and goals (Cakey & Carpenter, 2012; Liljenberg, 2015).

The second condition is opportunity for relationships to develop while teachers collaborate. Time is required for an employee to become comfortable to new work expectations and succeed in doing it well (Katz & Earl, 2010; Liljenberg, 2015). PLC members need time to build trust and confidence (Stollar, 2014). Relational trust and

capacity, where teachers are comfortable sharing information in a non-threatening environment with others, is an important piece in successful PLC implementation (Cranston, 2011; Schechter, 2012; Thornton & Cherrington, 2014).

Dike (2014) and Harvey and Broyles (2010) described situations where the confidence of a group's trust might be threatened as a sort of sabotage to change within the group that has delayed the effectiveness of PLCs. PLC's should be collegial environments where teachers improve instructional delivery, foster creativity, and relieve the isolation that characterizes so many teaching environments (Cakey & Carpenter, 2012). Krishnan, Gabb, and Vale (2011) found trust, respect, and opportunity to be variables necessary for teacher collaboration to be successful. Using PLC time prudently, allows teachers to collaborate about instruction and examine student performance data (Dever & Lash, 2013; Guskey, & Suk Yoon, 2009; Lance, 2010).

Shared personal practice. The final dimension of Hord's (1998) PLC model involves teachers working together to improve instructional practice. Hord and Sommers (2008) stated "that shared personal practice is often the last element to develop due to the challenge of taking teachers out of the isolation of their classroom and into a setting of shared practice, the PLC meeting" (p. 28). Collaboration efforts are a critical component of the success of PLCs as efforts positively influence the instructional environment of a school (McDonough, 2013). Teachers working together collaboratively to improve their individual teaching and learning is a skill that requires effective training (McDonough, 2013). Through shared practice, science teachers developed processes of collaboration for

examining student work and professional learning that enhances instructional practices (Chen & Wang, 2015; Fwu & Wang, 2012). This dimension involves teachers opening their classrooms to colleagues and observing the teaching process by offering notes and feedback to each other (Linder et al., 2012; Steeg, 2016).

Richmond and Manokore (2011) found that teachers in an urban Title I school district identified collegiality as essential for their professional growth after voluntarily participating in a PLC. The purpose of collegiality is to establish an organizational learning environment that supports individual improvement among teachers and leads to gains in student achievement (DuFour & Mattos, 2013; Garrett, 2010; Imms & Byers, 2017). When this time is used prudently, teachers have an opportunity to evaluate student data and collaborate regarding instruction (Guskey & Suk, 2009; Harris, 2015; Jennings & Bearak, 2014; Tanner, 2011).

The cultural design of a PLC should be teachers supporting and facilitating the growth of each other within the realm of principal support (Mandinach et al., 2015). Hord and Sommers (2008) referred to the PLC as learning process where peers are helping peers, teachers observing each other's classrooms, take notes, and discussing their observations with each other. Huggins et al. (2011) found that in schools exhibiting high levels of PLC characteristics, specifically shared practice, teachers display improved and authentic instructional activities that increase student achievement. Hord's research incorporated Senge's learning organizations' research to establish, what is recognized in the educational realm, as Hord's five dimensions of PLCs. DuFour incorporated Hord's

research to extend on the five dimensions of PLCs. DuFour established research extending PLC practices to include action orientation, continuous improvement, and results orientation as an outcome of shared beliefs, shared leadership, collective learning, and personal practice. The next section examines DuFour' model with a specific attention on constant improvement and orientation actions that lead to increased student learning.

DuFour's PLC Model. The model of the PLC developed by DuFour and many associates over a number of publications is grounded in six characteristics: (a) "shared mission, vision and values, (b) collaborative teams, (c) collective inquiry, (d) action orientation and experimentation, (e) continuous improvement, and (f) results orientation" (DuFour & Eaker, 1998, p. 70). The purposeful PLC is a group of individuals functioning together to improve their ability to achieve a shared vision and goals (DuFour et al., 2010b). Chen and Wang (2015) found in PLC implementation there were three essential themes to shape the instructional environment of a school: (a) team cohesion, (b) individual learning among teachers, and (c) a group focus on curriculum elements.

DuFour and Mattos (2013) asserted that top-down models of leadership aimed at change are not helpful in postmodern education. The DuFour model includes characteristics in Hord's five dimensions but is specific regarding the activities within a PLC that foster a collaborative community of educators and leading to increases in student performance (Condron et al., 2013). DuFour et al. (2010b) incorporated a six-characteristic model of PLCs and extended the work of Hord's five dimensions. This application of Hord's framework was evident with DuFour et al. (2010a) encouraging

teachers to address the learning needs of all students by using PLCs to engage in intentional learning and problem solving (Leclerc, Moreau, Dumouchel, & Sallafranque-St-Louis, 2012; Woodland & Mazur, 2015). DuFour et al. (2008) explained that PLCs are structured around the application of three major strategies: (a) student learning, (b) a culture of collaboration, and (c) results-oriented goals. For Easton (2016), there were five important PLC habits that lead to student learning success: (a) accountability for teachers, (b) skills and knowledge individual teacher apply to their practices, (c) collaborative relationships, (d) motivation to learn, and (c) shared resolve.

The first characteristic in the DuFour model focused on teachers' devotion to all students' learning. The culture of collaboration expectation enables staff members in a school to share this belief (McDonough, 2013). Educators collaborate and develop a shared vision to support learning and achievement and the results-oriented changes that accompany this shift (Daly, Liou, & Moolennar, 2014a; Moolenaar et al., 2012). Crawford (2010) defined such a shift as affecting how people think, solve problems, define boundaries, and do business. This change or shift in action and thinking resulted in PLCs veering away from a hierarchical to a collegial leadership style, embracing shared leadership (Hartley, 2010; Van Wart, 2013).

Shared vision and values focused on student learning. In the educational setting, the vision of an organization shapes the future and provides direction to members within the organization (DuFour & Marzano, 2011; Hord, 2004). Hallinger and Heck (2010) asserted that shared vision helps focus stakeholders in defining and supporting school

goals shown to link directly with student academic improvement. When leaders dictate the vision rather than including staff in the development, staff members are likely to resist the vision (Schechter & Feldman, 2013). The common values of group shape the design of the vision, which emerges over time when implemented effectively (Chin, 2013; Schechter, 2012). The shared vision central to PLCs is student learning. In a PLC, school members must define goals and expectations of student learning, and the practices expected to improve learning among teachers to conceptualize the essence for a common vision through which school members work together (Horton & Martin, 2013).

According to DuFour (2004), it is the responsibility of the principal to clarify and create a school vision aligned with the vision of the district. "Members of the organization must realize that their work is significant and by having a shared vision, the work of each member moves the organization into a positive direction" (DuFour, 2004, p. 28). Decision making in the school must be based on the shared vision which teachers use as a way to define the nature of excellent academic focus (Jacobson, 2010; Moller, Mickelson, Stearns, Banerjee, & Bottia, 2013; Rahman, 2011).

The shared vision should also motivate staff to work for goals that reach beyond their classrooms into the classroom of colleagues. The shared vision, therefore, ensures teachers operate according to a collective purpose (Jennings & Bearak, 2014; Resnick, 2010). "Members of the organization must recognize their work is meaningful, and by having a shared vision, the work of each member gains alignment with moving the PLC in a positive progression toward the vision" (DuFour, 2004, p.29). Individual

organizational visions may differ among schools; however, DuFour et al. (2010b) suggested that PLCs must be designed to keep the vision on student learning using three strategies: (a) what the PLC teacher members want each student to learn, (b) how the PLC teacher members identify when each student has learned it, and (c) how the PLC teacher members respond when a student has difficulty in learning. PLC practices too often are not used for improving instruction and instructional practices that lead to increased learning for all students (DuFour, 2014; Ermeling & Gallimore, 2013). In PLCs, teachers collaborate to reinforce idea sharing, to promote movement toward the shared vision, and to inspire group and individual reflection on their pedagogical practices (DuFour, 2014; Harris & Jones, 2010; Morison, 2009; Riveros, Newton, & Burgess, 2012). DuFour's second PLC characteristic involves the work of collaborative teams.

Collaborative culture and teams. DuFour et al. (2010b) defined collaboration as a process where educators work interdependently analyzing information to enhance professional practice for the benefit of improving learning for students, colleagues, and the school system. One of the major elements of successful PLCs is the formation of productive, collaborative groups of teachers who work together to ensure that student learning is taking place in the classroom (Wells & Feun, 2013). Collaboration between teachers and administrators is as important as collaboration between teachers (Wells & Feun, 2013).

Wells and Feun (2013) stressed the need for administrators to have a comprehensive understanding of the theoretical framework for PLC implementation in order to lead their schools in the cultural shift required for effective implementation. As PLCs are comprised of collaborative teams, stakeholders in a school community must shift from working in isolation to working in collaboration to create a culture focused on student learning (DuFour et al., 2010a; DuFour & Mattos, 2013). Teachers in PLCs must also seek to work together to design, implement, and evaluate student work, instructional practices, and assessments to achieve the group's vision (DuFour, 2003; Hord & Sommers, 2008; Jones, & Sallis, 2013). Researchers consistently found that teachers working in effective PLCs provided opportunities to collaborate with each other and discover assumptions related to student understandings and build on each other's strengths (Birenbaum, Kimron, & Shilton, 2011; Owen, 2015). Though collaboration may come easy for some, this process is challenging for others as teachers find sharing their ideas, strategies, and experiences problematic. For collaboration to be effective the tenants of respect, trust, and opportunity must be practiced (Dever & Lash, 2013). Ensuring time for collaboration to occur is essential for conversations to develop and deepen around student learning (Ronfeldt, Farmer, McQueen, & Grissom, 2015).

Scheduling time for teachers to collaborate is essential if collaborative efforts are to be successful (Adams & Vescio, 2015; Bryk, 2010; Ronfeldt et al., 2015). Not only should teachers meet during the school day, but also the time that they meet should also be uninterrupted and preserved from common school distractions (Darling-Hammond &

McLaughlin, 2011; Ronfeldt et al., 2015). Constant time allows teachers to meet regularly and to be dedicated to their vision and mission regarding student achievement and instruction (Adams & Vescio, 2015; Burns & By, 2012; Ronfeldt et al., 2015). In the local district, the superintendents' commitment to create or find the time for teacher collaboration to occur is evidence of the support to create a collaborative learning environment (McDonough, 2013). The third characteristic is collective inquiry, where teachers study best practices regarding instructional delivery and student learning outcomes and evaluate both student and teacher levels of learning (McLaughlin & Talbert, 2010; Owen, 2015).

Collective inquiry. DuFour (2003) described the authentic assessment of current trends in instructional practices and student learning and the search for the best practices necessary for supporting high-level student learning as the term collective inquiry. Drago-Severson and Blum-Destefano (2013) defined collegial inquiry as collective dialogue that persistently involves reflecting on personal assumptions, values, commitments and opinions with others. The dialogue produced from this reflection is intended to improve instructional focus, collective commitments, and professional relationships that advance learning for teachers and students (DuFour et al., 2010b). Members of the PLC are constantly working with teammates to obtain comprehensive understanding of the first critical question for PLCs: What do the PLC members expect each student to learn and be able to apply (Meyers & Nulty, 2009).

Teachers discuss what their students must learn and be able to apply. Because of

the collaboration regarding content, their ability to ensure that all students can learn becomes more solidified (Condron et al., 2013). Hunter (2010) and Turner, Kackar-Cam, and Trucano, (2015) described the challenge mathematics teachers have in using effective pedagogy to develop inquiry communities in which members are offered an opportunity to discuss proficient mathematical practices. This need for more content knowledge to be more effective is common among mathematics teachers (Turner et al., 2015). Teachers expressed the challenge of attempting to understand and implement pedagogical changes in the classroom (LeFebvre, 2014). DuFour et al. (2008) asserted that the practice of collective inquiry allowed team members to learn and cultivate new skills that lead to new experiences and knowledge.

Nelson-Holmlund, Deuel, Slavit, and Kennedy (2010) described barriers in leading deep conversations in collaborative inquiry groups in over 30 PLCs engaged in collaborative inquiry. Barriers or implementation measures to consider included congenial conversations and the avoidance of conflict, learning how to foster collegial conversations, and the ability to lead deep conversations about teaching and learning (Moller et al., 2013; Muñoz, & Branham, 2016).

DuFour et al. (2008) also described collective inquiry as an action-orientated characteristic where PLC members are persistent in questioning the status quo, pursuing new teaching and learning methods, and conducting action research to prove value of new learning. One person cannot improve learning for all; it requires the collective effort of the members in the school to join intellectual forces, develop shard knowledge, and

together meet the needs of all students thus improving their schools (Daly et al, 2014a; DuFour & Marzano, 2011). Changing conversation and collaboration from one of congenial interaction to one that demands a deeper introspection is challenging, and one reason why transformation to a PLC is rare, it takes substantive work and action (DuFour, 2003, 2004, 2014; Wells & Feun, 2013). The fourth characteristic in the DuFour model is an action-oriented practice among PLC members.

Action orientation: Learn by doing. DuFour et al. (2008) described an action-orientated educator as someone who brings energy to their work, as well as determination to improve their instructional delivery, valuing the collaborative planning process, and committed to reaching team goals. DuFour et al. (2008) stated "that learning by doing enables teachers to develop deeply reflective experiences along with greater commitments than simply learning by reading, listening, planning, or thinking" (p.16). "For action-orientation, teachers take the ideas generated from the collective inquiry phase and put them into action" (p.17). The PLC process provides the job-embedded instrument for reflection on practice and supports teachers to learn from each other, continually reinforcing the collective's work in realizing their vision of success for all students (Liberman & Miller, 2011; Steeg, 2016).

Magnuson and Mota (2011) described the circumstances in which their school limited contracts with external speakers for single event PDs. Teachers expressed negative responses regarding their experience with mandatory PD favoring instead having the ability to pursue areas of interest. As a result, they reported that the school's

teachers now rely on each other to provide PD during the PLC. For example, Huggins (2016) described the effect that the DuFour PLC model, specifically the action-oriented processes' effect on a rural, economically diverse high school in North Carolina. They found that after 4 years, student performance on end of course state evaluations increased significantly, ranging from 28% increase in English to 39% increase in Algebra I.

Teachers may perceive administrators to be a conduit of policy when teachers are shuffled from one single event PD to another (Koyama & Kania, 2014). Teachers' suspicious reactions often result from being the objects of implementation products instead of active participants promoting the process of educational change. Their stresses increased when working in a school identified or soon to be labeled as failing and resulted in the demoralization of teachers (Hogg & Yates, 2013; Santoro, 2011).

This suspicious mindset may be reinforced by campus leaders who appear to react to pressure by changing from one intervention and goal to another without data to support such shifts instead of leading with action-oriented models toward the achievement of team goals (Archibald, Coggshall, Croft, & Goe, 2011; Jansen in de Wal, Den Brok, Hooijer, Martens, & Van den Beemt, 2014). Following inquiry and action, the fifth characteristic of DuFours' model is a commitment to continuous improvement.

Continuous improvement. Exploring options to achieve team goals for the benefit of the campus is a necessary intrinsic component of a PLC. Continuous improvement is a commitment from the members of a learning organization to gather evidence, develop and implement ideas, analyze data, and apply new knowledge by providing instructional

practices to improve teacher success in areas where the use of data is required. (DuFour, 2004, 2014). Collegial human issues are critical for PLC implementation to be successful with student outcomes, and hard structures, such as group reflections, are necessary in order to facilitate authentic systemic improvements and assist in easing issues such as teacher burnout and feelings of being overwhelmed from the responsibilities of the job (Brunsting, Sreckovic, & Lane, 2014; Morrison, A., 2013).

Thessin and Starr (2011) studied the Stamford (CT) Public Schools and identified five elements that defined their PLC: (a) analyzing data, (b) evaluating student work, (c) examining instruction, (d) assessing student progress, and (e) reflecting on teaching and student progress areas. Anfara et al. (2012) pointed out that the structure of PLCs effectively facilitates the kind of collaboration and communication that nurtures reflective practice and continuous learning. Members of the PLC work constantly with teammates to gain a deeper understanding of the second critical PLC element: This element requires PLC members to recognize students who are not learning in the classroom (Condron et al., 2013; Hirsh & Killion, 2009).

DuFour et al. (2004) asserted that teams concentrating on specific student outcomes, working together collaboratively, and utilizing the abilities of each member would achieve results. Monroe-Baillargeon and Shema (2010) and Owen (2015) suggested when developing a student achievement culture, a process of analyzing student performance data is necessary prior to making instructional decisions regarding student achievement. Each member of the team has clearly defined roles and has specific

strengths, adding to the team's collective intelligence, leading to effective professional decision-making to improve student learning (Leclerc et al., 2012; Riveros et al., 2012). The sixth characteristic focuses on a commitment to being results-oriented.

***Results orientation*.** Using data about outcomes offers a valuable tool to PLC work (DuFour et al., 2010a; DuFour & Mattos, 2013; Owen, 2015). For example, Wells and Feun (2013) questioned the value of PLCs because a lack of evidence regarding efficacy as well as the complexity of effective implementation. Thus, members of PLCs should collaborate with other to gain a deeper understanding of the third critical question addressing how the PLC teacher members respond when students experience difficulty in learning (DuFour et al., 2010a) and address the issue of student academic achievement (Biancarosa, Bryk, & Dexter, 2010; DuFour & Mattos, 2013; Owen, 2015).

DuFour et al. (2010a) argued that the use of establishing benchmarks, the gathering and interpreting of the resulting data should be the goal of a PLC team. For students to achieve academically, PLCs must focus on a continual cycle of improvement and results. "Leaders are responsible for providing teachers critical data to organize information on student achievement and identify areas that need improvement" (Moss, & Brookhart, 2015, p.15). Assisting teachers in progress monitoring and improving their knowledge through data-driven dialogue may result in significant increases with student achievement (DuFour & Mattos, 2013; Owen, 2015; Psencik & Baldwin, 2012).

Garrett (2010) described how the implementation of PLCs increased student performance at Fortuna High School in California. Before implementation, freshmen

were failing algebra I, and it was common for 100 members of an initial class not to graduate on time. Following the PLC implementation process, the graduation rate increased, and the DuFour PLC model was credited with influencing students' successes. Teachers now focus on active student learning rather than using passive student learning techniques such as lectures provided by teachers to students (Garrett, 2010).

Kling and Bay-Williams (2014) conducted a causal comparative study concerning the effect of PLCs on urban educators and their pupils' reading and mathematics success levels. Kling and Bay-Williams (2014) revealed that pupil attainment levels significantly heightened with the use of PLCs in the form of weekly collaborative meetings. In a similar study of pupil attainment levels researched in a PLC setting. Ratcliff, Costner, Carroll, Jones, Sheehan, and Hunt (2016) found that the pupils scored higher on the assessments after the introduction of the PLCs.

In 2011, Thomas reported that in a large urban district, weekly teacher collaboration resulted in increased reading scores. ANOVA results revealed significant growth rates ($p < .05$) occurred after PLCs were created. Researchers indicated that teachers believed that weekly collaboration in PLCs affected their instructional practices and students' performance. Williams (2013) found the implementation of PLCs were a significant mediating variable on knowledge and practice. Additionally, Williams (2013) indicated several components of PLCs had a positive result including the following: (a) an increase in knowledge, (b) an improvement in practice, (c) an improvement in outcomes for students, and (d) an increase in teacher confidence in themselves. Garrett

(2010) found PLCs to be effective increasing mathematics, and similarly, Williams (2013) found PLC implementation to improve students' reading achievement.

Huffman (2011) examined the use of dialogue in the process of PLC members reflecting on student data; they reviewed various assessments and tools that provided a systematic process of data collection and analysis of student progress. Furthermore, Huffman suggested that numbers or data rarely reveal the whole story. Unless data are uncovered and investigated, practice and thinking do not change, common misunderstandings do not surface, and actions are limited in their effectiveness. Horton and Martin (2013) found PLCs to have positive outcomes on student learning through teachers using common assessment data to modify instruction. The transformation of schools into PLCs can be successful when results orientated actions are implemented effectively and embedded in the culture of the organization.

The Synthesized PLC Framework

In researching and reviewing the constructivist theory and how social learning occurs, Senge (1990) appeared to understand the significance of Vygotsky's (1978) paradigm and extended this work to include a social learning environment that would evolve into the purposeful learning organization. By incorporating Senge's research, Hord (1997) extended possibilities for shared vision to guide the work of PLCs as learning organizations. PLC members work as a collective learning team in a supportive environment, sharing their personal teaching practices, and taking on leadership roles outside of the regular classroom.

DuFour et al. (2008) used Hord's (1997) PLC framework to add an additional layer to the PLC model that incorporated the same tenets proffered by Senge (1990) and Hord. However, DuFour suggested focusing on continuous improvement and results in student learning emerging from the tangible work of PLCs in schools. DuFour believed that PLCs must be based on a continuous improvement model, meaning that teachers clearly define what each student learns. DuFour recognized the pressure put on teachers due to student accountability measures and argued that the work of a PLC involved reducing this pressure by offering support. DuFour embraced the challenge of accountability and encouraged school leaders to focus on a results-oriented learning culture.

DuFour et al. (2010b) stated that the PLC process is not a program that can be duplicated. It cannot be purchased, it must be implemented and only staff themselves can make this happen. Most importantly, it a continuous, never-ending process with many moving parts (DuFour et al., 2010b). DuFour et al. (2010b) also noted that many institutions of learning and districts acknowledge that their entities function as a learning community. Reed and Swaminathan (2016) promoted the primary elements of the PLC as the following:

> Collaborative cultures, the dismantling of teacher isolation, and highly effective teams that focus on learning. To facilitate a successful PLC, collaboration must be a part of regular school operations; through collaboration, clear deliverables must exist; norms are created; specific and measurable goals are sought; there is a

> constant focus on learning; and groups have access to data and relevant information to do their work. (p. 1101)

However, many do not adhere to fundamental ideas of PLCs. These entities do not ask critical questions that would lead to successful PLCs, which in turn lead to successful institutions of learning and heightened amounts of pupils' levels of presentation.

DuFour and Mattos (2013) posited that PLCs are about people, their teaching practices, and processes used to increase student achievement. PLCs are not a program. Researchers stressed the point that PLCs are not a packaged reform that improved student learning. PLCs are a way of thinking, collaborating, and acting. Establishing effective PLCs requires a change in mindset (DuFour & Fullan, 2013).

Accountability

School improvement researchers advocated that innovative schools are schools that implement systemic changes and become collaborative learning organizations with a shared vision in order to address the demands of student achievement, teacher PD needs and accountability (Huggins et al., 2011; Long et al., 2012). Mehta, 2013; Muñoz, & Branham, 2016; Nelson-Holmlund et al., 2010; Richmond & Manokore, 2011). Velasco, Edmonson and Brown (2012) declared that the performance of schools is a national priority to ensure every student receives a quality education. The continued rise of expectations to close achievement gaps is setting new standards for accountability. DuFour and Marzano (2011) stated that educators in America have the greatest number of challenging initiatives and mandates than at any other time in history. Because

accountability has increased for schools, systemic efforts to increase student achievement must be centered on improving daily pedagogic practice (Daly et al., 2010; DuFour, & Mattos, 2013; McDonald, Polnick, & Robles-Pina, 2013; Steeg, 2016; Swearingen, 2014).

Wells and Feun (2013) described the demands on administrators to implement school improvement initiatives and models to serve the students for whom they are responsible. Most of the educational research on PLCs centers on how the PLC structure and collaboration opportunities for teachers affect student achievement (Burns & By, 2012; DuFour & Mattos, 2013; Hall & Hord, 2011; Marzano et al., 2014; Schechter & Feldman, 2013). District administrators are responsible for the campus accountability related in part to student achievement (Midkiff, & Cohen-Vogel, 2015). PLCs are a vehicle to provide an opportunity for teacher to collaborate on issues that improve student learning, which creates a portrait of district and campus accountability (Dever & Lash, 2013; Gates &Watkins, 2010; Jennings & Bearak, 2014).

Federal. In 1983, the National Commission of Excellence in Education made national headlines with the seminal assessment of public education in the United States in its publication of *A Nation at Risk*. The nation's failing school system was described as declining, deficient, and at risk. A *Nation at Risk* served as stimulus to introduce a wave of school improvement efforts throughout the United States. "This improvement effort became known as the excellence movement" (DuFour et al., 2008, p. 2). NCLB (2002) was the reauthorization of the 1965 Elementary and Secondary Education Act (ESEA)

that emphasized national proficiency and closing achievement gaps in reading and mathematics for all students (Wolfe & Steinberg, 2014). NCLB required school leaders to use data in the form of measurable action plans beyond simply gathering and not analyzing data (Condron et al., 2013).

As a result of NCLB (2002), administrators began searching for methods and systems to increase student achievement and close achievement gaps among campus student ethnicity groups (Condron et al., 2013; Dee & Jacob, 2013). Accountability is not a new concept to educators because the increased pressure for students to perform on state achievement tests began in the early 1980s with the National Commission of Excellence in Education's report titled *A Nation at Risk* (Hilliard, 2012). However, holding schools accountable for student achievement data became a new standard in NCLB, which threatened school leaders with corrective action at schools showing less than acceptable student achievement. Educational leaders, in turn, sought new instructional approaches aimed to improve student performance and close the achievement gaps between students of different backgrounds and socioeconomic statuses (Mehta, 2013). The goal of NCLB was to have every student in the United States perform at or above grade level on state benchmark tests by 2014. (NCLB, 2002). Educational reforms, such as NCLB, conferred upon the nation new challenges, requiring states to have a system of accountability that supported academic achievement and the continued progress of every student (U.S. Department of Education, 2009). With the passage of NCLB, local and state accountability increased and as a result, a school's accountability

rating became based on the percentage of students meeting achievement expectations on state assessments.

State. In order to reduce and close the achievement gap and improve education for all students, standards within the current reform movement determine accountability by using data from state assessment results to show results of student achievement. In 1993, the Texas Legislature mandated the creation of the Texas public school accountability system. This system is used to rate school districts and evaluate campuses (TEA, 2012). In spring 2012, STAAR replaced the Texas Assessment of Knowledge and Skills (TAKS). In the state of Texas, where the focus school for this project is located, accountability measures at the state level are determined by STAAR and EOC assessments. The Texas Education Agency (TEA) is the state agency that oversees public education in Texas. The mission of TEA is to provide leadership, guidance and resources to help schools meet the educational needs of all students (TEA, 2011). TEA accredits public schools in Texas at the district level for Grades K through 12. The STAAR and EOC are summative assessments that measure how well students have met the standards for what they are expected to learn (TEA, 2013).

STAAR performance standards are related to test performance requirements based on the TEA's (2011) expectations for fulfilling the state-mandated curriculum standards of the Texas Essential Knowledge and Skills (TEKS). The TEA requires students to take the annual STAAR assessments in Grades 3 through 8 for reading and mathematics, Grade 8 for social studies, Grades 5 and 8 for science, and Grades 4 and 7

for writing. The TEA also directs high school students to complete and pass end-of-course assessments for the classes of Algebra I, Biology, English I, English II, and U.S. History.

Summative assessments like STAAR and EOC help legislators, school boards, superintendents, and principals make decisions about grade level progress, college readiness, and about student performance to determine whether they are meeting the required standards (Johnson & Chrispeels, 2010; Williams & Johnson, 2013). Determining data outcomes in the form of student achievement presents a valuable element of PLC work to teachers (DuFour et al., 2010a). Additionally, student achievement determines district and state accountability while school improvement is measured using these state accountability outcomes to determine student achievement levels (TEA, 2013).

DuFour et al. (2008) suggested that the goals of every PLC team should be to develop assessment benchmarks, analyze data, and review student work. For every student to achieve, school staff in the PLCs must focus on a cycle of improvement. The passage of the NCLB (2002) legislation provided an impetus for school administrators to restructure how they organized the culture of schools for student success and educational improvement to occur. A PLC structure is one initiative recommended as a way to restructure the ways in which schools are organized for teachers to work (Easton, 2016; Hord, 1997, 2004; Williams & Johnson, 2013).

Local. Social circumstances and ever-changing student populations including high numbers of ELL learners, students with a disability (SWD), and economically disadvantaged have brought about an urgent need for change in the area of education (Blanton & Perez, 2011). The purpose of educational assessment is to determine individual student understanding of required standards and use assessment results to modify, adjust, enrich, and differentiate instruction as needed to meet the learning needs of all students (Ready, 2013). A PLC structure, if effectively used by teachers, can result in the reduced teacher isolation and improved collegial interaction (Santagata & Guarino, 2012). In an effort to meet accountability measures, administrators in local school systems implemented the use of PLCs to facilitate teacher collaboration (Hallinger & Heck, 2010; Jacobs & Yendol-Hoppey, 2010; Jennings & Bearak, 2014). Scheduling time for teachers to collaborate is essential if collaborative efforts aimed at modifying, adjusting, enriching, and differentiating instruction for students is to be successful (Dever & Lash, 2013). The key priority of the PLC is to provide the teachers time to collaborate on student achievement and to improve student success.

One of the primary components of successful PLCs is the establishment of productive, collaborative groups of teachers who work together to ensure that student learning is taking place in the classroom (Wells & Feun, 2013). Teachers develop systems and processes of collaboration for reviewing student work that enhances instructional practices. The PLCs provide time during the day for reflection on classroom teacher practices and enable teachers to learn from each other, which continually

reinforced the collective to work toward the realization of the teachers' vision of success for all students (Jones, & Thessin, 2015; Liberman & Miller, 2011). DuFour (2014) described true collaboration as a system where teachers analyze their work as team in order to gain effectiveness as a collective group. Collaboration offers support through an instructional approach that encourages the open sharing of ideas (Moller et al., 2013; Musanti & Pence, 2010). Teachers who are willing to come together face-to-face and collaborate increase the likelihood for raising student achievement compared to those teachers who continue to work in isolation (Brunsting et al., 2014; Masuda, Ebersole, & Barrett, 2012).

Following the publication of *A Nation at Risk* by the National Commission of Excellence in Education in 1983, the public has held the opinion that American public schools are not preparing students as effectively as other countries thus, leaving the perception that the high school graduating population is less equipped to compete in global markets (Senge, 2006). In 2014, the 46th annual PDK/Gallup Poll of the Public's Attitudes Toward Public Schools, reported what Americans were thinking about public schools, and specifically their opinions of teachers and the classrooms (Bushaw & Calderon, 2014). For the first time in 5 years, a decline in the trust and confidence of teachers was reported. In particular, requirements into teacher preparation programs surfaced as a concern the public expected highly rigorous programs of study to prepare new teachers for the classroom (Bushaw & Calderon, 2014). A lack of content

knowledge, pace of instruction, and experience were reported as a need for teacher preparation programs (Brown, 2012).

Teachers in collaborative settings vary in age, experience, and educational level (Adams & Vescio, 2015; Jones & Thessin, 2015; Thessin & Starr, 2011). These differences, and the differing perspectives teachers generate, may be reduced through supportive PLC structures within a PLC (Jones & Thessin, 2015; Thessin & Starr, 2011). Within a PLC structure, teacher learning becomes job-embedded as teachers learn from the experiences of one another. Purposeful PLCs are seen as the ideal instrument for reaching common school goals established for ensuring learning by teachers and students alike (DuFour et al., 2010b).

Richmond and Manokore (2011) and Tam (2015) found the implementation of PLCs were a significant mediating variable on knowledge and practice among teachers. Researchers' also indicated several components of PLCs leading to growth in teachers' knowledge, practice, and self-efficacy as well as improved academic outcomes for students (Richmond & Manokore, 2011; Tam, 2015). As Vygotsky (1978) explained, learning is constructed through the social interaction and socialization of individuals. PLCs provide an environment for social conversations between teachers with varied degrees of experience (DuFour & Marzano, 2011; DuFour & Mattos, 2013). The different levels of experience bring greater knowledge to the PLC teacher group, and as a result, unlimited levels of knowledge within the PLC are constructed (Gates & Watkins, 2010).

Implications

PLCs were introduced in GHISD at the secondary level in each of the four core content areas of mathematics, ELA, social studies, science at the seven middle schools in the summer of 2011. The intention behind the PLCs was to increase student achievement by improving teacher knowledge and practice within a PLC collaborative setting (B. Peters [pseudonym], personal communication, January 8, 2011). Despite the district administrators' best efforts to support and grow PLCs at each middle school as a resource for teachers, feedback from district administrative staff, instructional coaches, and state achievement scores at the target middle school campus, Campus A, did not appear to be effectively using PLCs to improve student achievement (TEA, 2013; Thomas, 2011, 2013).

There is a problem in GHISD with the implementation of mathematics PLC processes as Campus A's PLC members work to support mathematics teachers' instruction and improve student achievement. Despite PD from district administrators, teachers may not be using the PLC data reflection practices to increase mathematics performance (personal communication, 2012). The purpose of this qualitative bounded case study was to explore the middle school teachers' and the administrative dean's perceptions of collaboration and levels of depth regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data analysis of student performance, and lesson design within a PLC. Based on the literature reviewed for this study, implementation of the PLC at the target middle school may be

part of the problem.

Data collected from the participants revealed perceptions to be positive toward the benefits of collaborating professionally and the influence collaboration had on student achievement. However, participants also indicated that the PLC processes could be refined to improve PLCs to function more effectively. Teachers suggested needing more training in the areas of lesson frame components, ownership of the data reflection processes, and learning focused on using data to recognize student learning gaps. The participants' PD suggestions could help shape a project benefiting both the school districts leaders and the PLC members in future school years. Their suggestions could lead to the development of a menu of PD options based on the individual learning needs of teachers, which would differ from common PD methods that tend to be prescribed and universal. The use of a research proven systemic diagnostic evaluation model focused on individual teacher concerns and needs would aid and support all district PD offerings.

School administrators need to consistently devote time developing PLCs on campuses to establish reliable implementation practices and collaboration (Thomas, 2013). Remaining consistent and providing continued district-level support is critical in sustaining PLCs to increasing student achievement in mathematics (Thomas, 2013). Giving teachers control over their learning can motivate them and may translate into enthusiasm and improved student achievement (Brucker, 2013; DuFour & Fullan, 2013; Pyle, Wade-Woolley, & Hutchinson, 2011). Implications for this study include the generation of specific PD for mathematics teachers focused on data reflection models and

protocols to be used with teachers' during PLC discussions when assessing the quality of lesson design during collaborative planning for improving student achievement.

Summary

In this section, I provided an overview of current research and literature available on the benefits and characteristics of effective PLCs. Although educational systems around the globe use PLCs, most PLCs are not well defined or understood, causing PLCs to be implemented frequently in parts rather than as the whole process (Ermeling & Gallimore, 2013; Hord & Tobia, 2012). This review demonstrated that implementation and PD is critical to the success of PLCs. PLC processes have the potential to assist teachers by creating an organizational culture with collective accountability on the part of all stakeholders to improve student achievement (Brucker, 2013; DuFour & Mattos, 2013; Horton & Martin, 2013; Wells & Feun, 2013). The implementation of PLCs in GHISD is a result of the superintendent's vision to provide a collaborative setting for teachers to work on their work. Collaboration should increase an appreciation for teamwork, strengthen teachers' ability to incorporate new teaching strategies, improve teaching skills, increase teacher confidence, enhance respect for colleagues, create opportunities for sharing ideas, and strengthen teachers' ability reflect on student outcomes (Chin, 2013; Waldron & McLeskey, 2010).

In the next section, I provide a description of the methodology used to investigate the problem using a qualitative case study design. In Section 2, I discuss the specific design used to answer the central and sub-questions discussed in Section 1. In addition, I

describe the sampling procedures, data collection, data analysis procedures, and findings from the of the project study and provide a synthesis of the findings in relation to the research questions, literature, purpose, problem and conceptual framework and implications for the project study identified as a position paper.

Section 2: The Methodology

There is a problem in the implementation of mathematics PLC processes as Campus A's PLC members work to support mathematics teachers' instruction and improve student achievement in the GHISD. GHISD administrators were provided information by the consultant regarding the progress of all schools' PLCs. The district's leaders lacked information about teachers' perceptions related to implementation of PLC processes and how teachers used PLC collaboration time at Campus A. Campus A's middle school students generated the lowest STAAR scores within the district on the Grade 7 mathematics achievement proficiency test (personal communication, January 8, 2011).

To explore the phenomenon of PLC effectiveness with mathematics educators who were participating in Campus A's PLC, I used a qualitative research design, conducted interviews, observations, and collected and reviewed of PLC artifacts (e.g., archival records and documents). Corbin and Strauss (2015) and Creswell (2012) have proffered that it is effective to use the instruments selected to study phenomenon in a qualitative study design. The following questions guided the exploratory case study that was designed to explore the Campus A PLC members' perceptions regarding teacher collaboration within the PLC framework:

RQ1: How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement?

RQ2: What processes do PLC members perceive they use to reflect on student mathematics data in their PLC?

RQ3: How do members participating in PLCs respond when data reflect a gap in student learning based on PLC observations?

In this section, I discuss the details of the methodology used to answer the research questions. The remainder of Section 2 includes explication of the research design, the population, the selection and criteria of the participants, the data collection methods, and the procedures and tools, including the role of the researcher, data analysis methods, and analysis of findings.

Qualitative Research Design and Approach

The research design for this qualitative study was an exploratory case study (Corbin & Strauss, 2015; Merriam, 2009; Yin, 2009) using a single underperforming middle school case to investigate the PLC members' perceptions of the central phenomena of mathematics lesson design, data reflections, and student mathematics achievement at target Campus A, which was the lowest underperforming middle school in the district. The qualitative exploratory case study design allowed the investigation of the specific elements found within the complex social unit of the PLC in a natural campus setting. This design was an appropriate approach because the local problem involved understanding teacher and administrator perceptions and their ongoing needs related to the effectiveness of the PLC implementation and processes employed within target Campus A's Grade 7 mathematics PLC.

Justification for Qualitative Case Study Design

According to Lodico, Spaulding, and Voegtle (2010), a case study allows the researcher to investigate a process to determine meaning and gain knowledge about an individual, group, or situation. Through this design, I collected rich, descriptive observations and interview data from teachers in a specific period of time during which teachers engaged in PLC meeting processes. Case studies take place in natural environments, such as middle school settings, and are ideal to examine administrators' and teachers' shared perceptions of instructional practice (Glesne, 2011; Yin, 2009). The exploratory case study design was aligned well with the social constructivist framework (Vygotsky, 1978) and supported the exploration of activities and practices within the social learning environment of the PLC. Creswell (2012) advocates using the exploratory case study to examine systems within definite boundaries of time and activity. In this study I used Creswell's ideology to study the Grade 7 mathematics PLC.

Lodico et al. (2010) described the case study approach as one that allows the researcher to act as the primary tool of data collection when investigating processes. The researcher determines meaning and gains firsthand knowledge about individuals and collaborating groups of individuals (Lodico et al., 2010). The exploratory case study method aligned well with this project because I asked participants questions about their perceptions, actions, and reflections and observed data reflection and lesson development processes during PLC meetings. This case study design involved the collection of data through interviews, questionnaires, a review of artifacts (e.g., planning documents) used

in the PLC and PLC teacher observations conducted to respond to the research questions and to gain data to understand the phenomena. This process enabled me to observe how the PLC participants implemented lesson plan development, collaborated regarding review of student data, and provided recommendations for interventions related to low student performance.

Merriam (2009) noted the researcher is the primary tool of both data collection and analysis in a case study because of the researcher's use of inductive reasoning to produce a final product that is explanatory. Teacher interviews, PLC observations, PLC member demographics, and a review of PLC artifacts used by PLC members provided all data associated with RQ1 and RQ2 to facilitate the examination of teacher beliefs, perceptions, experiences with data discussions, and lesson designs within the campus' Grade 7 mathematics PLC. As the researcher, it was my responsibility to appropriately collect and present the participants' responses to the interview questions and capture their description of processes used in the PLC.

Data collected during observations of the PLC meetings were triangulated with artifacts and processes provided by district administrators to support the PLC at Campus A. Observations of campus PLCs meetings provided an additional perspective of planning practices as well as providing me with data to reflect on the practices within PLC at the target campus. Merriam (2009) described observations as an opportunity for the researcher to be in the setting of the phenomenon of study as it naturally occurs, affording a firsthand view of the phenomenon rather than an account of the setting

obtained in an interview. Observations provided another level of information used with data gathered from interviews to triangulate and examine emerging findings.

Rationale for not Selecting Other Research Designs

Other approaches and designs other than the case study were considered for this project. A quantitative research design using surveys to collect numerical data could not provide the personal depth of teacher perceptions needed to adequately address the research questions in this project as interviews are not part of a typical quantitative design. This study was inductive by nature. Other qualitative approaches, such as ethnography and phenomenology, were considered; however, the exploratory case study design was deemed preeminent in terms of methodology and how to effectively explore the local problem in a naturally bound setting (Merriam, 2009; Yin, 2011).

Ethnography, much like a case study, incorporates observations and interviews, but these studies are often conducted over an unbounded period of time to attain data saturation (see Creswell, 2009). The focus of ethnography is to produce a detailed description of how a particular social group operates (Creswell, 2012). In this design approach, the researcher becomes immersed in the culture of the population over an unbounded period of time, allowing the researcher to obtain a deep, thorough description of cultural practices and activities among participants (Maxwell, 2013; Merriam, 2009). Ethnography was not the preferred design for this project due to length of time required to conduct ethnographic studies.

I considered phenomenology as a qualitative approach because it aligned well with social constructivist theory (Lodico et al., 2010). This design would have allowed for investigating shared beliefs rather than activities of the group through the eyes of the participants (Creswell, 2009). According to Merriam (2009), a phenomenological study emphases the structure of an experience in an attempt to deal with experiences in everyday life. Structures such as PLCs afford the phenomenological researcher an opportunity to gather data sampling some individuals and not an entire, bound system or period of time. For this project, limiting the number of teachers to those involved in the Grade 7 mathematics PLCs over a specific 9-week grading period at Campus A was necessary.

Therefore, the nature of the middle schools' mathematics PLCs represented a bounded system, and the exploratory case study was preferred to search for meaning and understanding of the PLC phenomenon (see Merriam, 2009). Interviews, observations, and a review of artifacts used by the PLC during a 9-week period to guide the groups' planning and reflection efforts provided data at the site level within a natural setting. The criteria for participant selection along with procedures of gaining participants was a critical consideration in that only members of the seventh-grade mathematics department were targeted.

Participants

Population and Sample

The setting for this case study was a public-school district, GHISD, in an urban Texas city with a student population of 28,717. The data were collected during the 2016-2017 school year. The enrollment by ethnicity is included in Table 3.

Table 3

District Ethnicity Count and Socioeconomic Status

Ethnicity	*N*	%
African American	5,149	18.0
Hispanic	19,229	66.0
Caucasian	2,849	10.0
American Indian	92	0.3
Asian	927	3.0
Pacific Islander	1,425	0.1
Two or more races	650	2.0

Note. Adopted from GHISD District Demographic Data (2017-2018).

To understand the case of the mathematics PLC at the underperforming middle school, I selected participants who had knowledge of the mathematics PLC processes and who could provide insight and understanding regarding what? (Creswell, 2012; Merriam, 2009). Purposefully recruiting teachers and the campus administrative dean who met the criteria necessary for this study facilitated its successful execution (see Yin, 2014). The criteria for selecting the participants for this study is discussed next.

Criteria for Selection of Participants

The primary criteria for participant inclusion was all Grade 7 PLC teachers and the campus administrative dean who were assigned to the Grade 7 mathematics PLC at the target site. Placing any additional criteria for inclusion upon the study might have reduced the participation rate among the available middle school mathematics teachers and campus administrative dean participating in the exploratory case study. There were six participants who met the inclusion criteria and provided deep insightful perspectives and campus-focused information because of their involvement in the PLC.

The PLC demographic questionnaire provided a synopsis of PLC membership, which I used in the triangulation process with other data collection instruments. The Grade 7 PLC consisted of six members, represented by four females and two males. Table 4 displays the characteristics of the six participants. The group of six educators had a combined number of 11 years as teachers of middle school math. Among the PLC members, several types of teaching certificates, such as general education, ESL, special education, mathematics Grades 1 through 8, were represented.

Participant Justification

The data collected from the six participants provided a deep level of individual understanding and teachers' perceived concerns related to collaboration in their PLC (Anney, 2014; Creswell, 2012). The sample size used in qualitative research methods is often smaller than that used in quantitative research methods. Qualitative case studies are used to gain an in-depth understanding of a phenomenon being studied or focus on

meaning and how or why of a particular issue, process, situation, or set of social interactions is occurring (Creswell, 2012).

Table 4

PLC Participant Profile

Participant no.	Gender	Years teaching MS math	Certification type	Highest education level	Years in current PLC	PLC training date(s)
1	M	4	Generalist 4-8 Mathematics 4-8	MS sports medicine	4	BOY 2012-2013
2	M	2	Mathematics 4-8 Mathematics 7-12	BS interdisciplinary studies	2	BOY 2015-2016
3	F	2	Gen Ed PK-4 Gen Ed 4-8 Special Ed	BS	1	BOY 2016-2017
4	M	2	Mathematics 4-8 ESL	BS interdisciplinary studies	2	BOY 2015-2016
5*	F	0	Generalist 4-8	Masters curriculum and instruction	9	BOY 2006
6	F	1	Gen Ed 4-8	BS family studies	1	BOY 2016-2017

Note. BOY = beginning of school year. MS = middle school. PLC = professional learning community. ESL = English as a second language. * indicates participant was an administrator.

For this project study, six participants who met the criteria and consented to participate were included in the study. The participants varied in years of teacher experience and years of teaching at the site PLC (Table 4). The differing participant perspectives presented rich data for my study. The number of participants and the years of experience each participant possessed added a balance and depth of inquiry to the research (see Creswell, 2012). The participants provided perceptions and the

administrator participant provided insights as an administrator participating and leading the PLC. In keeping my sample small, I was able to engage in greater depth with each participant (see Creswell, 2012). As a novice researcher, purposefully recruiting a smaller participant pool for my study allowed me to better manage the data and collection methods used to gain insight regarding the teachers' and administrators' diverse perceptions in relation to their PLC environment and collaboration.

Procedures for Gaining Access to Participants

In order to gain access to the participants, I submitted a letter requesting district cooperation in addition to an application to conduct research to the district superintendent in GHISD. I received contingent approval from the superintendent's office staff on January 6, 2016, pending Walden IRB. Once I received Walden IRB approval #09-22-160292286, I forwarded the IRB approval information to the superintendent and received an official letter of approval from the superintendent to conduct the research study.

I met with the principal at the study site and shared the official letter of approval from the superintendent, the IRB approval, and discussed the purpose of the study. As suggested by Creswell (2012), I explained to the participating middle school's principal the following: (a) the purpose of the study, (b) time required to conduct study, (c) time required from participants, (d) activities involved, (f) how data would be used, and (g) provisions to protect the confidentiality of participants and Campus A.

I sent a letter of invitation to potential Grade 7 PLC teacher participants at the target site using my Walden email account. The letter of invitation informed potential

participants of the purpose of the study, time required to conduct study, time required from participants for interviews and observations, expectations regarding archival data collected, how data would be used at the completion of the study, and provisions to protect the confidentiality of participants at Campus A. The invitation to participate also explained the voluntary nature of the study, the maintenance of confidentiality, the risks and benefits associated with the study, and the option to withdraw from the study at any time. In addition to the teacher participants, I also emailed a letter of invitation to the campus administrative dean, who was knowledgeable of the Grade 7 mathematics PLC, with an attached notice of consent and the same explanation of the study as provided to the teacher participants with different expectations regarding the retrieval of archival data.

The participants, teachers and administrative dean, returned their consents by electronic signature via email indicating their willingness to be a part of the study. I received confirmation of intent to participate and the notice of consent from three of six participants within 3 days. To reduce the likelihood of the perception of coercion by the participants, a follow-up email containing the letter of invitation and attached notice of consent was sent by the Executive Director of Research. After waiting 1 week after sending the initial invitation, the Executive Director of Research resent the letter of invitation and notice of consent to the potential participants who did not respond to the initial invitation to participate in the study. This follow-up process is a normal job function of the Executive Director of Research with district staff data regarding requests

from teachers, district surveys, and research studies. I contacted each participant one time as did the Executive Director of Research. After this I stopped attempts to gain access as all members had responded. Once I received the notice of consent from the remaining teachers or administrator participant, I proceeded to contact the potential participant via their email to schedule an interview. I followed up with each participant after scheduling the interview by confirming the date, time, and location of the interview prior to the interview. For the interviews, I used a readily available classroom and/or office within the school, as reserved for the participant to conduct the interviews. All interviews were conducted in a quiet and private location and did not exceed 60 minutes. I coordinated my PLC observations with the administrative campus dean, who regularly attended the PLC meetings, to observe the PLC planning sessions.

Establishing a Researcher-Participant Relationship

The purpose of this qualitative case study was to explore middle school teachers,' and the administrative dean's perceptions of collaboration, and levels of depth regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data analysis of student performance, and lesson design within PLCs. Ensuring trustworthiness in research allows others to value the integrity of the research (Anney, 2014). Trustworthiness includes credibility, transferability, dependability, and conformability. As an educator, I understand the uneasiness associated with providing information regarding aspects of the workplace and being unsure of how information will be used.

In order to build the relationship of trust, I hosted an initial voluntary group meeting with the site campus' PLC members. I introduced myself and allowed participants to ask questions regarding confidentiality, my motivations for the study, and any other concerns. Creating an initial meeting to for all participants provided transparency to participants regarding the study and appeared to alleviate anxiety that some participants had, especially for those who had never participated in an interview or observation-based study. At this meeting I began a rapport building process with the participants, which I focused on throughout the research study when engaging with all participants. I reassured participants about the confidentiality of their data. I explained that I would be the only person to review data for the study.

Ensuring participants' comfort facilitated their willingness to share their perceptions, and experiences that was critical to the trustworthiness of this study (see Merriam, 2009). These efforts facilitated establishing trust, so individuals felt comfortable sharing their perceptions during the initial contact and when interacting with me (see Creswell, 2009). Yin (2014) suggested the credibility of a researcher is dependent on the training they receive, their experience, track record, and how they present to participants. Because this case study was my first experience with collecting large quantities of qualitative data, the presentation of my qualifications to the PLCs was of utmost importance in establishing credibility. I approached the initial meeting with participants with the understanding that their first impression of me could possibly influence their responses and openness to the study.

I monitored any sway of my personal opinion or bias about my expectations for teachers' actions through bracketing while collecting and analyzing the data for this exploratory case study (Anney, 2014). According to Merriam (2009), leading questions reveal a bias or assumption that the researcher might hold or be making. In an attempt to limit any bias, leading questions were not used as interview questions.

Ethical Protection of Participants

Maintaining ethical protection for participants was practiced in accordance with guidelines set by the National Institutes of Health (NIH) Office of Extramural Research for protecting human research participants. My certificate obtained from NIH is evidence that I understand the expectations for providing each participant with ethical protection both during and after this study. As suggested by Lodico et al. (2010), I maintained a high level of ethics and was fully aware of the measures and treatments needed for each individual participant to feel protected. I worked to develop a consistent unbiased researcher-participant relationship by safeguarding each participant's personal information and confidentiality, so they were protected while sharing their work, beliefs, and perceptions with me including information given prior to, during, and post interview and PLC observation sessions.

Confidentiality. Keeping the records private and protected was essential to protect the rights of each participant. All names of participants, schools, and the district were de-identified in the report of the findings and on observations, interviews, and documents reviewed. The safeguards recommended by the IRB were in place for the

protection of each participant's rights such as: (a) engaging in no coercion to participate, (b) honoring privacy, (c) honoring time commitments, (d) protecting of identity, (e) treating participants with respect, and (e) reporting the findings truthfully (Bogdan & Biklen, 2007).

The informed consent form specified PLC members' participation in this project would not affect their status or evaluations in the school district. The informed consent focused on the purpose of the study, data collection regarding teacher perceptions related to their PLC experience. Protecting all forms of data and the participants' identities was necessary to protect participants' confidences as employees of the target school. I ensured participants repeatedly that I was the only individual aware of their responses. I established that the study was structured to present no actual risk to participants beyond the risks of daily living and that they could withdraw at any time.

One measure aimed at emphasizing confidentiality was the assignment of an arithmetical number to each participant as a code or pseudonym. Their consent documents were printed and stored in a secure location with the appropriate numeric code for each participant in order to mask the data. After 5 years the electronic consent forms will be deleted from email and emptied from the computer trash bin so no electronic copy of the consent and identifying data remain on my computer. This measure will help ensure participant identities are not directly or indirectly disclosed and the process facilitated confidentiality and was reiterated to participants throughout the data collection process.

Data Collection

In a qualitative research study, multiple forms of data are collected to help determine meaning in a single unit structure (see Creswell, 2012); in this case the structure I was seeking to understand was the Grade 7 mathematics PLC. Merriam (2009) suggested the case study researcher seeks insight, discovery, and interpretation rather than hypothetical testing. Interviews, questionnaires, planning documents, and three observations of the mathematics PLC's processes and activities provided rich, deep understanding of meaningful patterns and processes (Merriam, 2009). I gleaned information from each of these data sources related to the research questions and purpose of the study. I triangulated the sources of data collection thereby strengthening the validity of the findings. Qualitative inquiry rather than quantitative methods helped with solving the local problem, a phenomenon representing a real-life situation (see Merriam, 2009). Due to the collection of data using varying tools, I was able to understand the phenomenon being studied and, thus was able to answer the research questions following my analysis of the findings. The initial phase of data analysis involved determining the meaning and practice of the PLC by comparing answers to interview questions and observational notes with the research questions to understand how these data answered the research questions (Houghton, Murphy, Shaw, & Casey, 2015). I collected participants' perceptions regarding the collaboration and implementation phenomenon associated with the Grade 7 mathematics PLC in which the educators collaborated with the goal of promoting student mathematics achievement. The data collection was aligned

to the three research questions. The process used to gather and record data for each of the research questions appear in Table 5.

For RQ1 of this study, information was collected using an interview protocol with questions that focused on seeking information on ways the PLC members used their collaboration time on lesson design to improve student achievement. RQ2 involved data collection from the interview protocol, demographic questionnaire, PLC artifacts and observation protocol on the observed processes members used to reflect on student mathematics data. Data for RQ3 were derived from interviews, observations, artifact reviews, and protocols seeking information concerning the way PLC members responded to student learning gaps. The collection of data started with members of the PLC completing a demographic questionnaire.

Table 5

Research Questions and the Respective Protocols for Data Collection

Research question	Data collection tools	Data source
RQ1: How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement?	Interview questions	Members of Grade 7 mathematics PLC Interviews' digital recordings, transcripts, and field notes
RQ2: What processes do PLC members perceive they use to reflect on student mathematics data in their PLC	Demographic questionnaire Interview questions	Members of Grade 7 mathematics PLC Documents used by the PLC for lesson design, data reflection, e.g., agendas, minutes, lesson frames, etc. Interviews' digital recordings, transcripts, and field notes Demographic questionnaire data for participants' teaching background and PLC training information
RQ3: How do members participating in PLCs respond when data reflect a gap in student learning based on PLC observations and archival documents?	Artifacts Observation guide Demographic questionnaire Interview questions	Members of Grade 7 mathematics PLC Observations conducted during the PLC planning and data reflection process. Documents used by the PLC for lesson design, data reflection, e.g., agendas, minutes, lesson frames, etc. Interviews' digital recordings, transcripts, and field notes Demographic questionnaire data for participants' teaching background and PLC training information

Demographic Questionnaire

To generate deeper inquiry, each participant was asked to complete a demographic questionnaire. The demographic questionnaire gathered information from all teacher participants pertaining to years of teaching, mathematics content depth via

certification, years in the current PLC, and PLC induction date. This demographic information allowed me to analyze the responses in context of the research study and phenomenon being studied (see Creswell, 2012; Harper & Cole, 2012). I included the demographic questionnaire with the invitation to participate and notice of consent sent to potential participants.

Data gathered from the questionnaire provided a clarification of each member's teaching background as well as the date of PLC induction at Campus A. At the beginning of each interview, participants were asked to share their PD and/or training received concerning engaging in a PLC as indicated in the participant demographic questionnaire and as part of enhancing the creditability of the project study. Participants' years teaching middle school mathematics and years participating in the current PLC were used in triangulation with archival data such as lesson frames, and data reflection protocols. These archival data were further triangulated with interviews, and PLC observations. In analyzing the documents, I was searched for anomalies and confirmation of the phenomenon under investigation that may have affected PLC processes. All data were protected through use of pseudonyms using a numeric coding system (see Merriam, 2009). The first form of data collection was teachers' and the administrative dean's interviews that were scheduled at the site campus.

Interviews

In qualitative research, interviews are used as the dominant strategy for data collection or used in conjunction with observations and document analysis (Bogdan &

Biklen, 2007). Yin (2014) explained when interviewing each individual participant, the researcher gathers detailed information from observing the participant's behavior to questions and attitudes toward the topic of study, which leads to documenting the participant's perspective and understanding the participant's responses. I provided the interview questions to participants during the interview by providing them a hard copy of the interview protocol, which was a tangible document for participants as suggested by Creswell (2012). I used the interview protocols to seek answers for the first two research questions from the Grade 7 mathematics PLC members.

To make certain the interview questions generated the data necessary for fulfilling the purpose of the study, I asked two district administrators, one mathematics specialist and one methodologist, to review the questions and provide feedback regarding the ability of the interview questions to solicit valid data. The interview questions were used to obtain specific information about the collaborative work and planning conducted in the PLCs and the PLC members' expectations for student achievement as a component of the PLC meetings. Based on the two district administrators' feedback, I revised my interview questions so that clear and reliable responses were obtained.

The participant interview data contained perceptions of the data reflection and lesson planning processes of the PLC toward facilitating the Grade 7 students' mathematics achievement. Interviews for this study consisted of one-on-one open-ended interviews with six participants, with each interview lasting approximately 50 to 60 minutes. According to Harper and Cole (2012), the transferability of this study generates

greater credibility with thick, rich descriptions from the participant in order to allow the study and results to transfer to various times, people, situations, and settings.

One-on-one interviews were appropriate for interviewing GHISD participants who were not hesitant to speak, were articulate, and could share ideas comfortably (Creswell, 2009, 2012; Yin, 2014). For those who might be hesitant to speak during the PLC sessions, the interviews represented an opportunity for the participants to express perceptions about how to improve PLC processes so that Grade 7 students might improve their mathematics skills thereby possibly leading to higher mathematics achievement. The open-ended questions of the semi-structured interview format facilitated comfort for the participants with the interview process and allowed me to ask follow-up questions if a participant seemed hesitant to share openly or if the participant's response needed clarification.

Campus PLC participants were contacted via email to determine potential interview dates and times. Interviews were held at a mutually agreeable time and were not held during instructional time. One-on-one face-to-face interviews were conducted with the Grade 7 mathematics PLC teachers and campus administrative dean. The interviews were conducted at a mutually agreeable place that the participant perceived as a confidential area such as the participant's specific classroom or a campus office with the door closed to prevent interruptions. Once each participant scheduled an interview, I proceeded to meet with each participant at the agreed upon time to conduct the interview using the interview protocol.

At the beginning of each interview, I shared the interview agenda with the participant, made participants aware that I would be recording our session, provided instructions about the interview, and provided a copy of the interview questions in a large font size for readability. The intent of providing the interview agenda was to offer the participants a clear structure to the interview process so they would be informed and aware of each step of the interview process. Following introductions and the sharing of the agenda, I engaged a friendly conversation with each participant to establish a nonthreatening environment to facilitate the feeling of protection and the support the free expression of responses. I reiterated to the participants' that identifying information and content would remain confidential. I described the purpose of the study, and participants' safeguards. I worked to establish rapport with the participants prior to beginning the interview. I asked the participants if there were any further questions about the interview process or about the study before initiating the actual interview. I also made sure to remind the participants that they could end the interview and withdraw from the study at any time.

To control for any bias, I controlled my non-verbal expressions, body language, and tone of expression during the interview process. I followed the rules of active listening, providing verbal and nonverbal encouragement, and maintaining an open disposition to new ideas (Rubin & Rubin, 2012). This interview structure allowed GHISD's mathematics PLC participants to describe their individual PLC experiences and collaboration efforts. This interview plan provided the opportunity to obtain a deep,

descriptive understanding of the mathematics PLC as a phenomenon. Engaging in deeper inquiry with each individual participant provided insight and information for district-level administrators who support and lead PLCs. I used probing questions when I needed clarification about a response to a planned interview question that I had already asked to gain a deeper understanding of the participant's response to the interview question.

Following each recorded interview, I personally transcribed each interview immediately within 24-hours following the interview session into a word document. Once transcriptions were complete I provided the document of the interview to each participant to review for accuracy and offered them an opportunity to explain any comment that they believed could be vague or incomplete. I sought to clarify any responses I was unable to understand following the transcription of the interviews as part of this process. I also used bracketing and member checking to minimize any inaccuracies as a result of biases, in my transcription notes, and professional assumptions by providing participants with a draft copy of the research findings to review and provided feedback or suggestions for additions or changes. This process is referred to as member checking and is another means to confirm the validity of the findings by asking participants for further feedback on the draft findings. Observations of the PLC during team meetings were the next method in the data collection process.

Observations

Nonparticipant observation as a method of collecting data "in case study research when the researcher enters a social setting to observe processes, activities, and

interactions as an attempt of gaining a direct understanding of a phenomenon" (Mills, Durepos, & Wiebe, 2010, para. 1). Participant observation is used to increase the study's trustworthiness, because observations may help the researcher gain an increased understanding of the context and phenomenon under study. Trustworthiness, or validity, improves with the use of multiple strategies for data collection, such as observation, interviews, questionnaires, and document analysis. Direct, nonparticipant observation of the PLC was used as a tool for answering this study's descriptive research questions (see Yin, 2017) and allowed me to triangulate the emerged findings from interview and artifact analysis data with these observations.

The purpose of the observations involved recording my notes to capture aspects of the collaborative data reflection and lesson development practices during the PLC meeting as I observed. Nonparticipant observations of the site PLC meetings were the second method in the data collection process. District administrators provided a list of suggested PLC observation criteria to include in the observation protocol, which was developed by the teaching and learning department to focus the implementation of the design of PLC processes envisioned by the district staff that became known in the district as the work of PLC members. The observation tool I created and used contained detailed field notes of observed PLC processes and actions engaged in by the teachers and administrative dean. The data-recording tool I developed for this study contained PLC meeting processes district administrators expected PLC staff to incorporate during lesson design and data reflection regarding student performance.

Observations took place after the interviews and in the setting where the phenomenon of interest naturally occurs, unlike designating a location for interviewing (Merriam, 2009). In order to avoid disrupting the master schedule of Campus A, I coordinated my PLC observations with the administrative campus dean, who regularly attended the PLC meetings, to observe the PLC planning sessions. A PLC observation session lasted approximately 50 minutes. I focused on gathering a detailed description of the teachers' discussions and collaboration and on how teachers connected their data reflections and lesson planning to Grade 7 students' mathematics achievement.

As an additional observation collection method, when members of the site PLC provided artifacts during their PLC meetings, I scribed on these artifacts as appropriate to capture my understanding of how PLC members used the artifacts in the PLC processes. For example, I observed firsthand if teachers were using the processes and protocols established for PLCs by members by the district's teaching and learning department determined as best practices in analysis of lesson design and student data reflections.

Participant observation allows researchers to understand definitions of terms used by participants in interviews, observing such events may allow the researcher to gain information that participants may be unwilling to share. This observation is less invasive when digging deeper might seem impolite, insensitive, or uncomfortable for participants (Yin, 2014). Observing these PLC meetings allowed firsthand examination of data about how the PLC staff functioned and provided the information needed to answer RQ3.

My PLC observations focused on the following: (a) participants' selection of the physical setting for the PLC meeting, (b) participants' use of data reflections, (c) participants' use of processes used during mathematics lesson development, (d) participants' conversations regarding lesson design templates and planning, and (e) participants' responses when students' data gaps were identified. The first PLC observation occurred at the end of a 9-week assessment period when teachers were completing data reflection regarding the district's 9-week mathematics assessment. The timing of the observation allowed me to experience first-hand the actions of the PLC as they reflected on students' mathematics performance. Campus A administered the same common district 9-week mathematics assessment that all other middle school staff used as a district wide process. GHISD district administrators expected each PLC team to review and disaggregate 9-week mathematics assessment data.

There were two additional PLC observations that occurred at the beginning and middle of a 9-week period. The timing of these two remaining observations was intentional to observe and record processes described in the interview and used by the PLC in the first observation. I recorded PLC actions and compared them to interview questions and participants' descriptions of how they approached data reflection. These observations provided firsthand knowledge related to how teachers functioned within the social setting of a PLC (see Yin, 2017). The observations offered me the opportunity for gaining a unique insight into how the PLC staff approached the practice of closing students' mathematics achievement gaps beyond the data available through interviews.

Observations allowed me to observe how lesson plans and data reflections were developed by the PLC, and how the participants followed through with use of the strategies developed in the meeting. I used a journal to record information regarding setting, participants, and interactions within the PLCs. The journal contained the observation protocol used for collecting field notes during an observation (see Anney, 2014; Creswell, 2012). The journal provided a reflection tool for bracketing and as a reference during the triangulation of my data. In addition to observations of the PLC meetings, various artifacts (e.g., archival record or document) were gathered for triangulation of data and to respond to research questions (see Creswell, 2009; Yin, 2014).

PLC Artifacts

Once the interview notes and observation data were analyzed and coded, I collected additional qualitative data by reviewing PLC documents. During interviews and observations, I obtained the PLC artifacts (e.g., archival records and documents) from the participants, which they used to guide development of lesson frames, agendas, protocols, and data reflection practices as incorporated into the PLC during their collaborative planning and data reflection processes. Existing documented archival data were also analyzed to determine if these data supported the initial findings of the qualitative analysis of the interviews, and the observations of the site PLC.

In this study, I reviewed artifacts that included the lesson plans and documents used by the PLC participants to shape information from their data-driven discussions in

which they either revised or included the collaborative work of designing lesson frames for a particular unit of study. The lesson frames created by the Grade 7 PLC members provided a data source for exploring teachers' perceptions of lesson design, pedagogical strategies, and PLC implementation and effectiveness in supporting students' learning Grade 7 mathematics skills. These data were analyzed to uncover patterns of change (Patton, 2015) that existed in within the PLC related to use of data reflection and lesson design.

Artifacts (e.g., archival records or documents) from the natural setting allowed me to gather data without becoming involved with or interfering with participants (Merriam, 2009). For this study, an artifact was written, visual, digital, and physical material used by PLC members to guide lesson development and data reflection processes. I had access to artifacts that included agendas, minutes, results of 9-week mathematics assessments, and data reflection procedures. I received all student-related data as de-identified to protect the identities of the Grade 7 students; therefore, all student assessment data were anonymous. If any artifact that contained identifying information the information was removed or redacted prior to using it for data analysis. I de-identified all artifacts by assigning an alphabetical pseudonym and a description of the artifact. I observed the use of each artifact used by PLC and was allowed to take pictures of finished products to add to my journal notes.

I scheduled a meeting with district central administrators who facilitated GHISD mathematics curriculum and PLC implementation to inquire about the artifacts provided

by the district to PLCs to support teacher planning and the review of the 9-week mathematics assessments. I compared the artifacts with the ones provided by district to determine consistent patterns. I retained the artifacts collected from administrative staff and PLC members in a locked file cabinet in my home. I used these artifacts to triangulate meaning between sources of data during the coding process. According to Creswell (2012) and Merriam (2009), these sources of data provided valuable information for understanding the central phenomenon of the PLC as used for improving Grade 7 students' mathematics achievement. Generating and tracking data are the next method discussed as part of the data collection process.

Although I fully understood that archival documents might not allow for the exploration of the Grade 7 mathematics PLC members' perceptions, archival documents provided descriptive examples of the educators' shared experiences. Archival documents were evaluated to capture each piece of evidence as uniquely concrete and contextual information. These documents allow me to compare documents used during the PLC with responses to interview questions. Having these data sources to triangulate with the interviews facilitated the emergence of comprehensive themes. When the PLC documents were received, participants were asked to describe how they used the documents within the PLC. The description of how they used the documents was compared to my observations of how the PLC documents were used in PLC meetings in addition to the participant interview responses regarding how the documents were used.

Establishing Sufficiency for Data Collection Instruments and Methods

Creswell (2012) discussed the benefits of using multiple methods of data collection to triangulate the data and gain a thorough understanding of the problem. To understand the collaborative experiences and perceptions of teachers participating in the district's PLCs, I used several collection methods over a 9-week period to ensure credibility and trustworthiness through triangulation (see Creswell, 2012; Merriam, 2009). Triangulating in qualitative research may include the mixing of data, design, and analysis approaches that can "generate creative mixed inquiry strategies that illustrate variations on the theme of triangulation" (Patton, 2015, p. 248). Merriam (2009) defined triangulation as a process comparing across multiple sources of data such as artifacts, observation notes, and interview responses. Triangulation was an appropriate validation strategy for qualitative studies such as this exploratory case study.

For this study, I conducted research and gathered data at one target middle school. Data consisted of the following: (a) open-ended, in-depth, semi-structured interviews, (b) observations in the PLC setting where processes used by the mathematics team were observed including data reflection practices, (c) archival documents used by the PLC team such as protocols for their meetings, and lesson frames, and (d) a demographic questionnaire. Each of the four instruments provided data related to how teachers used their PLC to address Grade 7 students' mathematics achievement needs. I collected digital voice recordings and written observation notes during PLC observations. I used these data to make a comparison between interview discoveries and teachers' actions

during the observation of the targeted PLC meeting, and artifacts they used as part of lesson design, data reflection, and analyzing gaps in student learning.

Systems for Tracking Data

Merriam (2009) suggested designing and structuring a system for organizing and managing data early in the planning of research. I used these data to compare between interview discoveries and teachers' actions during the observation of the targeted PLC meeting, and artifacts they used as part of lesson design, data reflection, and analyzing gaps in student learning. A system of coding participants' identities served as a tool for assigning shorthand designations to the meanings associated with the data. The use of numeric codes, such as numbers 1 through 8, ensured the maintenance of confidentiality in the data.

I kept all data I collected from each participant secure within password-protected files on my personal computer. Paper copies of data sources were stored securely in a locked file cabinet at my home. I personally transcribed the interviews to enable efficient generation of insights regarding the data and easy coding opportunities while protecting the participants' identities for confidentiality. These data will remain secured and stored for 5 years, as required. After 5 years, any paper copies of data will be shredded, and electronic copies will be deleted or shredded. By using a variety of instruments to collect data, I generated an information-rich case study. Therefore, my role as researcher is described in the following section.

Role of the Researcher

My role as researcher in this qualitative exploratory case study was to gather unbiased data, conduct one-on-one participant interviews, conduct PLC observations, obtain artifacts, and use information from a demographic questionnaire. I am employed in the same school district in which the study took place, but I did not directly supervise or evaluate the performance of the middle school principal or teacher participant, or the dean involved. I have a master's degree with a principal and superintendent certification.

I hold a position on the superintendent's cabinet but supervised an unrelated department in the district. My position as a senior member of GHISD Central Administration staff could have influenced the participation of some members in the target middle school PLC, but I implemented the measures listed in quality of data, and role of researcher to diminish and/or prevent any sense of coercion. Therefore, I recognized my bias and how the results of the study might be used at the district level. I used a bracketing process to mitigate any possible preconceptions I may have had in this case study to ensure the data were collected and analyzed without interference of bias (see Anney, 2014).

The study included one mathematically underperforming middle school, Campus A. In my GHISD position, I did not directly supervise campus administrators or any teachers or programs at Campus A. I also did not have direct contact with teachers and had no input on their evaluations. I had no personal connections with any of the potential participants. I was not a mathematics teacher and had not participated as a teacher or

administrator in any of the district's PLC related to Campus A. I was, however, an assistant superintendent within the district, so my presence might have been construed as intrusive if I had not established a relationship with the mathematics PLC participants and earned their trust prior to conducting the interviews and observations. However, once I entered the field I made every effort to remain mindful of the potential for bias to surface at any point (see Yin, 2017).

Data Analysis

Data collected in this study included six Campus A educators including five teachers' and one administrative dean's perceptions regarding the collaboration and implementation phenomenon associated with the Grade 7 mathematics PLC in which the educators collaborated with the goal of increasing students' mathematics achievement. These data included participant interview data collected from the case study middle school's mathematics PLC members, observations of the PLC members during their planning sessions, and a review of artifacts, and data from a demographic questionnaire.

An inductive approach was used to analyze the data and produce the emerging themes. The importance of the inductive process when using qualitative data is to explain a central phenomenon, which requires building concepts and themes from interviews and observations in the field that enable triangulation between data sources (Merriam, 2009). The initial phase of data analysis involved determining the meaning and practice of the PLC by comparing answers to interview question and observational notes with the research questions to understand how data answered the research questions (Houghton et

al., 2015).

Methods of Analyzing and Coding

The purpose of data analysis is to bring meaning and order to data collected by a researcher (see Merriam, 2009). Merriam (2009) asserted that data analysis consists of examining descriptive responses from participants. I initiated the data analysis by immediately transcribing the audiotaped interviews. I used a digital recorder to capture each participant's responses verbatim during interviews. I typed the voice recording into a transcribed text file and saved each interview's text file as word document for ease of data management and manipulation.

In order to have quick access to the data, I created an electronic inventory containing identified codes for ease of data management and manipulation of my entire data set. These word documents allowed me to search for specific terms, make notations, and seek out common codes and develop themes. Next, I read each transcript thoroughly several times and created reflection notes as I developed a broad impression of the data. The information gathered from the observations allowed me to compare how the site campus' PLC approached this process with the processes the district staff expected the PLC to follow.

The data from the interviews, observations, and artifacts were coded by hand following a three-column technique described by Creswell (2009) for qualitative data analysis. Using this process, all raw data populated the center column of the data analysis code table that was created in word document. As I read through the interviews,

observations, and artifacts, I inserted emerging codes from the patterns found among the data in the left column. I typed the labels of the possible themes and additional reflection notes about the data in the right column. Codes and categories were labeled based on key words, phrases, or ideas from participants as I reviewed transcripts and observation data. Codes that emerged were noted in the left column, as I analyzed each transcript, and were grouped together. Groups of codes were noted in the right column. If these same codes appeared in other participant interview or observation transcripts, it allowed me to see the beginning of the development of reoccurring codes and categories. Following my thorough review and re-review of the data, I began to group the codes into categories. I then clustered the categories into reoccurring themes in a separate word document in which I could also copy and paste these data as I analyzed the codes and categories to the associated emergent theme.

The next step involved color-coding the data. I used the format suggested by Hatch (2002) as well as a distinct label for each indicator (Saldaña, 2015). Each indicator was color coded for tracking between multiple indicators. The same three-column template outlined above was used for organizing the emerging codes, concepts, and themes as I tallied and coded the data from the interviews and observations. Coding began with open, elaborative coding to discern the nature of the content referenced by the participants. As the patterns became clear, the themes became concentrated on the elements of the PLC process and the efforts for improving student achievement discussed

by the participants. Observations, artifact reviews, and the demographic information were triangulated with the interview data.

Because I anticipated the analysis might yield dozens of tentative categories (see Creswell, 2012; Merriam, 2009), I considered that emergent themes and categories could be related to Hord and DuFours' characteristics associated with learning community processes conceptual framework. The following characteristics surfaced from information collected in the demographic questionnaire, interview responses, and observations. The information included the following about the teachers: (a) impact of teacher content knowledge with the PLC membership, (b) approaches used within the PLC to deliver mathematics content, (c) instructional delivery and student performance gaps, (d) data reflections and lesson planning using PLC common lesson frames, (e) strengths and barriers regarding the implementation of PLCs, (f) instructional supports and, (g) data reflection practices used to promote student achievement.

Using this tentative coding process and breaking each interview and observation into individual frames of analysis allowed me to look closely at the data repeatedly in subsequent coding efforts. It was possible new themes could emerge until the coding process reached a point of redundancy or saturation as I triangulated between observations, PLC artifacts, and the interviews (Merriam, 2009). I anticipated the recoding of data to be frequent and cyclic as I aligned newly identify categories and themes throughout the analysis process. I eventually reached data saturation when I

began to recognize the same repetitive ideas and concepts and determined no new themes existed within the collection of data (Merriam, 2009).

I used a similar cyclic coding approach for analyzing the artifacts. The artifacts included the teachers' lesson plans, my observations from the PLC's data reflection process, and the students' 9-week mathematics assessment data. I triangulated the artifacts with interview responses and observations thus strengthening the depth of data collected for my study. Next, I discuss the processes used to establish the quality of my study.

Evidence of Quality

For this project study, member checking was used to validate the quality of my interview data and findings. Member checking and transcript review increase the trustworthiness and credibility of a study because the researcher involves participants in assessing the accuracy of findings and maintaining the researcher's neutrality (Creswell, 2012; Yin, 2015). Member checking ensured I provided an accurate account of the participants' actual words, meanings, and themes (see Creswell, 2009, 2012; Merriam, 2009). Member checking and transcript review were also used to establish credibility and validate the accuracy of my findings (see Creswell, 2009, 2009; Harper & Cole, 2012). I used member checking, which involved sharing the draft findings of the study with the participants to add thoughts, or comments on my draft interpretations (see Glesne, 2011; Harper & Cole, 2012; Merriam, 2009). The benefit of conducting member checking

allowed me to determine the validity of the data findings to identify any bias or misunderstandings I may have documented (see Kornbluh, 2015).

I provided interview transcripts to the participants and requested any changes or edits to the transcript. This transcript review provided the participants with the opportunity to ensure these data accurately described their responses and offered them the opportunity to add information or share. It was important that the participants' review data collected from them individually for accuracy and review the draft research findings and be given the opportunity to share any concerns (Glesne, 2011). This provided assurance as to the accuracy of the data collected in the interviews. Thus, I offered participants the opportunity to review their personal interview transcripts as well as the draft findings to add or suggest changes or to ask questions about any of the initial findings before I completed the final presentation of the data.

Another way I controlled for bias and added quality while conducting interviews and observations was to be aware of my nonverbal communication through my body language, facial expressions, and head nodding. I attempted to behave consistently with all participants by remaining pleasant and having a genuine smile (see Rubin & Rubin, 2012). I was aware my presence was out of the norm and collecting information within such a closed system was a disruption for the PLC environment. Credibility and quality was also addressed through the use of triangulation.

Triangulation provided another method to increase the credibility of my project (see Creswell, 2012). I used triangulation to corroborate the interviews, observations,

demographic questionnaire, lesson plans, and district document artifacts. Merriam (2009) suggested the use of multiple data collected methods in qualitative research. The data can be triangulated to increase credibility and validity of the research. Merriam (2009) defined triangulation as a process comparing across multiple sources of data such as between artifacts, observations, and interviews. Triangulation was an appropriate validation strategy for qualitative studies such as this exploratory case study. Creswell (2012) and Merriam (2009) suggested data collected in qualitative studies needs to be triangulated to increase credibility and trustworthiness. I triangulated data from interviews, the demographic questionnaire, observations, and artifacts to guarantee that these sources of data validated the identified themes. Triangulating these data sources increased the overall quality of the study and helped to ensure the identification of any discrepant data. Using multiple sources of data provided confirming evidence supporting the credibility and trustworthiness of the findings (see Creswell, 2012).

Field notes included within my observation framework also supported the quality of my project. I used field notes and journaled while observing the PLC to record the observation data in a narrative format and maintain the data in the case study database so that the data could be easily coded, analyzed, stored, and retrieved (Merriam, 2009; Yin, 2014). The field notes were also used within the triangulation of data for this project. Another method used to support the quality of this study was bracketing.

The use of bracketing provided and additional method to minimize bias on my part as I analyzed each data source (see Creswell, 2012). I actively recalled throughout

the research process that the validity and reliability of the study were dependent on the use of appropriate ethics (see Merriam, 2009). Merriam (2009) also asserted the trustworthiness of a qualitative study depends on the credibility of the researcher. Therefore, I bracketed my thoughts and reflections to ensure I did not influence the findings unduly. While analyzing each source of data bracketing helped minimize bias on my part. Next, I describe how I recognized discrepant cases.

Discrepant Cases

A discrepant case involves the circumstance when data show that a participant has had experiences or viewpoints different from the vast majority of the data collected for the study (Creswell, 2012). Encountering a discrepant case was possible with six participants. Recognizing a discrepant case involves searching for and distinguishing data that do not support, or appear to contradict, patterns of explanations otherwise emerging during data analysis (Creswell, 2012). Lobo, Moeyaert, Cunha, and Babik (2017) described discrepant cases as those contacting outliers or inconsistencies as compared to identified themes or categories. I searched for, recorded, analyzed, and my collection of data using a color-coding method and discrepant data that might have generated an exception or that modified patterns found in the data had a specific color assigned. Finally, I remained open-minded about the potential for discrepant cases as part of overtly avoiding the presence of bias during the analysis. The data retrieved remained consistent and no discrepant cases emerged.

In the results section I will discuss the findings associated with each research question, themes corresponding to each research question, discuss all salient data and synthesize the findings in relation to the problem, research question, literature and conceptual framework.

Data Analysis Results

The problem I sought to explore in this study concerned teachers' and the administrative dean perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at target Campus A. In order to understand the nature of the PLC implementation, I needed to develop an understanding of how the PLC members implemented PLC processes at Campus A. To achieve this, I needed to identify individual PLC member perceptions of the collaborative processes used to support student achievement. The following RQs guided this study:

RQ1: How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement?

RQ2: What processes do PLC members perceive they use to reflect on student mathematics data in their PLC?

RQ3: How do members participating in PLCs respond when data reflect a gap in student learning based on PLC observations?

Participants were purposely selected from the study district. There were six participants (five 7th grade mathematics teachers and one academic dean). This studied

relied on data collected from individual interviews, classroom observations, and archival data to answer research questions. All of the participants were available for individual interviews and selected the private location where the interviews were conducted. All participants had the opportunity to share their opinions and perceptions about the processes used in their PLC to improve student performance as a result of their collaboration.

In an effort to examine the teachers' and the dean's perceived efforts, the study primarily used the interview and observation protocols to identify the guiding framework of Hord and DuFour's characteristics of PLCs. This framework is dependent on staff working together to improve instructional practices aimed at improving student achievement (DuFour & Fullan, 2014). Although, participants shared certain differences in their perspectives about the phenomenon studied because of personal backgrounds and experiences, there was a consensus on what they perceived had an effect on their lesson planning, data reflection processes, and identifying student data gaps.

Findings

This section contains a summary of findings for each of the three research questions. Research questions and data sources that correlate are described in Table 5. Overall, I found nine themes in the data analysis process. Three themes for each research question emerged based as patterns during triangulation, which Merriam (2009) stated to be an acceptable number in qualitative studies. Table 6 illustrates each theme in relation to the number of participant responses from interview questions.

RQ1: Perceptions of Lesson Design and Impact on Student Achievement

This central research question is as follows: How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement? There were three themes that emerged from the data obtained from this question: (a) collaboration is viewed as supportive in the development of lessons, (b) collaboration in PLC influences teacher lesson delivery, and (c) PD is desired for a deeper understanding of the effect of lesson implementation has on student achievement. An analysis of the findings indicated that the PLC participants viewed their collaboration on lesson design to be effective; however, the data indicated PLC members lacked a specific understanding about the elements needed for developing effective lesson frames. Also, participants did not articulate or directly connect current student mathematics performance to their lesson designs. Clear parameters for student achievement did not emerge during interviews, observations, or document analysis. Participants were aware of the need to meet student achievement goals but lacked a focused systemic collaborative approach to defining and measuring such achievement.

Table 6

Emerging Themes by Research Question

Research Questions	Emerging Themes	Participant *n* Discussing Theme
1. Perceptions of lesson design and impact on student mathematics achievement	Theme 1: Collaboration is viewed as supportive in the development of lessons	6
	Theme 2: Collaboration in the PLC influences teacher lesson delivery	5
	Theme 3: Effective lesson plans influence student learning and achievement	5
2. Processes used by the PLC for data reflection	Theme 4: PLC structures and processes are not consistently used by participants	5
	Theme 5: PLC participants lack ownership in the development of reflection processes	5
	Theme 6: PLC members needs PD on supporting teacher collaboration needs related to student data reflection.	5
3. PLC response to gaps in student achievement data	Theme 7: Lack of structure for defining student achievement and proficiency	5
	Theme 8: Teachers have difficulty and need support in recognizing, monitoring, and understanding student data gaps	6
	Theme 9: PLC members desire consensus on goals and clear expectations for how the PLC will focus on student learning	5

RQ2: Process Used by the PLC for Data Reflection

The next research question was as follows: What process do middle school teachers and administrators perceive they use to reflect on student mathematics data in their PLC. The following themes emerged: (a) PLC structures and processes are not consistently used by participants. (b) lack of PLC ownership in the reflection process, and

(c) PD focused on supporting teacher collaboration needs for data reflection learning. Findings from both teachers and the dean described the processes and artifacts used in the PLC to reflect on student achievement. However, knowledge and understanding of data reflection varied among the participants, and the inconsistencies indicated the PLC members might lack purpose and understanding of current data reflection processes. Analysis of the findings indicated PLC members did not demonstrate a sustained continuous cycle of reflection practices that aligned with the mathematics objectives designed for ensuring students attained campus, district, and state achievement goals. PD was suggested in this area by participants.

RQ3: PLC Response to Gaps in Student Achievement Data

The final research question was as follows: How do members participating in PLC's respond when data reflect a gap in student learning based on PLC observations? Findings included participants' specific opinions and experiences about PLC actions that occurred when identifying learning gaps among students. Recognizing and responding to data gaps was difficult for all PLC participants. The need for learning, purpose, direction, and priority was well documented in the participants' responses. The following are areas where PD needs to be created and implemented in order to support the PLC: (a) defining student achievement and proficiency, (b) recognizing, monitoring, and understanding student data gaps, and (c) forming student achievement goals and expectations. Participants indicated lacking clarity about what to do with the student data were provided. Participants used terms associated with student expectations; however, I did not

gain any tangible evidence that student data were monitored or used to establish student achievement goals for the year.

Themes from the Findings Presented Under Associated Research Questions

As I reviewed and analyzed data, I found that the themes emerged from the members' efforts to improve student achievement as they understood the processes used within the PLC to meet campus goals. Both teachers and the administrative dean believed ongoing PD was needed in the areas of lesson design, data reflection, and recognizing student gap data. PD in the identified areas could lead to more effective content delivery, better improved analysis of student data, and the ability to recognize student learning gaps within data. Also, clear district expectations of PLCs throughout the district regarding lesson design, data reflection, and appropriated responses to gaps in student data is needed. The PLC participants wanted to learn and grow in their efforts to maximize student achievement and indicated a desire to improve practices and processes used in their PLC.

DuFour (2014) posited that PLCs are about people, practices, and processes; they are not a program. Researchers stress the point that PLCs are not a packaged reform that if rolled out correctly will improve student learning but rather PLCs are a way of thinking, collaborating, and acting to improve student achievement (DuFour & Fullan, 2013). In Table 7, emerging themes from this study are identified, and the PLC characteristics from Hord and DuFour's conceptual framework are presented.

RQ1: Perceptions of lesson design. I asked interview participants how they perceived their collaboration on lesson design to impact student achievement.

Theme 1: Collaboration is viewed as supportive in the development of lessons. I asked interview participants how they perceived their collaboration on lesson design to influence student achievement. The first theme to emerge from the first research question revealed that 100% of the participants noted that collaboration in their PLC had an influence on student achievement. The participants discussed applying content knowledge to lesson design with very specific statements. Participant 4 specified the following in reference to the design process, "so the sequence of how kids learn builds off of previous knowledge and this helps guide the design process." Participant 6 shared that when building a Grade 7 mathematics lesson, "make sure you are making clear that it's going from one set of ordered pairs to another." Participant 5 emphasized that "using the same vocabulary language that they learned in the sixth grade helps them [students] remember." Participant 5 shared concern about "starting with activities" rather than content in each mathematics lesson and recommended "that needs to change."

Participant 2 referred to developing "multiple processes for the same objective" so that "lesson design helps student achievement by giving us different ways to present things." In response to members recognizing the importance of content knowledge on student achievement, Participant 6 shared, "Oh, they got this wrong because they are not clear about when they are graphing and inequality." Participant 6 offered an example of

"talking about rise over run developing that objective" when planning that required the teacher "to think about it, and we have to talk about it."

Table 7

Themes Described According to Hord and DuFour Framework

Theme			Framework Characteristic Represented
No.	Label	Evidence	
1	Collaboration is viewed as supportive in the development of lessons	Participants described ways in which their collaboration on lesson design facilitated the use of the district curriculum overview and multiple process for the same objective.	Collaborative culture
2	Collaboration in the PLC influences teacher lesson delivery	Responses from PLC members indicated their collaboration on lesson delivery is valued. They recognize multiple perceptions focused on lesson delivery is positive for student learning.	Collective learning and collective inquiry
3	Effective lesson plans influence student learning and achievement	During interviews PLC members expressed their positive perceptions related to the effectiveness of lesson implementation. They based their value of the PLC on their personal experiences.	Shared personal practice and learning by doing
4	PLC structures and processes are not consistently used by participants	Teachers and the administrative dean described various approaches used to reflect on student achievement data. The PLC members did not recognize any approach as consistently used to monitor student achievement.	Student achievement and student learning focus
5	PLC participants lack ownership in the development of reflection processes	Teachers described a desire to have input on what their reflection process entails. Duplicated reports were identified as redundant. Value is noted in having a reflection process.	Shared beliefs, values, and vision
6	PLC teachers need PD on supporting teacher collaboration needs related to student data reflection	PLC members did not describe a sustained, continuous cycle of daily reflection practice. Members offered multiple options for PD to improve and support their learning.	Supportive structures and collective learning

(Table 7 continues)

(Table 7 continued)

Theme			Framework Characteristic Represented
No.	Label	Evidence	
7	Lack of structure for defining student achievement and proficiency	The PLC described various perceptions of student achievement. There is no clear pattern of agreement on how to determine when proficiency is met.	Shared values focused on student learning
8	Teachers have difficulty or need support in recognizing, monitoring, and understanding student data gaps	Participants described a need for more learning focused on identifying student gaps. Only one member specifically recognized a learning gap among student demographic data.	Learn by doing
9	Teachers or PLC members desire consensus on goals and clear expectations for how the PLC will focus on student learning	Participants discussed a need for the PLC members to define goals and specific student achievement targets with collaborate data use; however, this effort involves establishing a shared set of student learning goals and expectations across classrooms that did not happen in the PLC.	Shared goals and action orientation

Participant 5 added that lesson effectiveness "can vary based on how comfortable a teacher is with the content of a lesson and how much knowledge they have with a specific TEK [Texas Essential Knowledge] or unit." Participant 5 also noted that "we talk about breaking down the PA [performance assessment] and the TEK and this is a process of lesson planning." Participant 1 said, "We look to see what we want them to know by the end of the week" about measuring student achievement and the outcomes of the 9-week assessments. Participant 4 stated, "other people's perspectives change how I teach". Participant 5 summed up the work of lesson design in the PLC:

> We have a lot of teachers with 1, 2, and 3 years [of] experience. We would definitely benefit from spending more time understanding the TEK. What is the

> TEK requiring of the student? And breaking it down, spending more time with teachers understanding their content in those TEKs.

Participant 4 also suggested PD related to lesson frame expectations:

> The one main thing I would really change is making sure that each teacher has had some type of training about what the frame should look like, each component of the frame, where to find information in the frame. My first-year teaching to was just told to refer to the frames from last year and go off of that, nobody really sat down with me and talked to me about each piece of the frame, it was so stressful. It can be as simple as the master teacher sitting down with their department and going through each component of our frame explaining to us what to expect.

Responses from participants helped frame the theme regarding the influence of their collaboration on lesson design at the target site, which differed from their approaches to delivery of those lessons. When teachers' perceptions and personalities are considered, teachers begin to develop their own professional learning (Attorps & Kellner, 2017; Cook, Tone, & Zhu, 2014; Haug & Sands, 2013). Participants' responses indicated some PLC members lacked specific understanding about the elements needed for developing lesson frames. Perhaps, a gap exists between meeting teachers' needs for creating lesson frames effectively and the PD they received. Members would benefit from a clear understanding of campus and district goals related to lesson frame creation and data reflection. Teachers must simultaneously continue their efforts to close

achievement gaps by learning new instructional strategies in order for students to learn rigorous new learning standards (Entwistle, Karagiannopoulou, Ólafsdóttir, & Walker, 2015; Wood & Burz, 2013).

Theme 2: Collaboration in PLC influences teacher lesson delivery. Responses from PLC members could be associated with their perceptions of how their lesson designs influenced the approach for instructional delivery mode in terms of producing student achievement. Participant 5 responded, "Well, your lesson design and your delivery has critical impact on student achievement. Some teachers are diligent; they plan ahead." Participant 4 specified that PLC collaboration and delivery "has a significant impact for the simple fact that it's not just my train of thought on how something should be taught, and other people's perspectives change how I teach [the lesson in class] sometimes."

Participant 1 reported using the PLC meetings "to kind of see where they are going with their lesson, and how are they delivering a certain strategy" and noted that "collaboration beforehand and reflecting on it really helps them deliver their lesson." Participant 6 described the collaboration in the PLC as a way to improve lesson delivery by admitting that "sometimes I teach a little bit too high. Conversations in our PLC helps me understand and remember this is the first-time students have seen this concept. The collaboration really helps me with that." Participant 1 said reflecting on delivery during a PLC meeting enabled the teachers to improve "anything that we could've put here where our students didn't get anything right according to the product."

Participant 4 believed "the impact of collaboration is applied immediately" as the group determines the mode of lesson delivery. In fact, Participant 4 said, "During PLC we agreed to switch up yesterday's lesson and today's." Participant 2 added, "The lesson I taught yesterday was not the original lesson for yesterday." Participant 1 noted that modeling by a member of the group during the PLC was a resource that enabled the teachers to change perspectives about the delivery mode.

The use of information received from district curriculum overviews influenced lesson delivery, as Participant 5 reported: "Teachers, our new ones who may be hesitant or unfamiliar with the TEK, really use the curriculum overviews. 'How did we teach when we taught this? What did we do?' 'Did our effort improve student performance.'"

The last interview question in the series on lesson design, asked participants to describe the impact 9-week common assessments have on their lesson planning. Participant 1 indicated the 9-week common assessment did affect the PLC meetings because student achievement is measured weekly as well as at the end of each 9-week period. Participant 1 also provided an example of the 9-week assessment's effect:

> In the PLC with the 9-week district assessment, we normally sit down and get the lowest SEs [student expectations] from the test, and we kind of look and say, "Okay, so what did we do? How do we teach this this year?" We also compare it to last year.

Participant 6 offered a specific example of the PLC analyzing students' answers to a given item on the 9-week assessment. Participant 6 said, we discovered "Oh, they got

this wrong because they're not clear about when they're graphing an inequality." Responses from participants in this theme helped frame an understanding of their choices about lesson delivery modes and student achievement at the target site. Additionally, these choices led to the theme regarding their reflections about the effects of lesson implementation.

Theme 3: Effective lesson plans influence student learning and achievement. The third theme to emerge from the first research question was that teachers recognized the effect of lesson implementation on student achievement. Responses from the six PLC members included their perceptions and experiences of lesson implementation and how their individual implementation affected student achievement. Opinions and perceptions varied widely among PLC members. Participant 4 said lesson implementation:

> Allowed us, or it's taught us, to be more intentional as far as what we're teaching in the classroom. We understand that there are different components of slope, but looking at the 9-week data, or just looking at any of the assessments, allows us to be intentional with which type of slope we teach them and how we teach them.

Participant 6 noticed that "when we go over the 9-weeks test, I really know how I needed to clarify more stuff," such as becoming more specific and precise when delivering lessons to the students. Participant 5 shared that learning from implementation is about making adjustments to the lesson frame based on student achievement and asking, "Did we make notes on the frame about what we need to do differently for the next time because we don't want to have to recreate each frame?"

Participant 2 shared that implementation affects students "once we get to testing. We can see which one [lesson frame's implementation] actually did the best. I'll be doing whatever the best option was, or at least be trying." Participant 1 suggested that perhaps more conversation between teachers and students should occur during implementation as follows:

> I guess just making sure that there's a way to implement it in the classroom. A lot of times we talk about it as teachers but not with the students. It's a lot of reflection on what the kids did, their mistakes, but it wasn't really what could we have done better in the classroom. How could I have presented this better if they didn't get it?

Participants 2, 3, and 6 shared a perspective for consistency in expectations and follow through in the classroom. Participant 6 shared that lesson design and implementation had "been so changeable this year. It seems like we were supposed to do it one way, and then they [the campus' administration] said, 'Oh, wait that's too hard' and they scaled it back."

Participant 3 noted in observing one of the PLC members in the classroom "who planned lessons that week, planned a lot of things, but I really didn't see them implemented in the classroom" by this specific PLC member. Participant 6 added about timing and implementation that "it would be very beneficial if there was a conversation the day before the lesson was taught. I'm planning 2 weeks in advance, and I'm teaching 2 weeks behind," causing a discrepancy between planning and implementing.

Summary: Research Question 1 Themes. The PLC members' responses to the interview questions proposed to answer Research Question 1 indicated a common positive perception about collaboration and lesson design efforts through which the PLC influenced student achievement. There was a lack of consistent evidence that the teachers collectively applied new learning, evaluated the effects of the implementation, or consistently modified their practices because of their evaluation efforts.

The participants, in their interview responses, included examples of how they made modifications; however, the observations did not yield evidence of this practice. Senge (2006), Hord (2008), and DuFour (2014) found that personal mastery for learners is greater than developing and refining a skill set; individuals within the organization who strive for personal mastery have a deep sense of purpose based on their personal vision, and they continue to develop their practice to improve the current reality.

The mathematics PLC at Campus A had guiding protocols and the department's written norms. While these PLC protocols outlined the weekly schedule for lesson design outcomes, including the unpacking of SEs and a document for tracking the implementation and delivery of lessons, the participants' responses reflected their desire to learn, grow, and increase their clarity about lesson frame creation and use. Noel's (2015) findings of teachers needing to develop a portfolio of best teaching practices in order to grow as an educator addressed teacher choice in PD.

The participants described the tasks associated with their PLC practices; however, their understanding and use of these tasks to improve student achievement varied. PD

focused on improving teacher content knowledge is linked to improved student achievement (Jones & Dexter, 2014). Desimone and Garet (2015) found the student achievement success rate improves when PD is linked to classroom lessons. PLC participants openly shared the desire to gain more content knowledge and learn strategies to deliver more effective mathematics instruction that would ultimately lead to increases in students' mathematics achievement.

Of note, during my observations, no development of lesson frames occurred. I intentionally chose two Mondays for observations because those dates had been designated for modeling and grade level planning on a weekly PLC schedule provided to me. I discovered lesson frames were developed 2 weeks in advance and posted to the shared drive used by the site PLC mathematics teachers. I reviewed existing frames and found them to include the some of the elements in my observation guide. However, several elements were missing including the data analysis intended.

Participants expressed the desire to collaborate with other Grade 7 mathematics PLCs to compare frames and discuss delivery in the classroom. Members of the PLC appeared to operate from varying stages of understanding regarding their knowledge and confidence developing lesson frames. Analysis of the data indicated the participants' experiences symbolized Hord's (2008) and DuFour's (2004) PLC principles, but seemed to lack depth, consistent practice, and personal mastery.

Perhaps allowing choice in PD would enhance focus and direction in learning allowing adult learners to feel more in control of the specific content they are learning

(Owen, 2015). Determining a method of bridging the individual needs of participants is recommended to strength their personal mastery of mathematics content knowledge, instructional delivery mode, and build an understanding of how lesson implementation affects student learning and achievement (Mustafa & Ibrahim, 2013).

Research Question 2: Processes Used by the PLC for Data Reflection

The second research question was: What process do middle school teachers and administrators perceive they use to reflect on student mathematics data in their PLC. The participants described the processes and artifacts they used in the PLC to reflect on student achievement. Three major themes emerged from the responses within the contexts of Hord's (2008) and DuFour's (2014) PLC principles that were based on the specific opinions and experiences of members participating in the PLC study. Themes 4, 5, and 6, emerging from the interview responses and observations, were: (a) PLC structures and processes are not consistently used by participants, (b) PLC participants lack ownership in the development of reflection processes, and (c) PLC members need PD on supporting teacher collaboration needs related to student data reflection.

Theme 4: PLC structures and processes are not consistently used by participants. Responses from six participants could be associated with their perceptions of current refection processes within the PLC. During the interviews, members referred to several artifacts in relation to how they perceived the consistency of use of those artifacts in the reflection process. During the PLC observations, group members made comments

about the use of these artifacts in the reflection process. References to both artifacts and observation findings supported this theme.

Several participants connected the district 9-week assessment and the reflection process to each other as they commented on the PLCs approach to data reflections. Participant 2 provided an example of this type of connecting:

> I think that the 9-week assessments have pretty much been our go-to reflection piece. If we didn't have those, then I feel like we wouldn't really be reflecting in the right way. It really helps us to really have a way to check ourselves before STAAR and things like that, which is obviously the end game for most of us. I think that they're big for helping us to think about what the kids are doing, and act based on that.

Participant 4 discussed the connection similarly:

> If we didn't have 9-week assessments, we really wouldn't have any data to be reflecting on during PLC. Nine weeks is, we use it as a benchmark of what the kids should have learned up until this point, and then we use that data piece to see if we were successful with getting them to that level or not. We need the 9-week tests; we can't just not have it.

Participant 1 added the following experience:

> I think the common 9-week assessment is pretty much the whole reason why we have those data reflections. I feel like it’s pretty much like the foundation of those data reflections. This gives us a more objective way to look at data than what we

> already have because we already do the weekly reflections with our own quizzes, but then it's nice to have an outside perspective on the way that they could be asked those same questions and if my students are ready for that.

After explicating the connections between the district 9-week assessment and the reflection process, the participants discussed their practices for the reflection process. Participant 5 noted:

> They talk about breaking down of the PA and the TEK. We use a student product reflection, and basically, it requires a teacher to reflect on, what was the lesson objective, what was I looking for, what was mastery, what was the criteria for mastery, and what did I see.

Participant 1 discussed the process as the PLC "developed something we call the individual growth plan. So, we kind of use this document, I guess, to help guide the reflection." Participant 2 recalled the PLC:

> Breaks everything down, and we're really reflecting on what the students did and how we can help them. For each question we go through and see what percent [of students] got it right, what percent got A, B, C, or D, wrong and why do you think they picked those?

Participant 3 responded, "We're always asked, even during the week, we're asked, to do reflections on what we learned." Participant 3 added that "setting goals would be a good part of reflection" as a suggestion for the reflection process.

The following comments signified variations in the reflection process that were noticed by the participants this school year and how they acknowledged making these changes. Participant 2 said, “This year we’ve actually gone question by question, so we’ve been more particular about each question than we were last year. Last year, we did more of an SE targeting or concept targeting, sometimes like an objective.” Participant 6, however, did not “know if they’re going to continue doing this or not, because I think it was a new thing that people were very unhappy with.” Participant 3 noted:

> A lot of times I think the teachers feel like it's more work to do, instead of that it’s reflecting on their teaching or how they're doing. Yeah, it’s just like an extra thing to do and they're not reflecting on “how did I present this topic?”

Participant 5 discussed the “new electronic document for the 9-weeks reflection we’re filling out that basically requires teachers to list all the questions that a majority of the students missed.” Participant 5 added for “this electronic document, we are looking at target scores, and teachers need to identify students who either did not meet target, met target, or exceeded target.”

The electronic document represented the only reflection document I observed the PLC members using during a meeting. During the third observation, the group used the electronic document as well as an electronic application that contained a database of student demographic information as well as students’ mathematics grades to retrieve teacher specific student 9-week assessment data.

PLC staff frequently use various support documents or artifacts to guide their work throughout the school year. Documents reviewed at the site campus were discussed by participants as instruments to organize their reflection notes for comparison across each 9-week period within the year and again with a new cohort of Grade 7 students during the following school year. Participant 4 referenced a document "that is very popular" being labeled as "the circle, square, triangle." Participant 4 described this document's purposes as follows:

> The circle is to record something that's still circling in your mind. The square is for you to write down something that squares up your thinking, and the triangle is for you to record something that is still sticking out to you.

In addition to using 9-week reflection documents, participants shared the tool they used to reflect on students' weekly quizzes. This document housed data by period, included the number of students, and provided the percent of students passing each SE. Three guiding questions were used for this reflection process: (a) What did you notice about the data? (b) What factors contributed to this? (c) What do you plan to do to help ALL students be proficient of the SE?

Participant 4 described the Student Product Analysis document as follows:

> Basically, it requires a teacher to reflect on the lesson objective, what I was looking for, what mastery was, the product question and task, exceeding, meeting, and approaching standards as well as needs intervention [in addition to] a 1-10 rating on my instruction and how I used quick writes.

The final reflection document the participants shared was the, *Teacher Reflection Journal*, a 9-week specific goal setting document for each teacher. This document was shaped around the school's need to address all four measurement indices used in the current Texas Accountability System.

Participants used educational terms and identified the required steps for their reflections of student performance. However, participants did not make consistent connections between the tasks they used to reflect on student achievement in either the interviews or the observations. Participants described the perceptions and experiences of collective learning in their school as sharing teaching strategies and activities, reviewing student data, and learning new teaching strategies in their PLC; however, a cycle or system of follow-up actions for applying how their data were monitored did not occur during any observation.

Theme 5: PLC participants lack ownership in the development of reflection processes. Participants indicated their perceptions of ownership related to PLC processes and structures in this theme. Teachers working together collaboratively in improving teaching and learning is a learned skill that requires training. Through shared practice, teachers developed processes for the purpose of examining student work and professional learning that enhances instructional practices (see Fwu & Wang, 2012). Members share the power and, therefore, have ownership in the process creating an environment built on trust as relationships emerge within the PLC (see Hord & Sommers, 2008; Morrison, 2013).

The following responses indicated that participants lacked involvement in determining what tools and processes they were asked to use in their reflection process. For example, Participant 3 reported, “I don’t really have any ownership over the process.” Participant 3 noted that the documents they were asked to use “feel like it’s more work to do instead of that it's reflecting on their teaching or how they're doing. Yeah, it's just like an extra thing to do and they're not reflecting on ‘how did I present this topic?’ Participant 4 added, “Everything they give us as far a data, is just that; it’s given to us. They don’t really ask us how we think data should be collected.”

Specifically, in regard to documents, Participant 2 shared the following:

> I think that this year we have some new extra documents, and I feel like a lot of them require us to do a lot of things twice so there's a lot of redundancy in that. There’s a lot of double work. For example, we have every 9 weeks this year, we just started this this year, we take the test ourselves, and we write on the test why each answer choice was chosen in our minds, which ones the correct one, what SE the question is about, those kinds of things all on the test, and then we fill out a form that we put all those things again on, and I feel like a lot of it is just me transferring things that I can already see and read as it is, so I’m doing the same thing twice.

Participant 6 recommended the following:

> Finding a simpler way to get to the same destination would ease up a lot of stress on the teachers. Outside of PLC, with some of my other colleagues in other

> departments, it seems as though everyone has stress with how much or how long the process that they've given us takes. We don't mind doing it. We just wish there was an easier, simpler way to get to the same destination.

Participant 2 thought the PLC members rushed discussion of instruction to get to reflection:

> Some weeks, especially with the 45 minutes, we haven't had enough time for them to review stuff or to let them really be quizzed on. But we have to have a quiz every Friday to give data on where the kids are at and it supposedly is reflecting how well they're growing. I think, because they're quizzing too soon, it doesn't show what they're truly capable of.

Participant 4 advocated for "letting us have an opinion on how data should be collected. Then, taking some suggestions on how we can do that versus just giving us something that none of us think works."

Data gathered from participants indicate a desire to be more involved in the development of protocols used to guide their reflection process as a PLC. Responses from participants consistently questioned what the process is, and why they are not allowed to have input. Additionally, participants suggested types of PD they believe would help them provide better instruction ultimately leading to higher levels of student achievement.

Theme 6: PLC members need PD supporting teacher collaboration needs related to student data reflection. In regard to teacher collaboration, Hord and

Sommers (2008) referred to the PLC as learning process where peers are helping peers, teachers observing each other's classrooms, take notes, and discussing their observations with each other. PLCs allow teachers to collaborate about instruction and examine student performance data (Guskey, & Suk Yoon, 2009; Lance, 2010). It takes time for teachers to become comfortable to new work expectations and succeed in doing the work well (Katz & Earl, 2010). PLC members need time to build trust and confidence. Teacher collaboration is an important piece of successful PLC implementation as collaboration builds relational trust and capacity, where teachers are comfortable sharing information in a non-threatening environment with others (Cranston, 2011; Schechter, 2012).

Responses from participants led to quotes linked with their perceptions of PD support related to their growth in the area of data reflection. For example, Participant 6 described desired reflection learning as follows:

> I would like to learn a lot more about implementing data reflections. How's that? That's a positive way to say it? I know we have the mentors and the master teachers, but they have all these people to do and they have all these people that come to them. They've got their own classes to do. They've got their own paperwork to do. I've found that a lot of times I'm really scared that I'm not getting something.

Participant 2 described resources as a need support:

> Anytime that we can get more resources, that's going to help us a lot just in terms of where to get problems. I would love to see a PD that was more towards the

> department where we could actually get an overview of a lot of resources that we could have for mathematics, because I know that a lot of times we have a PD and it's a speaker and they're trying to get us resources that can cover all curriculum which is limiting to them, I feel like, because they probably know one content area that they used to teach, in that they could actually give better resources for overall, instead of just the broad picture ones like [the resource of] Kahoot, and those kinds of things.

Participant 5 advocated for "PD focused on implementing data discussions could be an improvement, really teaching teachers what a true reflection process looks like and how to do that incorporating data and be authentic with it."

Participant 4 offered a perspective about current the PD within the PLC as, "to be honest, the PD that we've gotten, I'm assuming it's PD, because it was during our cluster time. It seemed to be very strenuous as far as the process about how everything goes." Participant 2 said, "PD that we do have, I feel like, are just redundant and unnecessary most of the time. I've only seen our mathematics data reflection. I've never been to a different department or campus." Resonating a similar perception, Participant 3 stated the following:

> I would like to see multiple grade level collaboration. It's important to plan with your team, but I think bringing other grade levels and collaborating once a week would be helpful. I think it's good to get ideas from other grade levels.

Participant 6 noted, "I know that the 7th grade mathematics PLC at B campus is blowing [us] out of the water. I would love to see how their PLCs are run. I would love to see them in the classroom." Participant 5 suggested designing more "PD focused on the reflection process and the importance of focusing on factors that you can change, and you have control over." Participant 4 commented on observing PLCs and reviewing district data:

> I would like to look at the 9-week's data for the district, on the district level, see which schools are maybe rocking out certain SE's that our students didn't do so well on. Maybe observing those campuses or having some type of PLC with that campus, maybe take half a day and go through whatever low SEs that they rocked out on and asking them what they did and what they used to try to come back and implement that on our own campuses as a re-teach, maybe during tutoring or maybe during their intervention classes.

Participant 2 proposed the following:

> It's not necessary to hire someone from outside the district to provide PD. PLCs at B and C, just for the record, are pretty much the Grade 7 gods. They are who we look up to. They slay everybody on scores is the only way to put it, and so, giving the opportunity for them to tell us a little bit about their thought process when they're planning, how they present at least one lesson, would be big for us.

Knowledge and understanding of data reflection varied among the participants, and the inconsistencies indicated the PLC members might lack purpose and

understanding. The PLC members did not appear understand how to align their daily practices to fit with meeting stated student goals. As with Theme 1, participants' responses did not convey an understanding of how the tasks and processes of the PLC enabled them to attain expected summative (state) and formative (district) student achievement outcomes. The PLC members did not demonstrate a sustained continuous cycle of daily practices that aligned with the mathematics objectives designed for ensuring students attained campus, district, and state achievement goals.

PLC members indicated they have processes they use to reflect on lesson design and data reflection. Hord and Tobia (2012) suggested that data analysis offers a great starting point for collaborative discussions. However, comments made by the participants during their interviews indicated they lacked confidence about the exact purpose of each process, task, or document introduced in the PLC group meetings. I examined eight different documents used by the group for data reflection. These documents included the following: (a) Student Tracker "Connect the Thoughts," and Analytical Thinking, (b) Cluster Meeting Outcomes "Think Out Loud," (c) Introduction to Connections, (d) 3-1, (e) Student Product Analysis, (f) Reflection Journal, (g) Pace Yourself Tracking, and (h) Friday Quiz SE Percentage.

Participant 6 provided evidence of this finding and said, "I would love to learn more about implementing data reflections." The documents used by the Campus A mathematics PLC members included an electronic organizational template they could use to track measurements of student progress, but no observation of it being used happened.

Among the documents were guides for both the 9-week assessment and weekly quizzes. Data revealed multiple instances of PLC members discussing a lack of understanding about the data reflection process and concerns about the proper use of the template.

During the interviews, PLC members expressed a desire to play a role in developing documents and defining their reflection processes as a group; however, these actions did not occur during any of the three observation sessions. Participant 4 suggested that the reflection process needed to let "us have an opinion on how data should be collected. Then, taking some suggestions on how we can do that versus just giving something that none of us think works."

Summary: Research Question 2 Themes. Participants described the perceptions and experiences of collective learning in their school as sharing teaching strategies and activities, reviewing student data, and learning new teaching strategies in their PLC; however, a cycle or system of follow-up actions for applying how their data were monitored did not occur during any observation. Analyzing data provided by state and local assessments allows teachers to modify instruction to correct students' academic weaknesses as well as to design lessons for improving student performance (Learning Forward, 2014b**).** The PLC members recommended for PD that they visit other high performing campuses in the district to see first-hand and observe how those PLCs plan lessons, reflect on student performance, and take action. Changing the context of PD such as allowing PLCs to visit other campuses and observe collegial practices would allow teachers the opportunity to see varied strategies applied in the classroom and to engage in

follow-up of reflections on assessments (Bissett & Saunders, 2015). The willingness of participants to suggest and ask for specific PD to increase their ability to understand and develop a consistent reflection process is evidence of their commitment to student learning.

The first characteristic in the DuFour's model focused on teachers' devotion to all students' learning. Researchers' continue to find data supporting a practice where teachers meet frequently in PLCs to discuss lessons, assessments, and data gain opportunities to reflect on a conscious level and to become more aware of their daily decisions. An example would be an environment where all staff work together to advance instructional practices, and in doing so a common vision evolves; and continues to improve as the staff make the success of all students the vision (Hord & Sommers, 2008; Steeg, 2016). According to some researchers, the decline or stagnation of student academic performance is due to poor PD and low student expectations (Koellner, & Jacobs, 2015; Meyers & Smylie, 2017; Tachie & Chireshe, 2013). The final research question address how the members of the PLC approach student performance.

Research Question 3: PLC response to gaps in student achievement data

This final research question asked: How do members participating in PLC's respond when data reflect a gap in student learning based on PLC observations? DuFour et al. (2010a) argued that establishing common benchmarks, evaluating data, and understanding the success of benchmark data should be the goal of the PLC team. Huang and Sebastian (2014) characterized the role of schools in addressing gaps in student data

along socioeconomic status. Data collected for Research Question 3 involved triangulating between observational notes, interview questions, and artifacts. The data included participants' specific opinions and experiences about PLC actions that occurred when identifying learning gaps among students. Observation and artifact data were examined to refute or support each emerging theme derived from the interview data. An analysis of Themes 7, 8 answered this research question as participants indicated the following: (a) PLC teachers lack structure for defining student achievement and proficiency, (b) PLC teachers have difficulty and need support in recognizing, monitoring, and understanding student data gaps, and (c) PLC participants desire consensus on goals and clear expectations for how the PLC will focus on student learning

Theme 7: Lack of structure for defining student achievement and proficiency. Responses from participants described how they perceived student achievement and proficiency. Participant 1 described weekly quizzes as a piece of the process in which "we look to see what we want them to know by the end of the week. We develop our check for understanding making sure we taught everything we wanted to the correct way." One of the documents reviewed was labeled Friday Quiz and appeared to support the PLC members' weekly efforts to recognize student gaps. Teachers used this document to identify students with low mastery of SEs. Student names with their percent of mastery were recorded by period or block on this document, which also contained three guiding questions for teacher reflective responses. However, participants did not

explain the actual process, step by step, used to complete this document, but recognized it as a tool they used to identify students' learning gaps.

I did not observe this document in use during any of the three observation sessions even though multiple participants referenced its use during their interviews. For instance, Participant 2 said, "As we look through the scores for those tests, we think about what caused students to miss things, how our lesson that week has really gone. This isn't about what students know, it's about what I need to teach."

Participants included 9-week assessments in their explanations their process for tracking student achievement. During my third observation session that occurred at the end of a 9-week period, I witnessed PLC members' first experience using a new electronic tracking document. Participants addressed commonly missed quiz questions and the frequencies of the missed questions by SE. I did not view the document first hand, but I observed the PLC members' conversations related to the completing the task. During this meeting Participant 5 explained, "We're always looking for at least 60% or greater satisfactory levels and so as we look through the data reflection; we're looking for 60% or more" of the students to pass the assessment. As a result of tracking student gaps as they appear on 9-week assessments, Participant 4 added, "We had to look at our 9-week assessment data. We were told to push the low scoring questions and build those into our lessons and re-teach so that when STARR comes around, students would've seen it more than once."

Participant 4's example of a perhaps a pressed task ("we had to") instead of a valued process that defines acceptable student achievement and targeted student gaps. Participant 6 added to the advancement of this theme due to experiencing confusion related to student achievement:

> We feel as though the accountability is being misplaced. We feel as though there should be time allotted for us to go through the test with the students and have the students tell us why they got a certain question wrong or why they chose a certain answer choice versus us sitting with other teachers trying to figure out why kids may have chosen A when the correct answer was C.

A clear understanding of how the PLC defines student achievement as a target did not emerge. Participants' responses and my observation notes provided additional data connected to how PLC members recognize student data gaps as discussed below.

Theme 8: Teachers have difficulty and need support in recognizing, monitoring, and understanding student data gaps. Responses from all six participants described their perceptions of how the team determined the presence of a student learning gap. Participant 1 spoke from a perspective of recognizing prior year performances:

> Well, when we see a gap we also try to see how it was taught in the grade level before. You know, I think that's like the most powerful thing. What vocabulary were you using? What strategies were you using? How'd they see it before? Because maybe they'd seen it before, but we just explained it in a different way.

Participant 5 said the PLC members "definitely look at how students performed the previous year" [as well as] "use multiple data points, exit tickets, check for understanding. I would say that daily measurement includes asking the following: 'What do I see today? What did they get today or did not get today that I need to make adjustments for?'"

During the interviews, I redirected the conversation to seek specificity on student groups and gap awareness to determine what gaps the PLC members focused on at the time of the interviews. I received the following response from Participant 1, which was the only response offered from any participant about addressing a specific recognized learning gap among student demographic data:

> We normally gather our data, and it's been the same reoccurring thing for the past 5 years. You know, African Americans are the lowest demographics here on our campus, so we try to make that a focus or make sure that we're cognitive of what's going on.

In contrast to the opinions of Participants 1 and 5, Participants 2, 3, 4, and 6 seemed to lack clarity in their understanding of the concept of student gap and did not have the skills for recognizing it. Participant 6 provided this example to explain how to recognize a student learning gap, which was defined as "means that they're going down?"

> I've only looked at one. We went in, and we had to find our students that were green, pink, or orange. Then, they're coming back, and they're telling us, "This

> kid's in a Tier 1, this kid's in a Tier 2," meaning help. They're supposed to all be at Tier 3s. I guess, that's where we put them, in Tiers 1s, 2s, and 3s [sic].

Participant 3 thought a student learning gap could be seen "just by turning in the scores. We don't really talk about that much, to be honest here, and I don't know the impact of 9-week assessment tests. I want to say tracking." Participant 3 also admitted that "as far as data go, when we're in our PLC," student learning gaps are "just not really discussed." During observations of data reflections, I did not specifically see the PLC members have any reflective conversations about recognizing learning gaps. In the review of PLC documents, I also found no specific task associated with identifying student learning gaps. Participant 4 described lack of ability to complete this task as a gap in teachers' learning, and thoughtfully expressed, "If I'm being perfectly honest, I don't think I've been in a PD that has taught me how to address data gaps."

Participant 2 admitted:

> I don't think that we really talk about data gaps. For us, our groups are very similar as far as the way our students are, so there's not much need. I feel our campus doesn't really have to worry about that particular thing as much.

Based on these responses PLC members do not understand how to recognize student learning gaps. The last theme for RQ 3 emerged from the participants' responses to the interview questions as well as from their discussions and actions during the third and final observation of the 9-week reflection meetings.

Theme 9: PLC members desire consensus on goals and clear expectations for how the PLC will focus on student learning. Responses from participants led to the theme associated with a need for the PLC members to define goals and specific student achievement targets. Part of the work of a collaborative team involves the use of data to establish a shared set of student learning goals and expectations. District or school administrators can support this effort by providing schoolwide benchmark assessments that would be linked to state standards and would allow for comparing students' results across grade level classrooms (see Goldhaber, Liddle, & Theobald, 2013).

Participant 5 reinforced the need for shared goal setting in the PLC because "we teach to the middle. It's just natural for us to teach to the middle," or rather to the average students rather than the lowest performing or the highest performing students. The Campus A's district leaders do provide districtwide assessments that are linked to state standards, but district facilitators reported the assessments were not designed with the middle in mind. The district's assessments were designed to seek out data about the lowest performing students, whom teachers are expected to reach. Participant 1 described the use of assessment data for 9-week assessments as offering them the opportunity to "see exactly why students are missing things," and the teachers then "remediate based on test scores; that's the time where we sit down and look at the data [so] we can see what SE's are low." Responses similar to this one from Participant 1 were collected from all

six participants, but none of them clearly defined what low meant nor did they specify the target goal for student achievement.

Participant 2 reported that technology problems hindered the PLC's efforts to establish agreed upon student achievement goals because of how technology was used "to see target scores of students, to see the results of previous data. It organizes things. It hasn't been working all this year, but we definitely try our best to use it, it's a big tool."

The PLC supported and recognized members' collaboration regarding student performance as beneficial. Participant 4 identified the following:

> As a department, we have also had weekly quizzes that we give our students, and those lowest SEs we go through and reteach throughout the week, maybe during the bell work or just in small groups. That helps us reassess and see if [the students are] actually growing, or they're still achieving.

A review of documents did not provide an indicator of exact student achievement goals. However, the PLC members used terms such as meeting, exceeding, and approaching to describe student performance. Observation notes reflected that the PLC members focused on test questions with an item is correct percentage of lower than 60%.

Perhaps Participant 6 responded to knowing exactly what the student achievement goals were for the PLC as follows:

> Who's passing, and who's not? Passing at 70, passing at 80, passing at 60. You either passed or you failed. Okay, I'll be honest, that's what I'm very confused.

> I'll be honest, because I curve everything. There's not a real clarification about what's passing and what's not passing. I try to be fair with it.

Participant 6's response seemed to support the earlier response from Participant 5 who emphasized seeking to teach to the middle or average students; therefore, the PLC members seeking to ensure that 60% of the students passing seems to be related to seeking out the middle of the bell curve among all of Campus A's mathematics classes.

Recognizing and responding to data gaps was difficult for all PLC participants. The need for learning, purpose, direction, and priority was well documented in the participants' responses. In the data for this research question, participants noted data reflection to be an area in which they needed improvement and understanding. GHISD has various data systems available to help target student gaps. Participants indicated lacking clarity about what to do with the data they have. Participants used terms associated with student expectations; however, I did not gain any tangible evidence that student data were monitored or used to establish student achievement goals for the year.

The eight documents reviewed included reflective questions designed to guide teacher thinking; however, the documents did not clearly define the SEs held by the teachers, proficiency, and target goals. The absence of a clear SE target may have generated confusion among the PLC members as to exactly what a learning gap is and how to recognize it. Based on discussions within a PLC, the team's administrator and teachers should articulate clearly how the PLC will incorporate assessment data to support goals for student achievement (see Condron et al., 2013; Herreid & Schiller,

2013). Although positive collaborative effort exists, understanding and implementing the best methods for decreasing student achievement gaps and helping at-risk students persist within the PLC. Learning how to develop a plan with clear student achievement standards based on performance gap data seems appropriate for this PLC.

Summary: Research Question 3 Themes. DuFour and Marzano (2011) identified four areas to represent the core principles of a PLC that include the following: (a) focus on learning ensuring students learn to their fullest extent, (b) focus on working collaboratively, (c) use evidence of student learning to make continuous improvements to support student learning, and (d) require accountability for student results. Jennings and Bearak (2014) suggested that time should be devoted to evaluating students' item-level performance just as time was devoted to developing each test item.

My analysis of these data collected indicate a lack of knowledge may be linked to a missed opportunity in the teacher development stage of both the reflection process as well as understanding what to do with all the data provided from the process in regard to identifying and assisting students. Participants used educational terms and identified the required steps for their reflections of student performance. However, participants did not make consistent connections between the tasks they used to reflect on student achievement in either the interviews or the observations. The continuous engagement of teachers in PD related to the improvement of their knowledge, instructional delivery, and student achievement is critical. However, researchers found that empirical studies linking

learning activities for PLC development and teacher PD growth to be limited. (Akiba & Laing 2016).

Akiba and Laing (2016) studied the effects of six types of PD activities used with teachers on student achievement progress over a 4-year period. The researchers used data from 467 middle school mathematics teachers who completed a statewide longitudinal survey merged with the Missouri mathematics assessment data of 11,192 middle school students. Collaborative activities that were teacher centered enabled to learn about mathematics teaching and learning showed greater effectiveness toward generating student mathematics achievement improvement than learning activities lacking collaborative PD opportunities that were teacher centered (see Akiba & Laing, 2016).

The participants' PD suggestions could help shape a project benefitting both the school districts leaders and the PLC members in future school years. Their suggestions could lead to the development of a menu of PD options based on the individual learning needs of teachers, which would differ from common PD methods that tend to be prescribed and universal. According to Schildkamp and Poortman (2015) reflective learning based on daily experiences within the classroom assist teachers seeking appropriate PD opportunities to increase student achievement. If the perceptions and individual learning needs of members in the researched PLC are taken into consideration for the purpose of district planned PD learning activities an increased level of engagement, focus, and vision will follow as advocated by researchers (DuFour, 2014; Haug & Sands 2013; Hord, 2009).

Discrepant Cases

I remained open-minded about the potential for discrepant cases as part of overtly avoiding the presence of bias during the analysis. In fact, I found myself questioning responses from one PLC member in my initial transcription of interview responses. Responses seemed much different from other PLC members at the time. As I reviewed responses, bracketing helped minimize bias on my part. I found the ability to remain open-minded in the beginning more difficult than I expected. In the end, this member did not surface as a discrepant case because their perceptions and experiences were simply different than other members. The use of multiple data sources allowed me to triangulate across data collection and ensure the quality of my study.

Evidence of Quality

Establishing evidence of quality was demonstrated throughout this study using a process of triangulation, member checking, transcribed responses, and PLC documents to compare actions, observations, and verbal data received from PLC members. Interview questions alone would not have provided data inclusive of "what was said" and "what was done." Triangulation of each data instrument provided documentation yielding a full scope of both actions and dialogue of the PLC. Previously, Table 5 displayed examples of information gathered from multiple data sources leading to themes within each research question.

Member checking was offered to participants in an effort to demonstrate trustworthiness and reliability of the codes after the collection process. Providing this

opportunity to participants demonstrated my attempt to clarify data prior to analysis. I made each participant aware of this opportunity to review data specific to their unique participant assigned number prior to the collection of any data. Several participants commented regarding this opportunity. I was present on campus for two Fridays in a row. Participants received a reminder email and came at their convenience for review of interview transcripts and analysis of the data.

My observation document developed with district support was an appropriate tool for examining PLC meetings where both dialogue and action occurred regarding data reflections and lesson design. This tool included check box indicators as well as an area for journaling. Notes collected were used with interview responses and PLC documents in the coding phase to establish common themes. The triangulation of multiple data sources added depth to the findings and quality of this study.

Summary of Findings

The purpose of this qualitative bounded case study was to explore the middle school teachers' and the administrative dean's perceptions of collaboration and levels of depth regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data analysis of student performance, and lesson design within a PLC. Collecting data in the form of individual perspective's and teaching practices was necessary to gain understanding at the classroom level from PLC members, where the local problem is recognized.

Despite PD provided by district administrators, the findings of this study indicated

that teachers continue to have PD needs in the areas of lesson design, data reflection processes, and understanding student learning gaps. The need for more learning among the PLC members was evident based on low student achievement outcomes, which prompted this study as a local problem in GHISD.

Research Question 1 in this study focused on lesson design within the local PLC and how collaboration among members on lesson design influences student mathematics achievement. Hord and Tobia (2012) stated that professional learning in a PLC is a process involving teacher collaboration and the development of common understandings, concepts to teach, how to deliver the concepts, and how to evaluate their impact as well as which steps, if any, are needed to readjust instructions on the basis of the results. The PLC under study perceived their collaboration as effective.

However, an analysis of the data suggested PLC members lacked a specific understanding about the elements needed for developing effective lesson frames. Also, participants did not articulate or directly connect current student mathematics performance to their lesson designs. Participants did indicate an awareness of the concept of developing lesson frames related to student achievement and data analysis. According to the framework for PLCs supported by Hord and DuFour, collaboration is one of the most critical practices within a PLC. However, collaboration alone does not lead to increased student achievement levels, which is the problem among seventh grade mathematics students at Campus A.

Clear goals for student achievement did not emerge during interviews, observations, or document analysis. The primary goal of PLC implementation is to increase student achievement. Participants were aware of the need to meet student achievement goals but lacked a focused systemic collaborative approach to defining and measuring such achievement in relation to their lesson design. PD offered in this area as support for members should be consider for each participants' individual stage of concern in relation to lesson development. A one size fits all approach is not working based on student achievement outcomes for Campus A.

Research Question 2 in this study focused on data reflection efforts within the PLC and the processes used to reflect on student mathematics data. Ermeling and Gallimore (2013) stated that examining student work and assessment data is important during collaborative learning, but it is only effective when systematically connected to the planning and teaching cycle related to the specific learning needs of the student. Developing and establishing values or the collective commitments of a PLC is an extremely important task and should occur progressively as collaboration within the team deepens (DuFour & DuFour, 2013; Hord, 2008). Hord and DuFour's framework recognized that values and beliefs about education guide teacher behaviors as individuals no matter what the task. The individual perceptions of PLC members in my study were no exception to this fundamental characteristic.

Data collected from participants indicated structures and processes for data reflection are not consistently used by participants at Campus A. Team members stated

they were deficient in the knowledge and understanding of their ability to connect their planning, teaching cycle, and data reflection to the specific learning needs of students. PLC participants indicated a lack of ownership in the development of a reflection processes. This absence of ownership when developing and establishing values and collective commitments, such as lesson design and a data reflection process to monitor student learning in a PLC, is not aligned with Hord and DuFour's framework for effective PLCs. The lack of collective commitment was evidenced by the number of documents described and produced by members but clearly not understood.

PLC members did not respond or produce tangible evidence linking their understanding of how to align their daily practices to fit with meeting stated student goals. Similar to Research Question 1, participants' responses did not convey an understanding of how the tasks and processes of the PLC enabled them to attain expected summative (state) and formative (district) student achievement outcomes. Effective goal setting within a PLC both individually and collectively should foster results where PLC members are accountable of student achievement outcomes (DuFour & DuFour, 2013).

The PLC members did not demonstrate a sustained continuous cycle of daily practices that aligned with the mathematics objectives designed for ensuring students attained campus, district, and state achievement goals. Thus, knowledge and understanding of data reflection and monitoring student achievement varied among the participants. The inconsistencies in responses and documents used to track student data indicated the PLC members lack purpose and understanding for why an expectation of

reflecting on student data exists. DuFour and Mattos (2013) posited that PLCs are about people, practices, and processes; they are not a program. Based on data gathered in this study, practices and process required clarification and consistency.

The final research question focused on how members participating in the PLC respond when data reflect a gap in student learning. The success levels gap is a persistent problem that educators across the country attempt to narrow or close yearly among student groups and grade levels (Condron et al., 2013). Campus A is no different in attempting to close gaps in student learning. According to PLC framework discussed in the literature review DuFour and Hord have repeatedly confirmed that a significant factor in raising school attainment levels is the improvement of instructional capacity in the classroom. The main purpose of PLCs is to ensure that all students are learning and achieving at high levels (DuFour & Mattos, 2013). A lack of structure for defining student achievement and proficiency at Campus A exists. Low student performance outcomes would be an expected result of a PLC lacking an organizational definition of student proficiency.

An analysis of the findings in this study indicate that recognizing and responding to data gaps was difficult for all PLC members. The need for learning, purpose, direction, and priority for clearly defining student goals and proficiency was well documented in the participants' responses. GHISD has various data systems available to help target student gaps. Participants indicated lacking clarity about what to do with the student data they were provided. Participants used terms associated with student expectations;

however, I did not gain any tangible evidence that student data were monitored or used to establish student achievement goals for the year.

The positive finding of this study for campus administrators and district level support personnel is that PLC members desire learning on establishing goals and clear expectations for how the PLC will focus on student learning when data gaps are recognized. This shared commitment for collective learning, collective inquiry, and learning by doing, are characteristics Hord and Tobia (2012) associate with high performing PLCs. Determining the best support structure GHISD can provide for PLC members should include the individual stages of concern for each member. Data gathered for the three research questions were used to inform the project detailed below. These findings indicate teacher perceptions from their viewpoint. Valuing teacher perceptions is important because a shared vision drives professional development; therefore, causing these data to provide stakeholders with direction and meaning as viewed through the teacher and administrator lenses (Bambrick-Santoyo, 2014b). Using a cross narrative analysis of the data gathered for the three research questions I generated a recommendation to inform the project detailed below.

Project Deliverable

Section 3 will describe a project and review of literature consistent with the findings from this research to support a district plan for the campus. Learning at the teacher level in the researched areas is clearly needed at Campus A. Participants recommended specific PD suggestions based on the individual learning needs of PLC

members. Identifying the PD needs of other PLC members at various campuses within GHISD should occur. Determining how to meet individual teacher needs presents a challenge for campus and district administrators. An analysis of the findings indicate varying degrees or stages of learning and confidence among participants in this study. Meeting the various needs of the individual teachers in all three areas will require campus and district leaders to set organizational priorities. The use of a research proven diagnostic evaluation model could aid and support all district PD offerings related to teacher identified PLC needs including but not limited to specific grade level content, data reflection processes, and evaluation of gaps in student learning.

In my review of district policy and procedures related to PD I found the absence of program evaluations to support innovations like PLCs. Without data from PLC members it is difficult to determine the needs of a PLC and in what way to best support teachers. Therefore, I will develop a position paper including a recommendation suggesting the annual assessment and evaluation of district PLCs to determine PD offerings based on data collected from teachers inclusive of their individual level of concerns. Using a needs assessment or evaluation to access stages of teacher need or concern would allow the district to offer systemic and differentiated PD in all three researched (i.e., lesson design, data reflection, and achievement gaps) areas based on a teacher self-evaluation questionnaire not only at the site campus but also district wide. Section 3 will introduce a project and literature review offering a solution consistent with data findings.

Section 3: The Project

Introduction

The problem I sought to explore in this study concerned teachers' and the administrative dean's perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at target Campus A. Data collected from participants in GHISD revealed their perceptions to be positive toward the benefits of collaborating professionally and the effects collaborations had on student achievement in the PLC. However, PLC participants indicated their processes could be refined to improve their effectiveness. Analysis of the data indicated that PD for Grade 7 mathematics PLC teachers was needed in the following areas: using lesson frame components, owning and guiding the data reflection processes, and focusing on analysis of student data to discern learning gaps.

Meeting the various levels of PD needs among individual teachers in all three areas will require GHISD campus and district-level leaders to set organizational priorities and expectations for district PLCs. Using a needs assessment or evaluation to access stages of teacher need or concern would allow GHISD to offer systemic and differentiated PD in all three researched areas (i.e., lesson design, data reflection, and achievement gaps). A needs assessment in the form of a teacher questionnaire or survey could be administered to all mathematics PLC middle school teachers to have teachers self-assess where they view their skills and knowledge of these researched areas. The

results of these data could be analyzed to expand differentiated PD to other middle school campuses.

This project was designed based on study findings presented in Section 2 as a solution to the research problem. In my review of district policy and procedures related to PD, I found the absence of program evaluations to support innovations like PLCs in the district's guidelines or procedures. Without data from PLC members, it is difficult to determine each middle school's PLC members' needs and in what way to best support the participating teachers' and administrators' learning needs. Therefore, I developed a position paper including a recommendation suggesting the annual assessment and evaluation of district PLCs to be administered to both teachers and campus leadership. Data collected from the evaluation could be used to determine a menu of PD offerings based on data collected from teachers and administrators inclusive of their individual level of concerns. It is important to include all stakeholders in the process as the long-term solution to this issue will require a commitment from all staff.

In this section, I present a description of the goals and rationale for the genre choice of a position paper as my project. There is also a literature review, which consists of a theoretical framework and research to support an evaluation of PLCs as a recommendation for the project. The recommendations include the expansion of resources, existing supports, potential barriers, proposal for implementation a timetable, and roles and responsibilities for GHISD leaders. Next, I describe and recommend an evaluation model that is focused on change and the effect change has on program

implementation and long-term sustainability, such as for PLCs. In addition, I outline the project evaluation and implications for social change within the study site.

Descriptions and Goals

Position papers are an effective strategy to communicate findings, conclusions, and recommendations based on study results. The goal of this position paper is to promote GHISD leaders' awareness of individual teacher PD needs based on findings from a program evaluation of the district's PLCs. A secondary goal of this project is to create a menu of differentiated PD training based on the identified areas of need. The position paper (see Appendix A) and recommendations are designed to provide district leaders with an option for identifying differentiated PD based on teachers' and administrators' needs. Enacting differentiated PD will support teachers and administrators at the local site, within the district, and ultimately the development of future PLC evaluation policy in GHISD.

A position paper contains the basic relevant information known about a problem and should conclude with recommendations to address the problem (Argyle, 1991; Ibrahim & Benrimoh, 2013). A position paper is based upon GHISD's need to: (a) provide a clear understanding of the problem, (b) present material in a concise manner, and (c) make recommendations as a summary (Ibrahim & Benrimoh, 2013). Before embarking on the position paper writing process, it is important to have a well-developed outline with clear goals and position identified (Argyle, 1991; Ibrahim & Benrimoh, 2013). The outline for my paper will be discussed later in this section.

Rationale

The findings noted in Section 2 of this study indicated GHISD had need for continued PD at the administrative and teacher level. While conducting this study, I found processes within the site PLC which lacked consistency and a clear purpose. Members of the PLC were open to refining practices and perceived their collaboration had a connection to student achievement outcomes. Findings indicated that building a deeper understanding of lesson design, using data reflection, and recognizing gaps in students' data were significant areas about which the PLC members needed ownership to enact during PLC meetings.

Teachers suggested they needed more training in the areas of lesson frame components, learning on data reflection processes, developing ownership of the process as a PLC, and learning focused on using data to recognize student learning gaps. Wells and Feun (2013) found that teacher-led decisions assisted in building PD opportunities that are applicable to teachers' individual learning needs. Providing effective PD concurrently for the three areas identified by teachers included (a) collaborative lesson design, (b) collaborative data reflection, and (c) identifying student gaps. The campus and district leadership staff might find providing various PD sessions aligned with individual learning needs to be a challenge. Data indicated teachers functioned at varying degrees of stages of learning with regard to having the PLC skills needed for effective implementation of PLC meetings focused on improving student performance. Meeting

the various needs of individual teachers in all three PD areas will require setting priorities by the campus and district staff (DuFour & DuFour, 2013; Dufour & Mattos, 2013).

PD focused on the needs of adult learners and how they respond to change processes has the potential to address the PLC process gaps expressed by multiple participants in this study. Enabling teachers to be a part of developing structures used in the PLC is a result of effective PD (see Gray, Kruse, & Tarter, 2016). Offering PD will also create opportunities for collaboration with other high performing individuals to clarify and create processes that are valued by all members (Gray, Mitchell, & Tarter, 2014; Wells & Feun, 2013). When district leaders take teachers' perceptions and learning characteristics into account, teachers begin to develop motivation and act toward their own professional learning (see Bleicher, 2014; Cook et al., 2014; Grover, Miller, White, & Wood, 2014; Haug & Sands, 2013). Professional learning promotes teachers' ownership of the processes they use in the PLC and willingness to use their voices. The lack of PD addressing teachers' perceptions and concerns about the PLC processes contributed to the negative collaborative environment at the site PLC, which in turn negatively affected the teachers' perceptions about high workloads, redundant processes, and teacher retention issues (Moss & Brookhart, 2015).

My position paper includes recommendations for a program evaluation of PLCs in the target district in order to inform the district and campus staff of the PLC baseline functioning level related to PLC implementation at each campus in the district. These baseline data will be a starting point for development of PD to support teachers and

administrators at the local site and district wide. Covay Minor, Desimone, Caines Lee, and Hochberg (2016) found designing PD calibrated to teachers' needs and prior knowledge, which has potential for increasing PD effectiveness. Educational reform is a powerful force of change behind local, state, and national reform movements. Such change needs to be managed and led with a specific effort on identifying how the change process effects people in the classroom who ultimately influence students. PD content and design are important factors in determining the engagement levels of teachers and evaluating their perceptions (Moss & Brookhart, 2015). Before district administrators can design PD calibrated to teachers' individual needs and prior knowledge they must collect data reflecting the status of teachers' needs. Recommending an assessment of PLCs as a program evaluation will provide GHISD leadership staff with data to generate a menu of PD options for PLC members. My review of literature focuses on educational change and how innovations such as PLCs teams influence and disrupt the educational environment. The conceptual framework will embed Fullan's educational change theory as a recommendation for adopting a change framework within GHISD. The Concerns Based Adoption Model (CBAM) will be discussed as a change framework to meet the learning needs of adult learners (Roach, Kratochwill, & Frank, 2009).

Review of Literature

The problem I sought to explore in this study concerned teachers' and the administrative dean perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at

target Campus A. Participants at Campus A require more PD and support in the areas of lesson frame components, ownership of the data reflection processes, and learning focused on using data to recognize student learning gaps. This need aligns with the findings for the research questions in my study. This literature review will support the purpose and necessity of an annual PLC program evaluation as a means to develop PD options that meet teachers' needs and concerns based on teachers' perceptions and experiences (Parise, Finkelstein, & Alterman, 2015).

Based on results in this study, I recommend developing a comprehensive, ongoing method for the annual evaluation of GHISD's PLCs beginning with the local site Campus A. The evaluation will be used as a means of gathering teachers' perspectives on their PD needs and developing opportunities for teacher growth based on their individual learning needs. The project resulting from this research is a position paper with recommendations for GHISD to implement an evaluation standard for PLCs in order to sustain change innovations in the district.

I reviewed scholarly literature related to the study findings and project genre. Several resources informed this literature review. Databases included ERIC, EBSCOhost, Walden dissertations, and ProQuest Central. Search terms were *position paper*, *professional development*, *educational change*, *leading change*, *sustaining change*, *teachers as change agents*, *student achievement*, *program evaluations*, *evaluation models*, *adult learning, educational innovation*, *CBAM*, *SoCQ*, and *PD policy*. This review of literature provided context and structure for the content of my position paper as

the project genre. This section includes discussions on the following topics: (a) educational change, (b) innovation, (c) adult learning needs, (d) program evaluation, (e) PLC evaluation models, and (f) supporting teacher needs with PD.

Educational Change Framework

The framework for this literature review is based on Fullan's work specific to change in learning organizations. Fullan (1991) used two theories to frame his work on educational change. Fullan recognized Rogers' (1955) theory of diffusion with programs of innovation, which supports learning associated with changing expectations within an organization. Knowles' (1970) theory on adult learning has also been used to support a practice of providing learning for adults in a manner differently than students. GHISD is a recognized district of innovation lacking a district PD framework for preparing teachers with the adult learning required to effectively support programs of innovation such as local PLCs. Fullan incorporated both theories because Fullan understood how new learning designed for adults to comprehend the diffusion of innovation theory related to innovations and change (Fullan, 1991; Knowles, 1970; Rogers, 2013). In order for educators to establish schools as learning organizations where teachers innovate, collaborate, and take risks, school leaders must grasp the nature and impact of change. Additionally, school leaders require an understanding of what actions will enable them to lead a change process successfully (Hall & Hord, 2011; Hargreaves, Lieberman, Fullan, & Hopkins, 2014; Hord & Roussin, 2013; Kotter, 1997; Levasseur, 2012).

The rapid pace at which information is being added to all fields of education increases the necessity for a deep understanding the change process and how and thrive in a culture of constant change and high expectations (Holmes et al., 2013). A change initiative is intended to fundamentally modify the culture of practice within a school to improve student achievement (Gray, Kruse, & Tarter, 2016). Change initiatives are also used to reform or alter the culture of schools (Gray et al., 2016; Hazle, Welch, & Mohammed, 2014; Holmes, Clement, & Albright, 2013). As school district staff begin the change process, they are tasked to identify their schools' climates and readiness for change (Hall, 2013).

The findings from this project study suggested GHISD would benefit by providing PD for Campus A's PLC members and perhaps all the district's PLCs This PD should be focused on the needs of adult learners aligned with both campus and district student achievement goals. Most importantly, the PD should reflect teacher-identified content centered on the needs of adult learners and be presented in a respectful manner for teachers' professional status and experiences. Developing a PD menu of adult learning content integrating the theory of diffusion to support innovative change initiatives would support adults as self-directed learners who require detailed information on why a change is necessary with educational practices. Theories established by Fullan's (2012), change in learning organizations, Knowles' (1970) adult learning theory, and Rodger's (1955) diffusions of innovation principles will be the guiding conceptual frameworks infused in the recommendations of the position paper. When organizational

leadership staff are well-informed of teacher perceptions concerning needed PD, then PD can be designed to be meaningful and relevant for teachers and administrators or any adult requiring the PD (Johnson & Johnson, 2017; Qablan, Mansour, Alshamrani, Aldahmash, & Sabbah, 2015).

Rogers (2013) stated people cannot accept new processes on their own; they must connect prior knowledge to new knowledge. Knowles (1970) recommended that the combination of an individual's life experiences and self-construction are the most important resources that support adults when acquiring new learning concepts (Knowles, 1970). Understanding the prerequisite framework of Rogers' and Knowles' work, Fullan (1991) developed a paradigm of educational change. Fullan's (1991) work addressed the initiation, implementation, and sustainability of change initiatives focused on improving student achievement (Fullan, 2012, 2014; Hall, G., 2013; Morrison, A., 2013).

Change must be embraced, and the efforts of administrators and teachers in a PLC can negatively or positively affect implementation and sustainability (see Jones & Thessin, 2015). PLCs in GHISD already represent a type of innovative change that was implemented for collaboration among mathematics teachers as a strategy to attain gains in student achievement. The gap in practice and processes recognized at the PLC site may be an initial concern linked to a need for teachers to connect prior knowledge to new knowledge of the change and innovation created by the implementation of PLCs. Rogers' theory of diffusion of innovation is described as a self-regulatory process promoting collaboration, exploration, and problem solving as a part of the process of learning in

which, individual perspectives yield multiple points of view (Mercer & Howe, 2012; Rogers, 1955). Innovation and implementation of new processes or ways of thinking have been considered a strategy for change agents to use as learning when attempting to influence how individuals operate within an organization.

Innovation and phases of change. The change process includes three widely accepted phases (Adams & Jean-Marie, 2011; Fullan, 1991, 2007; G. Hall, 2013). The first phase of the change process is the adoption or initiation phase (Burke, 2017; Nolan & Stitzlein, 2011). A need is identified, and a course of action is chosen. The initiation phase encompasses all the activities that lead up to the second phase of the change process implementation

The second phase of the change process is the implementation of the reform or innovation to meet the identified need. The most difficult part of the change process is the implementation of the reform (Bertram, Blase, & Fixsen, 2015; Koyama & Kania, 2014). Bertram et al., (2015) synthesized implementation to be the process of establishing practices with a lasting and intended outcome on the cultural of the school. The people within the school directly engage in the implementation process and have had the greatest influence on the achievement or failure of the change initiative (Gialamas, Pelonis, & Medeiros, 2014).

The third phase of the change process involves ensuring the long-term sustainability of the change initiative (see Morrison, A., 2013). Sustainability are the created actions of the change initiative and are continuously ongoing (Holmes et al.,

2013). Leadership is one of the main factors influencing the sustainability of change initiatives. Tingle, Corrales, and Peters (2017) found this need to be paramount with principals working in large urban school district with thousands of systemic parts. PD for teachers, related to change initiatives, improves professional practice and the likelihood of successful implementation (Bambrick-Santoyo, 2014a). The entire process of initiation, implementation, and sustainability can take a minimum of 3 years to 5 years (G. Hall, 2013), and even as long as 7 years.

Trust building. The human element, the implementers, the teachers in the trenches have the greatest influence on the success or failure of an innovation (Turan & Bektas, 2013). Gaining teacher trust is the foundational principle in the change process because without it, no progress can be made (Holmes et al., 2013). The people within the school directly engaged in the implementation process have had the greatest impact on the success or failure of the change initiative (Gialamas et al., 2014). Therefore, considerable effort should be given to understanding and forming positive working relationships with the teachers and administrators launching the implementation to maintain the process of change (Turan & Bektas, 2013). Gaining the trust of adult learners improves the likelihood of successful implementation (Bambrick-Santoyo, 2014a). Developing PD which includes strategies to build trust among the participants is an important component of effect PD.

Adult Learning and PD

Researchers have characterized a PLC as professionals involved in a continuous

cycle of learning in order to improve student achievement (Akiba & Liang, 2016; Learning Forward, 2014b; Reed & Swaminathan, 2016; Ronfeldt et al., 2015; Wood & Burz, 2013). To ensure effective PD, designers need to understand adult learning processes to incorporate them appropriately. Teacher input is valuable for the design process, and their concerns need to be addressed during the planning and implementation of any PD to support effectiveness of PLCs (Stewart, 2014). Successful teacher outcomes from PD should lead to improved student outcomes. Knowledge from PD which is relevant and applicable will positively influence student outcomes through improved teacher practice, a better understanding of content knowledge, and personal growth (Bassarear et al., 2015; Harland & Kinder, 2014; LeFevre, 2014). Knowles (1970) distinguished the andragogic theory of learning, which has the attribute of self-directed teacher learning activities, is more appropriate for adults.

Understanding and incorporating characteristics of this theory and application to PD design is an essential component for achieving success with adult learners. Knowles' (1970) theory of andragogy includes the following six characteristics: (a) self-concept, (b) experience, (c) learning readiness based on need, (d) problem-centered focus, (e) internal motivation, and (f) knowing the reason for the need.

Self-concept. According to Knowles (1970), for adults self-concept is related to self-directedness. The organization of self-concept is multidimensional and hierarchical as the adult learner matures in knowledge and experiences, the complexity of the life experiences encourages further understanding of self and increases motivation for new

knowledge (Knowles, 1970). Academic self-concept measures the learners' perspectives of themselves as learners (Knowles, 1970). Positive classroom environments and higher levels of instructional quality are evident when teachers have a heightened sense of self-efficacy (Holzberger, Philipp, & Kunter, 2013).

Experiences. When adult learners engage in learning related to prior experiences they make connections and understand the importance of the learning and engage in the assignment or task in the PD. Teachers who engaged in learning related to their personal experiences and motivations are more likely to apply the PD to instructional practices (Covay Minor et al., 2016; Nohl, 2015). By incorporating knowledge from prior experiences during the PD, for example, the adult learner is able to make meaning of the new knowledge, while simultaneously facilitating the learning of others (Evans, 2014; Nohl, 2015).

Readiness to learn. Knowles (1970), found two factors leading to the readiness of adults to learn, which included the need to cope with some life situation and second the need to perform a task. Having the ability to apply PD to instructional practices includes the teacher engaging in learning and using prior experiences to guide need-based learning. Establishing the teacher's readiness to engage in new learning can be increased through exposure to exemplary PD.

Problem-centered focus. Knowles (1970) recommended that learning structured for adults be goal oriented with a clear purpose to ensure the learning experience is meaningful. Depicted as developmental outcomes, the goals of a learning experience

should be aimed at individual growth, institutional growth, or societal growth. The goals and purposes of learning experiences are quite often focused on individual growth designed to benefit the group or institutions. PD is a good example of such learning. When teachers work together to achieve the same goals for their students, they learn differently but share the common willingness to collaborate for the benefit of the group or institution (Saylor & Johnson, 2014; Tesfaw & Hofman, 2014).

Internal motivation. Knowles (1970) stated the motivation for adult learners is internal, not external. Adults can be motivated externally with higher salaries and job promotions; however, adults are more motivated internally based on factors that include self-esteem, quality of life, and job satisfaction. In addition, adults have increased motivation to learn when they have a desire and a reason for learning, including gaining personal value as well as instrumental help with solving a problem (Knowles, 1970).

Why new learning is important. Most adults learn best when they first understand why they need to acquire new information or develop new skills (Knowles, 1970). Before adults engage in learning experiences, they must see how the benefits of such experiences outweigh their investment in time and effort (Knowles, 1970). Some individuals perceive required PD as a statement about their lack of proficiency, rather than a benefit for their future successes. Instruments such as diagnostic assessments, evaluations, and learning style inventories may be used to support identifying what needs to be learned and how to best approach the new learning opportunity with the adults of interest, such as with teachers.

Implications of adult learning theory. A PLC priority is increasing the effectiveness of adult learners with an ultimate goal to increase teachers' levels of knowledge (Reed & Swaminathan, 2016). When effectively applied, PLC staff support student achievement (Carmichael & Martens, 2012). The overall goal in creating PLCs is to increase both teacher and student learning. Although the six adult learning assumptions demonstrate how adults learn differently than students, this difference should drive a need to structure and offer PD to teachers in a manner that recognizes their life experiences related to their teaching profession. When teachers have learning opportunities they see as relevant and applicable to their instructional needs, they are more likely to believe their PLC experiences are beneficial to improving student outcomes, such as academic achievement levels (Knowles, 1984; Saylor & Johnson, 2014). Teachers who are passive about their development do not actively apply new learning through peer collaboration, discussions, and observations (Saylor & Johnson, 2014). The Campus A PLC members' data included recommendations for teachers to have opportunities to observe a high performing PLC as a PD opportunity, which was an activity previously recommended by Bissett and Saunders (2015).

The learning opportunities provided through PD should be aligned with school improvement plans, adult learning needs, as well as the knowledge, experience, and beliefs of the teachers (Burke, 2017; Saylor & Johnson, 2014). An infrastructure of PD options that leads to action in the classroom is likely to be viewed as relevant and applicable, which is essential to adult learners (Knowles, 1984, 1975). Based on findings

in Section 2, teachers at Campus A have multiple PD needs associated with lesson design, data reflection, and responding to student gap data. An analysis of the findings also indicated that all six participants have varying PD needs based on their tenure in the classroom or understanding of PLC processes.

Meeting the various needs of each participant cannot occur in a 3-day PD session project. Attention must first be given to accessing the individual PD needs of each participant based on reported self-perceptions. To this end, I suggest using the assessment of GHISD's PLCs as a means of gathering data at the teacher level to determine a menu of structured PD options that best meets the individual learning needs of teachers working within a PLC structure. This direction would allow teachers at the local site, as well as district wide, to be grouped in similar cohorts based on their self-identified immediate needs, which values adult learning needs and the experiences they bring to collaborative PD. Next, I discuss the use of program evaluations to determine a course of action for GHISD.

Program Evaluations

At the fundamental core of an educational change movement researchers recognize initiation, implementation, and sustainability of initiatives focused on improving student achievement to be necessary components for a desired change to materialize. (Fullan, 2012, 2014; Hall, G., 2013; Mehta, 2013; Morrison, A., 2013). Educational programs must be evaluated routinely to determine each of these components are included to encourage and activate change. (Gargani & Miller, 2016; Posavac, 2015;

Schalock et al. , 2014; Swearingen, 2014)). Cellante and Donne (2013) indicated the use of outcome-based evaluations to offered stakeholders data to determine areas of need. The main difference between program evaluation and other forms of qualitative research is that program evaluation can result in changes being made to the program understudy based on the data (Lodico et al., 2010; Royse, Thyer, & Padgett, 2015).

Program evaluation is conducted with the expectation that decisions will be made about the program at the conclusion of the evaluation leading to a change in current practice or revised plan of action. Qualitative designs using interviews and observations deepen knowledge and provide a plethora of information about an area of study but may not lead to a change in practice because of bias or poor data collection methods. In the educational arena, program evaluations are used to gather information from actual practitioners in the field and assess how a program or initiative is working and if the needs of both teachers and students are being met (Gargani & Miller, 2016; Tarsilla, 2016). Caffarella and Daffron (2013) defined the program evaluation as a process used to determine whether the design and delivery of a program is valid and whether the proposed outcomes are being met.

A program evaluation directly addresses a problem, such as examining PD needs from the perspective of the teachers and administrators to best support district PLCs (Spaulding, 2013). A program evaluation is conducted with the expectation that decisions will be made about the identified program based on the data produced (Jordan & Matt, 2014; Johnson, Hall, Greene, & Ahn, 2013). The purpose of a PLC program evaluation in

GHISD is to determine how teachers perceive their individual learning needs, what the content and depth of PD should be, providing direction for administrators to implement a supportive PD system (Jordan & Matt, 2014). Program evaluation is a way of exercising quality control over educational programs. It allows the researcher to examine very specific aspects of a program and judge them for effectiveness.

Dunsworth and Billings (2011) suggested that program evaluation is common in the field of education because it initiates changes and improvements by giving information about programs to school leaders and administrators so that they can make sound education decisions for the staff and students they serve. The PLCs in GHISD have not been evaluated, even though educational programs must be regularly evaluated in order for their fundamental worth to be known (Cellante & Donne, 2013; Spaulding, 2013). Spaulding (2013) suggested that evaluations should be conducted to determine areas for reinforcement and refinement within program implementation. Spaulding's position aligns with an induction and retention process for teachers involved in PLCs who are new to the district or campus.

Program evaluation findings emerge from the information and feedback provided by the actual practitioners of a program, in this case each campus' PLC members (Ermeling & Gallimore, 2013; Killion & Hirsh, 2013; Spaulding, 2013; Sultana, 2015). When administrators value program evaluation results by applying them to formulate new PD for further teacher improvement, teachers indicate they are more likely to embrace the PD. The outcome of the evaluation process validates the internal motivation

of teachers thus, increasing the likelihood of their participation (Killion, & Hirsh, 2013). The enhanced sense of ownership that comes from shared PD options based on teacher input may empower teachers' development of PLCs implemented as designed, which are focused on the needs and goals of the adult learners, the teachers, and GHISD as an organization.

A qualitative research design including interviews and observations align well with a program evaluation in that data are gathered from participants in order to understand how participants experience their PLCs as well as understand the research problem and address research questions (Creswell, 2012). Researchers who utilize program evaluations are usually interested in assessing how a particular innovation or program is working for a district rather than in generalizing findings to other districts or settings (Chyung, 2015; Creswell, 2012; Spaulding, 2013; Yin, 2014). Program evaluation is a way of exercising a degree of quality control within innovative educational programs. The results of a program evaluation can highlight strengths and outline areas for growth allowing the researcher or evaluator to make recommendations for improvement and follow-up actions (Cook & Odom, 2013; Gargani & Miller, 2016; Tarsilla, 2016).

There are multiple approaches leaders can take to lead change initiatives for student achievement in an era of high stakes accountability that cause teachers to experience increasing demands on their performance (Hord & Roussin, 2013; McLester, 2012) choosing an appropriate model or approach to the evaluation of a program is the

first step in monitoring a change initiative (Chyung, 2015). In my position paper, I am recommending as an option that GHISD consider the CBAM as an evaluation measure. Next, I discuss why I am recommending the use of CBAM.

PLC Evaluation Using the Concerns Based Adoption Model

School culture and climate needs to be assessed prior to instituting meaningful change initiatives (Hall, 2013). There are many evaluation models to be considered when implementing instructional innovation within a school and district. Teachers are repeatedly called upon to implement and sustain instructional change endeavors. Unfortunately, few teachers ever understand the challenges of change, or their level of concern associated with change, or how to manage various stages of change or innovation as discussed earlier (Moscoso, Chaves, Vidal, & Argilaga, 2013; Smith & Ory, 2014). CBAM is a different framework because it provides a process-based approach for change that includes data collection tools and interventions to support staff during multiple phases of a program initiative (Hall & Hord, 2011).

In order to determine whether PLCs are performing as effectively as expected, school leadership staff should evaluate their PLCs and determine effectiveness and progress with implementation (Learning Forward, 2014b; Shakman & Rodriguez, 2015). Part of developing an innovative program design is identifying the key stakeholders. Stakeholders and those around them can be influenced by the decisions made by district decision makers (Chyung, 2015). The CBAM implementation includes developing a change facilitation team. The team is trained to use data tools which monitor and support

the teachers implementing instructional changes (Hord & Roussin, 2013). A facilitation team at the research site, for example, could increase the ownership and transparency of the PLC process among all participants in GHISD. In my position paper I provide detailed rationale for the use CBAM to GHISD's administrative team.

Another reason for my recommendation of the CBAM framework is because it includes the use of a formative evaluations as a resource. The justification for using this specific evaluation is that it will provide teacher perceptions based on the design of the program evaluation prompts. The feedback will assist in determining the PD menu for summer 2019 and future timelines. Leadership within GHISD will determine how the summative evaluations are executed and monitored.

Supporting Teacher Needs with PD

Each year, GHISD administrators schedule teacher workdays, half-day PD opportunities, optional weekly PD, and required monthly professional development. The PD sessions are standards based training and aligned with best practices used to meet state and national goals, not individual teacher needs. To increase the effectiveness of PD, voices and perspectives of participants must be heard (Saldaña, 2015). Teachers in Moss and Brookhart's (2015) study expressed a lack of PD at the local site focusing and reinforcing the PLC development process, implementation process, and a plan for PLC evaluation. The resulting unconstructive processes affecting the teachers' understanding of PLC processes is evident in teacher retention rates. PD requires the engagement of stakeholders in needs-based learning to plan, implement, and evaluate strategies that

improve student achievement (DuFour & Mattos, 2013; Hargreaves et al., 2014; Learning Forward, 2014a). The program evaluation described in this section includes an examination of the GHISD district staff supporting and extending PD strategies as a result of the teachers' perspectives gleaned from this research study.

Participants in my study expressed frustration with the perception of having no voice in the PD enacted by administrators or central office personnel in the district. Valuing teacher perceptions is important because a shared vision drives PD, therefore, giving meaning and direction to the data (Bambrick-Santoyo, 2014a). Teachers must be the first ones consulted when determining PD as presented in the literature addressing the expectations of PD (Darling-Hammond, 2014; Hargreaves et. al., 2014; Kennedy, 2014). Wilcox, Murakami-Ramalho and Urick (2013) found that teachers believed the most important part of PD involved designing ongoing and sustained PD. Often times, administrators or curriculum specialists, who are more removed from the classroom, determine PD and teachers become an after-thought rather than a forethought as stakeholders (Avargil, Herscovitz, & Dori, 2012; Shurr, Hirth, Jasper, McCollow, & Heroux, 2014). One of the goals of PD is to increase teacher knowledge to increase student achievement. Through incorporation of teacher perspectives to develop appropriate PD, learning becomes meaningful, directed, and engaging (Bleicher, 2014). However, researchers point out that often overlooked are teachers' perceptions of the types of PD they need, and clear expectations for PD application in the classroom (Hargreaves et al., 2014; Owen, 2015).

Because of various definitions of effective PD a lack of information concerning teachers' perceptions of PD exists. An understanding of teachers' perceptions of PD may be used to improve current PD strategies and implementation to benefit students (Bleicher, 2014; DuFour, 2014; Owen, 2015). Incorporating differentiated models of PD allows educators to increase their learning because they receive opportunities to identify their own needs and work toward closing gaps in their content knowledge or pedagogical knowledge (DuFour, 2014; Jita & Mokhele, 2014). Providing choice in PD at the individual teacher level can occur in GHISD using data from CBAM to guide the menu of offerings (Roach, Kratochwill, & Frank, 2009).

Offering teachers choices in PD they attend assists in ensuring teachers remain engaged throughout all stages of learning associated with the PD. Teachers who engage in the learning process of determining the types of PD offered respond by facilitating in the learning process, engaging in reflection, and ultimately leading to changed instructional practices (Cook et al., 2014; Jita & Mokhele, 2014). Choice in PD promotes personal motivation and engagement to increase professional knowledge and increase instructional practices. Top-down mandated professional learning does not address the concerns or needs of teachers (Roseler & Dentzau, 2013). The goal of PD is to create a change in teachers' behaviors associated with classroom practices. When teachers' perceived needs are incorporated into the design of PD options teachers' approval and implementation of PD increases. As a result, new behaviors are demonstrated in the classroom setting (Darling-Hammond, 2014).

Understanding of the goals of PD assists in assessing teacher perceptions by providing a foundation for professional learning expectations. Collaboration, teacher growth, and student growth are the expected goals of professional learning (Tam, 2015). PD promotes the changes of teacher behaviors and in pedagogical knowledge (Learning Forward, 2014b). Teachers as adult learners demonstrate a natural need to interact with one another (Gleason & Gerzon, 2014). Effective and targeted PD includes promoting shared goals, developing a shared vision, increasing teacher leadership and learning, and promoting positive student outcomes (Sturmer, Konings, & Seidel, 2013).

Grouping PLC participants at the research site has not moved student achievement in a positive direction. Teacher needs, based on their perceptions of need, is not being met at the school site. Educators appear to support differentiating student learning but fail to provide similar differentiated support for adult learning. Finally, the purpose of this literature review informs readers why a position paper is relevant for stakeholders in GHISD to refine their support of PD using systemic annual assessments of teachers and administrators to promote individualized or differentiated PD (Jita & Mokhele, 2014; Johnson et al., 2013; Tam, 2015). The ongoing yearly evaluation of PLCs processes will yield data that may be used to provide PD support at the individualized needs level of PLC members. This study may contribute to positive social change by improving individualized PD options in school districts, leading to gains in student academic achievement.

Project Description

The analysis of the data from this project study indicated a need for PD in area of lesson design, data reflection, and use of data to identify student learning gaps in the mathematics PLC at Campus A. There is a significant need for PD in all three areas. However, the need may require different PD training for teachers based on years of experience or other variables such as teaching experiences, mathematical pedagogy, and PLC learning. Providing effective PD for three areas of need may present a challenge for the district staff. Analysis and triangulation of interviews, observations, and PLC artifacts revealed a need for additional PD in areas researched as well as defining a clear expectation of PLCs to teachers. A position paper with recommendations supporting the evaluation of Campus A's PLC was chosen for the project genre based on the findings detailed in Section 2. This proposed model of assessment may be considered for use at other PLCs in the district as determined by leadership staff.

The choice of a position paper as the project genre was substantiated by four major factors: (a) the widely differing levels of knowledge of the participants within the site PLC, (b) the need for ownership of the processes by the PLC participants, (c) the foundation of data to support a menu of PD options that meet the varying concerns and needs of the individual educators, and (d) the need to understand change or innovation in organizations. The position paper contains information about the problem studied at Campus A and conclude with a recommendation to address the problem (Ibrahim & Benrimoh, 2016). This position paper: (a) provides a clear understanding of the problem,

(b) presents information in a concise manner, and (c) includes recommendations and a summary to be shared with GHISD administrators who serve on the superintendent's cabinet (Ibrahim & Benrimoh, 2016).

GHISD has a teaching and learning team within the curriculum department that is recognized as outstanding and responsive by district principals in serving teacher needs. This team provides support and an objective approach in their involvement acting as a facilitator in the evaluation process of district data derived from an annual state assessments. GHISD campus and central office administrators support PLC members in the evaluation process by developing a multi-step process for assessment PLCs that includes engaging stakeholders, designing the content for the assessment, collecting and analyzing data, and disseminating results.

The successful implementation of innovative programs like PLCs involves much more than space, materials, resources, and budget. Determining the needs of the teachers actually performing the work and deciding the priority of each need requires assessing the human factor that often times is not understood (Fullan, 1991; Knowles, 1970; Rogers, 1955). CBAM is a complete framework with instruments and techniques that have been implemented and researched. These tools enable district staff to measure staff concerns and PLC program use in order to give individual PD support. The CBAM provides a change model including a framework that GHISD may work with campus administrators to develop questions for the stages of concern inventory, which is the first of three diagnostic components for assessing and guiding the evaluation process Cost is a

variable associated with any research-based program-based evaluation. It is not possible to estimate this cost until an evaluation model is determined. GHISD has the ability to split-fund the cost across several departments to meet funding needs.

Potential Barriers and Solutions

Cost has the potential to be the largest barrier in the selection of an evaluation model. As districts across the State of Texas manage budget cuts, low bids are often a frequent response. Establishing a process for the evaluation of academic programs would ensure that resources were applied efficiently and effectively. Program evaluations are relatively new to many districts, excluding those used for federally funded programs, so often there is no formal process for the selection of an evaluation model in place. Hall, Freeman, and Roulston (2014) recommended the timing of an evaluation be purposefully examined. The process of assessing the status or level of PLC implementation could derail the implementation and success of the assessment if a clear vision for the direction of PLC evaluations is not established. The appointment of a selected committee to establish standards and guiding principles for program evaluations would be a starting point towards a solution (Hazle, Welch, & Mohammed, 2014). This committee could provide ongoing PD support as needed including team coaching with the end goal being to empower teacher leaders to become more effective implementing change-based initiatives in the school district.

Proposal of Implementation

Project presentation is planned for the fall of the upcoming school year with the initial evaluation of PLCs beginning in early spring of the following year. This time frame gives the district staff time to conduct their primary research to gain more detailed information regarding their choice of an evaluation model. Because program evaluations are new, GHISD district leaders would need to educate strategic stakeholders about why these assessments are important and articulate the district goal of PLC evaluations to fill in the gaps in knowledge and skills to support successful implementation of PLCs. Creating a vision to support a culture of continuous improvement using program evaluations should be shared with all stakeholders.

The selection committee will formalize evaluation priorities, build and reinforce infrastructure to support specific components of the evaluation process, and implement a long-term plan for the evaluation of PLCs. The weeks that follow can focus on developing the initial PLC evaluation for the individual PD needs of teachers including, but not limited to lesson frame development, data reflections, and responding to student gap data. For example, a teacher PD day could be used to launch the first evaluation of teacher needs and content for summer PD opportunities. The committee must determine how the annual evaluation will be funded. The funding formula should become a line-item request annually to insure funds are available as needed. A report of data collected will be shared with stakeholders' post teacher evaluation. Departments will need time to collaborate regarding resources including funding to provide the desirable PD menu. A

calendar including a list of PD options should be made available to teachers as soon as possible.

Roles and Responsibilities

The central goal of the PLC evaluation for the GHISD educators is to improve the quality of teaching at the study site and enrich students' academic achievement and educational experience while ensuring the fidelity of the PLCs within the district. I am suggesting that every middle school teacher and administrator have the opportunity to participate in this evaluation together with Campus A. Each member of the district will have the responsibility of approaching the evaluation objectively, be willing to collaborate and become engaged in the evaluation process. The stakeholders are school officials with decision-making responsibilities for the school district. I will not have a role in the direction GHISD stakeholders decide to take. My role is to present the findings to the superintendents' cabinet in the form of a position paper which includes a recommendation suggesting an annual assessment of PLC levels of implementation and assessment of PLC individualized teacher and administrator needs.

The overarching change desired is that the annual assessment of PLCs becomes a continuing practice for GHISD. It is also recommended that district stakeholders form a committee comprised of district stakeholders to guide and create the vision and goals of the program evaluation. Roles and responsibilities within the district will be delineated by the superintendent and executed by those designees appointed. I will suggest that teachers be included and represent a significant percentage of stakeholders within the district as

because their needs, concerns, and perceptions are the basis of this study. Another suggestion will be to challenge the administrators leading GHISD to be focused on supporting teachers to implement the PLC and support the teachers in the goal of calibrating the new skills proposed for growth.

Project Evaluation Plan

At the conclusion of my report to the superintendent and cabinet, I will ask for an evaluation of my findings and recommendations. This will be short formative evaluation using a Likert scale to gauge feedback on my presentation, findings, and recommendations. Evaluation data gathered from this group may be used to establish a vision for the yearly assessment of PLCs within the district. Cabinet reflections must be considered and grounded for the evaluation of PLCs to have the intended influence.

The use of data from the evaluation of my presentation is a starting point for discussion among this group. Providing both formative and summative data to all stakeholders will provide the information needed to determine how to improve existing programs and implement new programs more effectively. Using a Likert scale to gather data on my recommendations was chosen because of the individual process involved in rating.

Goals

Evaluation goals identified for this project are intended to have an influence on program success within GHISD. If my recommendation is considered, current programs will be evaluated for success and new programs will be conceptualized, implemented,

supported, and evaluated yearly. I have identified four goals for this project:

Goal 1: Propose for GHISD a research-based program model for supporting the innovation of PLCs.

Goal 2: Implement a research-based program evaluation model to access the individual stages of teacher concerns as a result of their PLC experiences.

Goal 3: Generate a differentiated PD menu based on the identified areas of teachers' and administrators' concerns.

Goal 4: Use data from the evaluation to facilitate a comprehensive, ongoing annual evaluation of GHISD's PLCs.

For Goal 1, I recommend the GHISD leadership team consider the use of the Concerns Based Adoption Model (CBAM) as an evaluation method and change model for their district PLCs. The work of PLCs is a continuing processes "through which educators and administrators work collaboratively to seek and share learning and to act on their learning, with the goal of enhancing their effectiveness as professionals for pupils' benefits" (Hord, 1997, p. 10). CBAM is designed on the understanding that as stated above, change occurs during a process rather than a one-time PD event, and as teachers engage with the process of change, they not only experience a number of affective stages of concern but also progress through different levels of application regarding the change initiative (Hall & Hord, 2011; Loucks & Hall, 1977; Loucks, Hall, & Newlove, 1975).

For Goal 2, the assessment and evaluation of PLCs effectiveness by incorporating

CBAM and distributing the Stages of Concern Questionnaire (SoCQ) will generate immediate data for use by stakeholders at the local site and district wide (Bailey, & Palsha (1992). The 35-item SoCQ asks teachers to determine the degree to which they agreed with several statements related to the PLC as an innovation and how they managed all the responsibilities that a new innovation requires (Bailey & Palsha, 1992). These assessment data enable leaders to examine the concerns of staff across multiple sites (Bailey & Palsha, 1992). Leaders at the district level can use the data to determine the types of concerns identified by teachers. The data can be presented district wide offering a transparent view of expectations for PLCs and support for teacher needs. Ultimately, yielding teacher perspective data to be considered in developing a menu of PD options needed at the local site as well as district wide will provide a sense of ownership in the PLC evaluation (Bambrick-Santoyo, 2014a).

For Goal 3, according to the data collected in this study, ownership of the processes was not practiced within the PLC, forming an area of concern, particularly for teachers new to the PLC. PD focused on the needs of adult learners and how the change process affects learners has the potential to address the process gaps expressed by multiple participants in this study and enable opportunities to collaborate with high performing individuals to clarify and create processes that are valued by all members (Wells & Feun, 2013). When district leaders take this approach to PD options for teachers the likelihood of teachers embracing the learning be strengthened leading to more skilled and informed teachers (Bleicher, 2014; Cook et al., 2014; Haug & Sands, 2013).

For Goal 4, the SoCQ questionnaire data can be used by the board and superintendent to set clear districtwide PLC expectations based on a formal policy for campuses and provide data for an annual review of the policy expectations. Findings from the CBAM model enables stakeholders to be confident about the pursuit of change and innovation. Also, CBAM is a packaged program that includes all the materials and guidance needed to successfully engage in the assessment and evaluation of GHISD's PLCs. Following the SoCQ this model provides a tool to review levels of use within the PLC.

Key stakeholders groups will be involved in reaching the stated goals. Participants in this process include central office administrators, principals, teachers, and possibly board members as well as parents. These stakeholders will have access to the evaluation results. Including parents is important because information from the evaluation may be used by the board to determine if programs continue or are discontinued.

Project Implications

Local Impact

This project is built on findings from Section 2, which revealed the participants at the local site need additional of PD. The participants expressed a need for more learning in the areas of lesson design, data reflection, and recognizing student gap data. Any one of the three areas has a considerable breadth and depth of knowledge and application in the PLC and classroom. Also associated with the findings are the varying individual needs of each participant. Meeting these needs for teachers increases the potential for gains in student academic achievement as well as gains in teacher self-confidence (Taylor, 2010). As a solution to the research problem, I recommend the evaluation of GHISD's PLCs. If the PD need is a districtwide issue, it is recommended that a district-wide PD menu be created for teachers based on their individual level of need or concern. Findings presented to district decision makers in my position paper, may influence district stakeholders to re-evaluate current PLC and PD resulting in improved student mathematics achievement and positive social change within the district because of the influence and benefits for teachers, administrators, and students.

Far-Reaching

Considering students as the main beneficiaries of this study, there are possibilities for districts surrounding GHISD and possibilities for state-wide districts that struggle with PLC effectiveness. As district staff search for more effective ways to reach their

students academically, this study provides a viable starting place for other districts' who may not have considered the individual PD needs and perspectives of the teachers. As I reviewed content for the literature review supporting program evaluation it became clear that conducting program evaluations is not a consistent practice in most districts. Nationwide, leaders are searching for options to improve student achievement, and consider data from existing programs to assess the effectiveness of the program at meeting teacher and student needs (Gargani & Miller, 2016; Tarsilla, 2016).

Conclusion

Section 3 outlined the project, described the project goals, and the scholarly rationale for selecting a program evaluation. A review of the literature supported the use of a position paper as the appropriate means to address the problem and guide a project recommending an evaluation of local PLCs. Although the findings of this localized study research cannot be generalized to other districts, there are social change implications that may apply: (a) supporting peer collaboration by creating conditions where the perceptions of implementers are used to guide instructional change efforts, (b) seeking local solutions for problems as opposed to top-down PD decisions, and (c) recognizing the expectation of collaboration among professionals in the school environment requires more than a directive, time, and vision. PLC program implementation requires annual systemic evaluations/assessment, structure, processes, and on-going support including human resources and funds to provide PD for teacher needs.

The final section is devoted to the implications of the project as they relate to the

local community and beyond. In Section 4, I discuss my personal reflections and conclusions concerning this study. I also identify future directions for research in addition to offering implications and applications related to the study findings.

Section 4: Reflections and Conclusions

In Section 4, I end with a presentation of reflections and conclusions regarding my project study. In this section, I include recommendations for future research in the area of district support for PLCs as well as implications and applications. I also present qualities of leadership and change as a doctoral scholar, practitioner, and researcher. Section 4 concludes with my recommendations for continued research that could contribute to positive social change.

The problem I explored in this study concerned teachers' and the administrative deans' perceptions about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at one middle school with low mathematics performance. In order to discern the nature of the PLC implementation, I developed an understanding of how the PLC members used PLC processes for the Grade 7 mathematics delivery at Campus A. The need for more learning among the PLC members was evident based on the low student achievement outcomes in Grade 7 mathematics, which prompted this study as a local problem in GHISD. The findings of this study revealed that despite the PD provided by district administrators to the Grade 7 mathematics teachers, these instructors continued to have PD needs in the areas of creating lesson designs, improving data reflection processes, and understanding student learning gaps.

The project resulting from the outcomes of the study appear in a position paper including a recommendation suggesting the annual assessment and evaluation of district

PLCs to determine PD offerings based on data collected from teachers to be inclusive of their individual level of concerns. Targeted PD will provide a knowledge base of mathematics content, processes for data reflections, and methods for using student gap data to formulate PLC goals leading to more effective PLC outcomes for student achievement. The PD menu resulting from the evaluation will assist administrators with supporting and sustaining PLCs. The complete position paper can be found in Appendix A.

Project Strengths and Limitations

There are several strengths associated with this project study. First, there were multiple data collection methods rather than interviews alone. Open-ended interviews provided detailed-specific information from participants related to their perspectives and opinions. The use of PLC observations and a review of PLC archival documents enabled me to triangulate those data with the participants' interview responses. Another strength of this study is the resulting position paper which emerged from the evaluation portion CBAM data that will be used to complement the work in the PLCs. The prescriptive approach to providing PD will enable teachers to maximize the effectiveness of their PLCs based the Campus A teachers' requests for more training in the areas of lesson frame components, ownership of the data reflection processes, and learning focused on using data to recognize student learning gaps. The participants' PD suggestions will shape the future of PD and benefit both the school district's leaders and all PLC members in future school years.

The project fills some of the gaps in practice about sustaining effective PLCs using program evaluations. The Campus A middle school mathematics teachers indicated that they had not had enough PD to use their mathematics PLC effectively. Educational programs must be routinely evaluated to determine initiation, implementation, effectiveness, and sustainability of initiatives (Gargani & Miller, 2016). Cellante and Donne (2013) argued for educational leaders to use outcome-based evaluations and to offer stakeholders data about areas of need. In the case of this Grade 7 mathematics PLC, evaluations would have helped district leaders determine what additional PD was needed by the Campus A teachers of mathematics. Choosing an appropriate model or approach to the evaluation of the district's PLC training program is the first step in monitoring a change initiative (Chyung, 2015). The PLC program evaluation in GHISD will help district leaders understand how teachers perceive their individual learning needs and what the content and depth of PD should be, providing direction for administrators to implement a supportive PD system (Jordan & Matt, 2014). Program evaluation is a way of exercising quality control over educational programs and strengthens any training offering.

Specifically, an evaluation provides data for district leaders to apply to the development of PD action plans, reflections, and effectiveness. Lacking a clear transparent district vision for the yearly assessment of PLCs has, in the past, led to gaps in communication and understanding between members of specific PLCs at the middle schools. The gaps in communication and understanding contributed to the

implementation concerns as reflected in these data obtained by PLC teachers and one administrative dean. A limitation for this project could be how district leaders decide to communicate the value of the evaluation and how they disseminate the results. The recommendations are dependent on the district leaders to implement. If the recommendations in the position paper are not used then the result could be that no change in the PLC implementation at Campus A occurs. The resources provided by GHISD leaders to teachers on middle school campuses in the past might be improved through evaluations provided by teachers who participated in PD which could strengthen the district's efforts to employ appropriate resources that would decrease students' mathematics learning gaps in the future.

Recommendations for Alternative Approaches

One alternative approach for the district to consider is to forgo the CBAM assessment of the mathematics PLC and use surveys to collect information from teachers about their perceived PD needs. Instead, a needs survey could be conducted with the administrators and teachers at Campus A to determine how to best align PLC practices to increase student achievement outcomes. This survey approach would allow administrators and teachers to have opportunities to share practices that improve student achievement. Another alternative could be collegial coaching and peer observations. Peer-teacher feedback from class observations could increase the effectiveness of collaboration processes in the PLC. The last alternative approach is to have Campus A teachers collaborate with the other middle schools' Grade 7 PLCs for writing lesson plans

specific to each of the 9-week curriculum scope and sequence expectations for instruction. Collaborating while writing lesson plans could enable each teacher to receive additional support and a sense of accountability regarding the need for lessons that meet the standards of both district and state objectives. Collaborations between all middle schools' PLCs in the district could yield stronger results and applications of data reflection learning.

Scholarship, Project Development, and Leadership and Change

Through this educational journey, I have learned that scholarship is about the endless quest for social change. Social change means finding solutions to problems. Additionally, because I have considered myself a lifelong learner, I learned when I do not recognize the need for change in a system and process, I am only a learner, not a change agent who leads other learners.

Scholarship

I found conducting research to be much more difficult than I initially anticipated it would be. This research and knowledge generation experience has tested me with more rigor than any other academic challenge in my life. Conversely, I found completing the project study to be the most rewarding academic challenge of my life. My experience with research and scholarly writing was limited during my courses while earning my bachelors and master's degrees. I did not experience any of the scholarly writing expectations or data collection requirements prior to working toward this degree. Scholarship has definitely been a part of this doctoral journey. After my first two courses

at Walden, I knew I wanted to research PLCs in some capacity. After many conversations with my committee and discerning the local district's issues, I decided to focus my study on one Grade 7 mathematics PLC.

Completing the research process taught me about perseverance, strength, patience, and determination to push through my scholarly shortcomings. Through this process, I developed scholarly writing skills and increased my ability to use data. Along this journey, I have dedicated my time to researching PLCs and forming an understanding of implementation, support, and sustainable innovation. I have proudly learned to meet the vigorous standards of Walden University and became acutely aware of social change outcomes.

Project Development and Evaluation

The project developed in this study is a position paper that recommends a yearly evaluation of district PLCs in GHISD. The theoretical framework that guided the project was Knowles' adult learning theory, Fullan's research on organizational change, and Rogers' theory of diffusion. I selected a position paper to allow me the opportunity to make a recommendation regarding PD needed to support and sustain the district's PLCs. The primary goal of the project is to improve the quality of teaching, by considering teachers' concerns about the experience of the PLC. Increasing teachers' and administrators' learning applications and collaboration will improve student achievement in the district. The formative evaluation for the project will include feedback from the superintendents' cabinet that will rate the effectiveness of the recommendation within my

position paper. The superintendent's cabinet bears the responsibility for choosing and implementing the district's initiatives, such as the current PLC structures. Therefore, this position paper offers them the opportunity to increase the rigor of the PLC program and the value of the PD used for enabling teachers to benefit from PLC participation.

Leadership and Change

Educators must be leaders in their learning environments. I recognize my position as a professional educator to include providing support for innovative change. Teachers follow an effective principal's lead and become change agents in their classrooms and PLCs. Becoming an advocate for change was not an easy transition for me. Because of my leadership style, I tend to need more information than is usually given in large groups and time to reflect and develop plans for change initiatives. However, I have learned how to be an effective leader by following guidance from fast-paced implementers.

I have seen first-hand how social change evolves during change initiatives and benefit students, parents, and teachers. Reinventing oneself is required in education just like it is in the business world. Senge (2006) recognized the need to adapt and change, and Fullan (1991) reinforced the need for educational leaders to balance change processes. I gained significant knowledge from their works during this journey that will influence my future leadership behaviors. This doctoral journey encouraged my growth as a leader and helped me gain a sense of empowerment in my leadership role in the school district. I gained a sense of my own reinvention.

Reflection on the Importance of the Work

This doctoral journey improved my focus on priorities and tenacity. I did not initially possess the confidence in myself to complete this journey. Every step of the way, through each course, I gained confidence and knowledge in my experiences as a leader of leaders. This achievement of completing a project study while growing as a leader of leaders was the most challenging task of my professional and academic careers. During this project study journey, I was pushed to new limits of ability as a scholar and leader. I thought about giving up during times of challenge, however, I now recognize the progress and commitment it took to get to this point in my doctoral program. If I had not realized this goal of attaining highest possible learning status, I believe I would have failed to meet my expectations about being a lifelong learner. My journey is now an example for others who may face challenges that seem insurmountable.

This process took patience, sacrifice, and determination to persist to completion. My learning gaps were especially problematic during the data analysis process because of the amount of data required to be disaggregated, aggregated, coded, and triangulated. I struggled to convert data findings into an opportunity for a viable solution to my identified local problem. The coursework associated with this program at Walden was challenging and rigorous, requiring me to push myself to complete and post assignments, revise as needed, and search for literature applicable to my project study within a 5-year date range. My persistence and scholarship acquisition have supported my goal of earning the EdD.

The position paper that emerged from the findings of the data collection in this study provides me with a sense of academic accomplishment. The project is not the solution to the research problem I expected when I started this journey. Following the data analysis, I found developing the position paper required me to undergo additional learning and much research. I found research to be limited on an exact framework for the position paper. However, I gained clarity that a position paper requires a vision and outline as consistently recommended in the literature (Ibrahim & Benrimoh, 2016). I designed the position paper specifically for its intended audience, the superintendent's cabinet. The project study forms the culmination of my formal education, upon which I will build new knowledge as a lifelong learner.

Implications, Applications, and Directions for Future Research

The purpose of this study was to examine the perceptions of teachers and the administrative dean about Grade 7 mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment at target Campus A. The position paper represents an opportunity for the school district's leaders to recognize teachers' and administrators' perspectives formally. It represents an opportunity to apply the data revealed in this project study.

Implications and Applications

Findings from this study indicated that solutions to the research problem should include focused PD related to developing lesson frames, understanding data, and responding to gaps recognized in student data. However, the participants have varying

needs for support and learning. The annual evaluation of GHISD's PLCs will provide data for supporting individual teachers and administrators who implement and sustain the middle schools' PLCs.

The process of an annual CBAM evaluation of the schools' PLCs will increase the district leaders' understanding about the challenges and processes experienced by school-level teachers and administrators and enhance the district leaders' understanding of teachers' PD needs. The evaluation effort will provide opportunities for teachers and administrators across the district to share their experiences as PLC members. Data from the CBAM evaluation will used to develop a menu of PD options based on the individual needs of all schools' PLC members. Collaboration among district leaders on the position paper recommendations (Appendix A) has the potential to engage all district stakeholders in supporting PLCs, which could lead to additional resources being allocated to support PLCs and related PD. The CBAM may yield information specific to the needs of PLC members that may include an overview of progress that leads to an assessment of teacher needs and review the purpose of PLCs in the target district.

Directions for Future Research

This study provided insight into the progress, support, and current PD needs of PLC members in GHISD at Campus A. The resulting project of a position paper addresses the gap in practice at Campus A that was found during the study. The position paper provides recommendations to the school district's leaders that includes an annual

evaluation process for PLCs and application of a PD menu of support according to individual teachers' needs for effectively sustaining their PLCs.

The project study's implications for future research includes forming methods for tracking the effectiveness of PLC performance; conducting a study on the effect of collaboration among PLC members who design, plan, and deliver Grade 7 mathematics content; and discovering how the vision and goals intended for the PLC program are operationalized with fidelity. It would be beneficial to track the mathematics performance of students who attended Campus A to obtain data about how the school's PLC contributed to their academic gains or losses throughout their high school years. A future endeavor could be the implementation of a progress monitoring system for any immediate PLC effects on student performance that could be used district wide. Data would then be available to provide teachers and administrators with immediate feedback on students' progress. Future research concerning PLC implementation and progress could also be conducted at other campuses in the district or at other districts in the state. The data generated from another case study using alternative study sites could promote PLC programming comparisons and contrasts regarding the PLC as a program of innovation. This broader scope of study could be beneficial for all stakeholders, especially students.

Conclusion

The problem I explored in this study concerned teachers' and the administrative deans' perceptions about Grade 7 mathematics lesson design, data reflections, and

student mathematics achievement in relation to the PLC environment. The problem was researched through the lens of PLC practices used by members of the seventh-grade mathematics team at Campus A. The goal of the study at Campus A was to examine the perceptions of teachers and administrators about their collaboration in the Grade 7 mathematics PLC because their students' mathematics scores were consistently lower than the students' mathematics scores at the other middle schools in the district. In order to discern the nature of the PLC implementation, I interviewed the PLC members and observed how the PLC members applied its processes. The findings of this study revealed that despite the PD provided by district administrators, teachers needed additional PLC-related PD in the areas of lesson design, data reflection processes, and understanding of student learning gaps.

During the course of my data collection, I discovered GHISD central administrators had not evaluated teachers' concerns or program needs related to district PLCs. Basically, no data existed to determine the effectiveness of PLCs or how PD was offered related to PLC programming needs. Even though the PLC is a democratic process wherein teachers take ownership for their learning (Holzberger, Philipp, & Kunter, 2013), district stakeholders need to evaluate PLC functioning to determine when a school's teachers and administrators operate an effective PLC. Such an evaluation process, like that of CBAM, enables stakeholders to learn from the implementers and to promote necessary change that will benefit student outcomes (Gray & Summers, 2015; Wells & Feun, 2013). Essentially, schools must inspect their PLCs and determine strengths and

weaknesses so that changes can be made to ensure sustainability.

The participants in my study had positive perceptions professionally of the benefits of collaboration and how collaboration could benefit student academic achievement. However, the participants suggested their PLC processes could be refined for improving PLC effectiveness. In order to determine whether a PLC is truly functioning as effectively as it was designed, schools should use CBAM to evaluate their PLCs for effectiveness (Learning Forward, 2014a; Shakman & Rodriguez, 2015). In the position paper (Appendix A), I recommend the evaluation of GHISD's PLCs using CBAM as a solution to the researched problem.

References

Adams, A., & Vescio, V. (2015). Tailored to fit: The learning professional. *Journal of Staff Development, 36*(2), 26-30. Retrieved from https://learningforward.org/docs/default-source/jsd-april-2015/tailored-to-fit.pdf

Adams, C. M., & Jean-Marie, G. (2011). A diffusion approach to study leadership reform. *Journal of Educational Administration*, *49*(4), 354-377. doi:10.1108/09578231111146452

Akiba, M., & Liang, G. (2016). Effects of teacher professional learning activities on student achievement growth. *The Journal of Educational Research*, *109*(1), 99-110. doi:10.1080/00220671.2014.924470

Anfara, V. A., Jr., Caskey, M. M., & Carpenter, J. (2012). Organizational models for teacher learning. *Middle School Journal*, *43*(5), 52-62. doi:10.1080/00940771.2012.11461830

Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. *Journal of Emerging Trends in Educational Research and Policy Studies, 5*(2), 272-281. Retrieved from https://pdfs.semanticscholar.org/1419/f7b54e6b7f1215717a5056e0709f8946745b.pdf

Archibald, S., Coggshall, J. G., Croft, A., & Goe, L. (2011). *High-quality PD for all teachers: Effectively allocating resources: Research & policy brief*. Washington, DC: National Comprehensive Center for Teacher Quality. Retrieved from ERIC database. (ED520732)

Argyle, N. J. (1991). *Instructions for writing policy position papers: A guide for the fledgling analysist.* Valdasta State University. Retrieved from https://www.valdosta.edu/pa/documents/polpospa.pdf

Attorps, I., & Kellner, E. (2017). School-university action research: Impacts on teaching practices and pupil learning. *International Journal of Science and Mathematics Education*, *15*(2), 313-330. doi:10.1007/s10763-015-9686-6

Avargil, S., Herscovitz, O., & Dori, Y. J. (2012). Teaching thinking skills in context-based learning: Teachers' challenges and assessment knowledge. *Journal of Science Education and Technology, 21*(2), 207-225. doi:10.1007/s10956-011-9302-7

Bailey, D. B., & Palsha, S. A. (1992). Qualities of the stages of concern questionnaire and implications for educational innovations. *The Journal of Educational Research, 85*(4), 226-232. doi:10.1080/00220671.1992.9941120

Balay, R. (2012). Effect of learning organization perception to the organizational commitment: A comparison between private and public university. *Educational Sciences: Theory and Practice*, *12*(4), 2474-2486. Retrieved from www.edam.com.tr/estp

Bambrick-Santoyo, P. (2014a). Build a meaningful student culture from day one. *Phi Delta Kappan*, *95*(8), 72-73. doi:10.1177/003172171409500817

Bambrick-Santoyo, P. (2014b). When students don't meet the bar. *Phi Delta Kappan*, *95*(7), 72-73. doi:10.1177/003172171409500718

Bassarear, T., Byrnes, K., Cherkowski, S., Hanson, K., Kelly, J., Latta, M. M., ... Soloway, G. (2015). *Mindful teaching and learning: Developing a pedagogy of well-being*. Lanham, MD: Lexington Books.

Bausmith, J. M., & Barry, C. (2011). Revisiting professional learning communities to increase college readiness: The importance of pedagogical content knowledge. *Educational Researcher, 40*(4), 175-178. doi:10.3102/0013189X11409927

Bay-Williams, J. M., & Speer, W. R. (Eds.). (2012). *Professional collaborations in mathematics teaching and learning: Seeking success for all.* Reston, VA: National Council of Teachers of Mathematics. Retrieved from https://www.nctm.org/Search/?mssearch=Professional%20collaborations%20in%20mathematics%20teaching%20and%20learning:%20Seeking%20success%20for%20all#/68703f51111435836561835430ec2aab

Bertram, R. M., Blase, K. A., & Fixsen, D. L. (2015). Improving programs and outcomes: Implementation frameworks and organization change. *Research on Social Work Practice*, *25*(4), 477-487. doi:10.1177/1049731514537687

Biancarosa, G., Bryk, A. S., & Dexter, E. R. (2010). Assessing the value-added effects of literacy collaborative professional development on student learning. *Elementary School Journal, 111*(1), 7-34. Retrieved from ERIC database. (EJ913198)

Birenbaum, M., Kimron, H., & Shilton, H. (2011). Nested contexts that shape assessment "for" learning: School-based professional learning community and classroom

culture. *Studies in Educational Evaluation, 37*(1), 35-48. Retrieved from ERIC database. (EJ925775)

Bissett, N., & Saunders, S. (2015). Criticality and collegiality: A method for humanizing everyday practice? *Journal of Management Education*, *39*(5), 597-625. doi:10.1177/1052562914557281

Blanton, L. P., & Perez, Y. (2011). Exploring the relationship between special education teachers and professional learning communities. *Journal of Special Education Leadership, 24*(1), 6-16. Retrieved from ERIC database. (EJ926847)

Bleicher, R. E. (2014). A collaborative action research approach to professional learning. *Professional Development in Education, 40*(5), 802-821. doi:10.1080/19415257.2013.842183

Bloom, G., & Vitcov, B. (2010). PLCs: A cultural habit built on trust. *Leadership, 39*(4), 24-26. Retrieved from EBSCOHost database. (Accession No. 48965509)

Bogdan, R. C., & Biklen, S. K. (2007). *Qualitative research for education: An introduction to theories and methods.* Boston, MA: Laureate Education.

Brown, A. B. (2012). Non-traditional preservice and their mathematics efficacy beliefs. *School Science & Mathematics, 112*(3), 191-198. doi:10.1111/j.1949-8594.2011.00132.x

Bruce, C., & Flynn, T. (2013). Assessing the effects of collaborative professional learning: Efficacy shifts in a three-year mathematics study. *Alberta Journal of*

Educational Research, 58(4), 691-709. Retrieved from ERIC database. (EJ1006496)

Bruce, C., Flynn, T., & Stagg-Peterson, S. (2011). Examining what we mean by collaboration in collaborative action research: A cross-case analysis. *Educational Action Research, 19*(4), 433-452. doi:10.1080/09650792.2011.625667

Brucker, E. L. (2013). *Implementation and perceived effectiveness of professional learning communities in the Kanawha County School District in West Virginia* (Doctoral dissertation). Retrieved from http://mds.marshall.edu/etd/444/

Brunsting, N. C., Sreckovic, M. A., & Lane, K. L. (2014). Special education teacher burnout: A synthesis of research from 1979 to 2013. *Education and Treatment of Children*, *37*(4), 681-711. Retrieved from ERIC database. (EJ1070195)

Bryk, A. S. (2010). Organizing schools for improvement. *Phi Delta Kappan, 91*(7), 23-30. Retrieved from ERIC database. (EJ882366)

Bui, H., & Baruch, Y. (2010). Creating learning organizations: a systems perspective. *Learning Organization, 17*(3), 208-227. doi:10.1108/09696471011034919

Burke, W. W. (2017). *Organization change: Theory and practice*. Thousand Oaks, CA: Sage.

Burnett, S. M. (2010). Substantiating constructivism from a brain-based perspective. *International Journal of Interdisciplinary Social Sciences, 5*(4), 145-153. doi:10.18848/1833-1882/CGP/v05i04/51660

Burns, B., & By, R. T. (2012). Leadership and change: The case for greater ethical clarity. *Journal of Business Ethics, 108*(2), 239-252. doi:10.1007/s10551-011-1088-2

Bushaw, W., & Calderon, V. (2014). Americans put teacher quality on center stage. The 46th annual PDK/Gallup poll of the public's attitudes toward the public schools: Part II. *Phi Delta Kappan, 96*(2), 49-59. doi:10.1177/0031721714553411

Caffarella, R. S., & Daffron, S. R. (2013). *Planning programs for adult learners: A practical guide*. New York, NY: John Wiley & Sons.

Cakey, M., & Carpenter, J. (2012). Organizational models for teacher learning. *Middle School Journal, 43*(5), 52-62. Retrieved from http://www.jstor.org/stable/i23119432

Carmichael, D. L., & Martens, R. P. (2012). Midwestern magic. *Journal of Staff Development, 33*(3)*,* 22-26. Retrieved from https://www.learningforward.org/docs/jsd-june-2012/carmichael333.pdf?sfvrsn=2

Cellante, D., & Donne, V. (2013). A program evaluation process to meet the needs of English language learners. *Education, 134*(1), 1-8. Retrieved from https://www.questia.com/library/p5118/education/i3454129/vol-134-no-1-fall

Chen, P., & Wang, T. (2015). Exploring the evolution of a teacher professional learning community: a longitudinal case study at a Taiwanese high school. *Teacher Development, 19,* 427-444. Retrieved from ERIC database. (EJ1081726)

Cherkowski, S., Hanson, K., & Kelly, J. (2015). Living collaborative leadership: Cultivating a mindful approach. In K. Ragoonadan (Ed.), *Mindful Teaching and Learning: Developing a Pedagogy of Well-Being* (pp. 49-67). Landham, MD: Rowman & Littlefield.

Chin, T. (2013). How ethical leadership encourages employee voice behavior in China: The mediating role of organizational harmony. *International Business Research*, *6*(10), 15. Retrieved from http://www.ccsenet.org/journal/index.php/ibr/article/view/28877

Chyung, S. Y. (2015). Foundational concepts for conducting program evaluations. *Performance Improvement Quarterly, 27*(4), 77-96. doi:10.1002/piq.21181

Condron, D. J., Tope, D., Steidl, C. R., & Freeman, K. J. (2013). Racial segregation and the Black/White achievement gap, 1992 to 2009. *Sociological Quarterly*, *54*(1), 130-157. doi:10.1111/tsq.12010

Cook, B. G., & Odom, S. L. (2013). Evidence-based practices and implementation science in special education. *Exceptional Children, 79*(2), 135-144. doi:10.1177/001440291307900201

Cook, W. D., Tone, K., & Zhu, J. (2014). Data envelopment analysis: Prior to choosing a model. *Omega*, *44*, 1-4. doi:10.1016/j.omega.2013.09.004

Corbin, J., & Strauss, A. (2015). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (4th ed). Thousand Oaks, CA: Sage.

Covay Minor, E., Desimone, L., Caines Lee, J., & Hochberg, E. D. (2016). Insights on how to shape teacher learning policy: The role of teacher content knowledge in explaining differential effects of professional development. *Education Policy Analysis Archives, 24*(61). Retrieved from ERIC database. (EJ1103351)

Cranston, J. (2011). Relational trust: The glue that binds a professional learning community. *Alberta Journal of Educational Research, 57*(1), 59-72. Retrieved from ERIC database. (EJ934010)

Crawford, M. (2010). Getting to the heart of leadership: Emotion and education leadership. *Educational Management Administration and Leadership, 38*(2), 136. doi:10.1177/1741143210038001020 1

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Boston, MA: Laureate Education.

Daly, A. J., & Finnigan, K. (2010). Understanding network structure to understand change strategy. *Journal of Educational Change, 11*(2), 111-138. doi:10.1007/ s10833-009-9102-5

Daly, A. J., Liou, Y. H., & Moolenaar, N. M. (2014a). The principal connection: Trust and innovative climate in a network of reform. In D. Van Maele, P. Forsyth, & M. Van Houtte (Eds.), *Trust and school life* (pp. 285-311). Dordrecht, Netherlands: Springer.

Daly, A. J., Liou, Y. H., Tran, N. A., Cornelissen, F., & Park, V. (2014b). The rise of neurotics: Social networks, leadership, and efficacy in district reform. *Educational Administration Quarterly*, *50*(2), 233-278. doi:10.1177/0013161X13492795

Daly, A. J., Moolenaar, N. M., Bolivar, J. M., & Burke, P. (2010). Relationships in reform: The role of teachers' social networks. *Journal of Educational Administration, 48*(3), 359-391. doi:10.1108/09578231011041062

Daly, A. J., Moolenaar, N. M., Liou, Y. H., Tuytens, M., & Del Fresno, M. (2015). Why so difficult? Exploring negative relationships between educational leaders: The role of trust, climate, and efficacy. *American Journal of Education*, *122*(1), 1-38. doi:10.1086/683288

Darling-Hammond, L. (2014). One piece of the whole: Teacher evaluation as part of a comprehensive system for teaching and learning. *American Educator, 38*(1), 4. Retrieved from ERIC database. (EJ1023870)

Darling-Hammond, L., & McLaughlin, M. W. (2011). Policies that support professional development in an era of reform. *Phi Delta Kappan, 92*(6), 81-92. doi:10.1177/003172171109200622

Dee, T. S., Jacob, B., & Schwartz, N. L. (2013). The effects of NCLB on school resources and practices. *Educational Evaluation and Policy Analysis*, *35*(2), 252-279. doi:10.3102/0162373712467080

DeMonte, J. (2013). *High-quality professional development for teachers: Supporting teacher training to improve student learning*. Retrieved from ERIC database. (ED561095)

Desimone, L. M., & Garet, M. S. (2015). Best practices in teacher's professional development in the United States. *Psychology, Society, & Education, 7*(3), 252-263. doi:10.25115/psye.v7i3.515

Dever, R., & Lash M. (2013). Using common planning time to foster professional learning. *Middle School Journal, 45*(1), 12-17. Retrieved from ERIC database. (EJ1026545)

Dike, V. E. (2014). Planned intervention and organizational development: The role of leadership in change initiatives. *African Journal of Science, Theology, Innovation and Development*, *6*(1), 39-44. doi:10.1080/20421338.2014.902576

Drago-Severson, E., & Blum-DeStefano, J. (2013). A new approach for new demands: The promise of learning-oriented school leadership. *International Journal of Leadership in Education: Theory and Practice, 16*(1), 1-33. doi:1080/13603124.2012.741265

DuFour, R. (2003). Leading edge: 'Collaboration lite' puts student achievement on a starvation diet. *Journal of Staff Development, 24*(3), 3-3. Retrieved from http://www.sdcoe.net/lls/school-improvement/PublishingImages/Pages/PLC-Leadership-Practice/Collaboration%20Lite%20-%20DuFour.pdf

DuFour, R. (2004). Leading edge: The best staff development is in the workplace, not in a workshop. *Journal of Staff Development, 25*(2), 63-64. Retrieved from https://learningforward.org/docs/jsd-spring-2004/dufour252.pdf?sfvrsn=2dufour252.cfm

DuFour, R. (2014). Harnessing the power of PLCS. *Educational Leadership*, *71*(8), 30-35. Retrieved from ERIC database. (EJ1043762)

DuFour, R., & DuFour, R. (2013). *Learning by doing: A handbook for professional learning communities at work*. Bloomington, IN: Solution Tree Press.

DuFour, R., DuFour, R., & Eaker, R. (2008). *Revisiting professional learning communities at work.* Bloomington, IN: Solution Tree Press.

DuFour, R., DuFour, R., Eaker, R., & Karhanek, G. (2004). *Whatever it takes: How professional learning communities respond when kids don't learn.* Bloomington, IN: Solution Tree Press.

DuFour, R., DuFour, R., Eaker, R., & Karhanek, G. (2010a). *Raising the bar and closing the achievement gap: Whatever it takes.* Bloomington, IN: Solution Tree Press.

DuFour, R., DuFour, R., Eaker, R., & Many, T. (2010b). *Learning by doing: A handbook for professional learning communities at work* (2nd ed.). Bloomington, IN: Solution Tree Press.

DuFour, R., & Eaker, R. (1998). *Professional learning communities at work: Best practices for enhancing student achievement.* Bloomington, IN Solution Tree Press.

DuFour, R., & Fullan, M. (2013). *Cultures built to last: Systemic PLCs at work*. Bloomington, IN Solution Tree Press.

DuFour, R., & Marzano, R., J. (2011). *Leaders of learning: How district, school, and classroom leaders improve student achievement.* Bloomington, IN: Solution Tree Press.

DuFour, R., & Mattos, M. (2013). How do principals really improve schools? *Educational leadership, 70*(7), 34-40. Retrieved from ERIC database. (EJ1015452)

Dunsworth, M., & Billings, D. (2011). *Effective program evaluation*. Bloomington, IN: Solution Tree Press.

Easton, L. B. (2016). Strategic accountability is key to making PLCs effective. *Phi Delta Kappan*, *98*(4), 43-48. doi:10.1177/0031721716681776

Elbousty, Y., & Bratt, K. (2010). *Continuous inquiry meets continued critique: The professional learning community in practice and the resistance of (un)willing participants.* Retrieved from ERIC database. (ED510036)

Entwistle, N., Karagiannopoulou, E., Ólafsdóttir, A., & Walker, P. (2015). Research into student learning and university teaching. In J. Case & Huisman, J. (Eds.), *Researching higher education: International perspectives on theory, policy and practice* (pp. 190-208). London, UK: Routledge.

Erdem, M., & Ucar, I. H. (2013). Learning organization perceptions in elementary education in terms of teachers and the effect of learning organization on

organizational commitment. *Educational Sciences: Theory & Practice, 13*(3), 1527-1534. Retrieved from ERIC database. (EJ1017694)

Ermeling, B. A., & Gallimore, R. (2013). Learning to be a community: Schools need adaptable models to create successful programs. *Journal of Staff Development, 34*(2), 42-45. Retrieved from ERIC database. (EJ100548)

Evans, L. (2014). Leadership for professional development and learning: enhancing our understanding of how teachers develop. *Cambridge Journal of Education, 44*(2), 179-198. doi:10.1080/0305764X.2013.860083

Fullan, M. (1991). *The new meaning of educational change*. New York, NY: Teachers College Press.

Fullan, M. (2012). *Change forces: Probing the depths of educational reform*. New York, NY: Routledge.

Fullan, M. (2014). *Leading in a culture of change personal action guide and workbook*. San Francisco, CA: John Wiley & Sons.

Fulton, K, & Britton, T. (2011). *STEM teachers in professional learning communities. From good Teacher to great teaching*. Washington, DC: National Commission on Teaching and America's Future. Retrieved from http://www.ewa.org/sites/main/files/1098-executive-summary_0.pdf

Fwu, B., & Wang, H. (2012). Bridging the gap between and beyond school science through collaboration: Promoting science teachers' professional development

through diversity and equal partnership. *Asia-Pacific Education Researcher, 21*(3), 464-471. Retrieved from https://ejournals.ph/

Gargani, J., & Miller, R. L. (2016). What is program evaluation? *American Journal of Public Health, 106*(6), e13. doi:10.2105/AJPH.2016.303159

Garrett, K. (2010). Professional learning communities allow a transformational culture to take root. *Education Digest, 76*(2), 4-9. Retrieved from ERIC database. (EJ903507)

Gates, G. S., & Watkins, M. (2010). The place of autonomy in school community: Taking a closer look at teacher collaboration. *Journal of School Leadership, 20*(3), 272-303. Retrieved from ERIC database. (EJ916107)

Gialamas, S., Pelonis, P., & Medeiros, S. (2014). Metamorphosis: A collaborative leadership model to promote educational change. *International Journal of Progressive Education*, *10*(1), 73-83. Retrieved from http://www.inased.org/ijpepi.htm

Gleason, S. C., & Gerzon, N. (2014). High-achieving schools put equity front and center. *The Learning Professional, 35*(1), 24.

Glesne, C. (2011). *Becoming qualitative researchers: An introduction* (4th ed.). Boston, MA: Pearson.

Goldhaber, D., Liddle, S., & Theobald, R. (2013). The gateway to the profession: Assessing teacher preparation programs based on student achievement.

Economics of Education Review, *34*, 29-44. Retrieved from https://doi.org/10.1016/j.econedurev.2013.01.011

Gray, J. A., & Summers, R. (2015). International professional learning communities: The role of enabling school structures, trust, and collective efficacy. *International Education Journal: Comparative Perspectives*, *14*(3), 61-75. Retrieved from ERIC database. (EJ1086795)

Gray, J. A., Kruse, S., & Tarter, C. J. (2016). Enabling school structures, collegial trust and academic emphasis: Antecedents of professional learning communities. *Educational Management Administration & Leadership*, *44*(6), 875-891. doi:10.1177/1741143215574505

Gray, J. A., Mitchell, R., & Tarter, C. J. (2014). Organizational and relational factors in professional learning communities. *Planning and Changing*, *45*(1/2), 83. Retrieved from ERIC database. (EJ1145639)

Grover, K. S., Miller, M. T., Swearingen, B., & Wood, N. (2014). An examination of the self-directed learning practices of ESL adult language learners. *Journal of Adult Education*, *43*(2), 12-19. Retrieved from ERIC database. (EJ1047345)

Gulamhussein, A. (2013). *Teaching the teachers: Effective professional development in an era of high stakes accountability*. Washington, DC: Center for Public Education. Retrieved from http://www.centerforpubliceducation.org/system/files/Professional%20Development.pdf

Gulamhussein, A. (2013a). The core of professional development. *American School Board Journal*, *197*(1), 22-26. Retrieved from https://www.nsba.org/newsroom/american-school-board-journal/past-issues

Guskey, T. R., & Suk Yoon, K. (2009). What works in professional development? *Phi Delta Kappan, 90*(7), 495-500. doi:10.1177/003172170909000709

Hall, D. (2013). Drawing a veil over managerialism: Leadership and the discursive disguise of the new public management. *Journal of Educational Administration and History, 45*(3), 267-282. doi:10.1080/00220620.2013.771154

Hall, G. E. (2013). Evaluating change processes: Assessing extent of implementation (constructs, methods and implications). *Journal of Educational Administration*, *51*(3), 264-289. doi:10.1108/09578231311311474

Hall, G., & Hord, S. (2011). Implementation: Learning builds the bridge between research and practice. *Journal of Staff Development, 32*(4), 52-57. Retrieved from ERIC database. (EJ941379)

Hall, G. E., & Hord, S. M. (2015). *Implementing change: Patterns, principles and potholes* (4th ed). Upper Saddle River, NJ: Pearson.

from http://www.sedl.org/pubs/catalog/items/cbam17.html

Hall, J., Freeman, M., & Roulston, K. (2014). Right timing in formative program evaluation. *Evaluation and Program Planning, 45,* 151-156. doi:10.1016/ j.evalprogplan.2014.04.007

George, A. A., Hall, G. E., Stiegelbauer, S. M., & Abdullah, S. (2006). *Measuring implementation in schools: The Stages of Concern Questionnaire.* Austin, TX: SEDL. Retrieved from http://www.sedl.org/pubs/catalog/items/cbam17.html

Hallinger, P., & Heck, R. (2010). Leadership for learning: Does collaborative leadership make a difference in school improvement*? Educational Management Administration & Leadership, 38*(6), 654-678. doi:10.1177/1741143210379060

Hargreaves, A., Lieberman, A., Fullan, M., & Hopkins, D. W. (Eds.). (2014). *International handbook of educational change: Part two. Volume 5*. New York, NY: Springer.

Harland, J., & Kinder, K. (2014). Teachers' continuing professional development: framing a model of outcomes. *Professional development in Education, 40*(4), 669-682.

Harper, M., & Cole, P. (2012). Member checking: Can benefits be gained similar to group therapy? *Qualitative Report*, *17*(2), 510-517. Retrieved from https://nsuworks.nova.edu/tqr/vol17/iss2/1/

Harris, A. (2011). Reforming systems: Realizing the fourth way. *Journal of Educational Change, 12*(2), 159-171. doi:10.1007/s10833-011-9156-z

Harris, A. (2015). Teacher leadership: The future direction of educational reform? *Leading and Managing*, *21*(2), ii-v. Retrieved from https://search.informit.com.au /documentSummary;dn=164322617751663;res=IELHSS

Harris, A., & Jones, M. (2010). Professional learning communities and system

improvement. *Improving Schools, 13*(2), 172-181. doi:10.1177/1365480 210376487

Hartley, D. (2010). Distributed leadership according to the evidence. *Educational Management Administration and Leadership, 38*(1), 138-140. doi:10.1177/ 17411432100380010301

Harvey, T. R., & Broyles, E. A. (2010). *Resistance to change: A guide to harnessing its positive power*. Lanham, MD: Rowman & Littlefield Education.

Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany, NY: State University of New York.

Haug, C. A., & Sands, D. I. (2013). Laboratory approach to secondary teacher professional development: Impacting teacher behavior and student engagement. *Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *86*(6), 197-206. doi:10.1080/00098655.2013.826484

Hauserman, C. P., & Stick, S. L. (2013). The leadership teachers want from principals: Transformational. *Canadian Journal of Education*, *36*(3), 184-203. Retrieved from ERIC database. (EJ1057490)

Hazle Bussey, L., Welch, J. C., & Mohammed, M. B. (2014). Effective consultants: A conceptual framework for helping school systems achieve systemic reform. *School Leadership & Management*, *34*(2), 156-178. doi:10.1080/13632434. 2013.849684

Herreid, C. F., & Schiller, N. A. (2013). Case studies and the flipped classroom. *Journal of College Science Teaching*, *42*(5), 62-66. Retrieved from ERIC database. (EJ1011743)

Hill, H. C. (2009). Fixing teacher professional development. *Phi Delta Kappan, 90*(7), 470-476. doi:10.1177/003172170909000705

Hill, H. C., Charalambous, C. Y., & Chin, M. J. (2018). Teacher characteristics and student learning in mathematics: A comprehensive assessment. *Educational Policy.* Advance online publication. doi:10.1177/0895904818755468

Hilliard, A. T. (2012). Practices and value of a professional learning community in higher education. *Contemporary Issues in Education Research, 5*(2), 71-74. Retrieved from ERIC database. (EJ1073127)

Hipp, K. K., & Huffman, J. B. (2010). *Demystifying professional learning communities: School leadership at its best.* Lanham, MD: Rowman & Littlefield.

Hirsh, S., & Killion, J. (2009). When educators learn, students learn. *Phi Delta Kappan, 90*(7), 464-469. Retrieved from http://www.jstor.org/stable/i20446149

Hogg, L., & Yates, A. (2013). Walking the talk in initial teacher education: Making teacher educator modeling effective. *Studying Teacher Education*, *9*(3), 311-328. doi:10.1080/17425964.2013.831757

Holmes, K., Clement, J., & Albright, J. (2013). The complex task of leading educational change in schools. *School Leadership & Management, 33(3)*, 1-14. doi:10.1080/13632434.2013.800477

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology, 105*(3), 774. doi:10.1037/a0032198

Hong, B., & Yehuda, B. (2010). Creating learning organizations: A systems perspective. *The Learning Organization, 17*(3), 208-227. doi:10.1108/09696471011034919

Hord, S. (1997). *Professional learning communities*: *Communities of continuous inquiry and improvement.* Austin, TX: Southwest Educational Development Laboratory. Retrieved from http://www.sedl.org/pubs/change34/plc-cha34.pdf

Hord, S. (1998). *School professional staff as a learning community*. Austin, TX: Southwest Educational Development Laboratory. Retrieved from http://www.allthingsplc.info/files/uploads/issuesaboutchangecreating.pdf

Hord, S. (2004). Professional learning communities: *Learning together, Leading together*. *Changing schools through PLCs*. New York, NY: Teachers College Press.

Hord, S. (2007). What is a PLC? *Southwest Educational Development Laboratory Letter, 19*(1), 3-5. Retrieved from http://www.sedl.org/pubs/sedl-letter/v19n01/what-is-a-plc.html

Hord, S. (2008). Evolution of the professional learning community. *Journal of Staff Development, 29*(3), 10-13. Retrieved from ERIC database. (EJ802048)

Hord, S. (2009). Professional learning communities. *Journal of Staff Development, 30*(1), 40-43. Retrieve from ERIC database. (EJ827545)

Hord, S. M., & Roussin, J. L. (2013). *Implementing change through learning: Concerns-based concepts, tools, and strategies for guiding change*. Thousand Oaks, CA: Corwin Press.

Hord, S., & Sommers, W. A. (2008). *Leading professional learning communities: Voices from research and practice.* Thousand Oaks, CA: Corwin Press.

Hord, S., & Tobia, E. (2012). *Reclaiming our teaching profession. The power of educators learning in community*. New York, NY: Teachers College Press.

Horton, J., & Martin, B. (2013). The role of the district administration within professional learning communities. *International Journal of Leadership in Education: Theory and Practice, 16*(1), 55-70. doi:10.1080/13603124.2012.671366

Houghton, C., Murphy, K., Shaw, D., & Casey, D. (2015). Qualitative case study data analysis: An example from practice. *Nurse Researcher, 22*(5), 8-12. doi:10.7748/nr.22.5.8.e1307

Huang, H., & Sebastian, J. (2014). The role of schools in bridging within-school achievement gaps based on socioeconomic status: a cross-national comparative study. *Compare: A Journal of Comparative and International Education*, *45*(4), 501-525. doi:10.1080/03057925.2014.905103

Huffman, J. (2011). Professional learning communities in the USA: Demystifying, creating, and sustaining. *International Journal of Learning, 17*(12), 321-336. Retrieved from EBSCOHost database. (Accession No. 73027864)

Huggins, K. (2016). An investigation of professional learning communities in North Carolina school systems. *Journal of Research Initiatives, 2*(1), 1-18. Retrieved from http://digitalcommons.uncfsu.edu/jri/vol2/iss1/9

Huggins, K., Scheurich, J., & Morgan, J. R. (2011). Professional learning communities as a leadership strategy to drive mathematics success in an urban high school serving diverse, low-income students: A case study. *Journal of Education for Students Placed at Risk, 16*(2), 67-88. doi:10.1080/10824669.2011.560525

Huguet, A., Marsh, J.A., & Farrell, C. C. (2014). Building teachers' data-use capacity: Insights from strong and developing coaches. *Education Policy Analysis Archives, 22*(52). doi:10.14507Doi:10.14507/epaa.v22n52.2014

Hunter, R. (2010). Changing roles and identities in the construction of a community of mathematical inquiry. *Journal of Mathematics Teacher Education, 13,* 397-409. doi:10.1007/s10857-010-9152-x

Imms, W., & Byers, T. (2017). Impact of classroom design on teacher pedagogy and student engagement and performance in mathematics. *Learning Environments Research*, *20*(1), 139-152. doi:10.1007/s10984-016-9210-0

Ippolito, J. (2010). Three ways that literacy coaches balance responsive and directive relationships with teachers. *Elementary School Journal, 111*(1), 26. Retrieved from ERIC database. (EJ913204)

Jacobs, J., & Yendol-Hoppey, D. (2010). Supervisor transformation within a professional learning community. *Teacher Education Quarterly, 37*(2), 97-114. Retrieved from

ERIC database. (EJ896072)

Jacobson, D. (2010). Coherent instructional improvement and PLC's—Is it possible to do both? *Phi Delta Kappan, 91*(6), 38-45. doi:10.1177/003172171009100611

Jansen in de Wal, J., Den Brok, P. J., Hooijer, J. G., Martens, R. L., & Van den Beemt, A. (2014). Teachers' engagement in professional learning: Exploring motivational profiles. *Learning and Individual Differences*, *36*, 27-36. doi:10.1016/j.lindif. 2014.08.001

Jennings, J. L., & Bearak, J. M. (2014). "Teaching to the test" in the NCLB era: How test predictability affects our understanding of student performance. *Educational Researcher*, *43*(8), 381-389. doi:10.3102/0013189X14554449

Jimerson, J. B., & Wayman, J. C. (2015). Professional learning for using data: Examining teacher needs and supports. *Teachers College Record*, *117*(4), 1-36. Retrieved from http://www.tcrecord.org/library/abstract.asp?contentid=17855

Jita, L. C., & Mokhele, M. L. (2014). When teacher clusters work: selected experiences of South African teachers with the cluster approach to professional development. *South African Journal of Education, 34*(2), 1-15. doi:10.15700/201412071132

Johnson, P. E., & Chrispeels, J. H. (2010). Linking the central office and its schools for reform. *Educational Administration Quarterly, 46,* 738-775. doi:10.1177/ 0013161X10377346

Johnson, D. W., & Johnson, R. T. (2017). The use of cooperative procedures in teacher education and professional development. *Journal of Education for Teaching*, *43*(3), 284-295. doi:10.1080/02607476.2017.1328023

Johnson, J., Hall, J., Greene, J. C., & Ahn, J. (2013). Exploring alternative approaches for presenting evaluation results. *American Journal of Evaluation, 34*(4), 486-503. doi:10.1177/1098214013492995

Jones, C. M., & Thessin, R. A. (2015). A review of the literature related to the change process schools undergo to sustain PLCs. *Planning and Changing*, *46*(1/2), 193-211. Retrieved from ERIC database. (EJ1146267)

Jones, C., & Thessin, R. A. (2017). Sustaining continuous improvement through professional learning communities in a secondary school. *Journal of School Leadership*, *27*, 214-241. Retrieved from ERIC database. (EJ835455)

Jones, G., & Sallis, E. (2013). *Knowledge management in education: Enhancing learning & education*. New York, NY: Routledge.

Jones, W. M., & Dexter, S. (2014). How teachers learn: The roles of formal, informal, and independent learning. *Educational Technology Research and Development*, *62*(3), 367-384.

Jordan, A., & Matt, E. (2014). Designing policies that intentionally stick: Policy feedback in a changing climate. *Policy Sciences*, *47*(3), 227-247. doi:10.1007/s11077-014-9201-x

Katz, S., & Earl, L. (2010). Learning about networked learning communities. *School Effectiveness and School Improvement*, *21*(1), 27-51. doi:10.1080/0924345 0903569718

Kearney, W., & Peters, S. (2013). A comparison of teacher and student perceptions of elementary classroom climate. *National Forum of Educational Administration & Supervision Journal*, *31*(1), 23-37. Retrieved from http://www.nationalforum.com/Journals/NFEASJ/NFEASJ.htm

Kennedy, A. (2014). Understanding continuing professional development: the need for theory to impact on policy and practice. *Professional Development in Education*, *40*(5), 688-697. doi:10.1080/19415257.2014.955122

Killion, J., & Hirsh, S. (2013). Investments in professional learning must change. *The Learning Professional, 34*(4), 10-28. Retrieved from https://learningforward.org/docs/default-source/jsd-august-2013/killion344.pdf?sfvrsn=2

Kling, G., & Bay-Williams, J. M. (2014). Assessing basic fact fluency. *Teaching Children Mathematics*, *20*(8), 488-497. Retrieved from ERIC database. (EJ1041898)

Kornbluh, M. (2015). Combatting challenges to establishing trustworthiness in qualitative research. *Qualitative Research in Psychology*, *12*(4), 397-414. doi:10.1080/ 14780887.2015.1021941

Koyama, J., & Kania, B. (2014). When transparency obscures: The political spectacle of

accountability. *Journal for Critical Education Policy Studies, 12*(1), 143-169. Retrieved from http://www.jceps.com/wp-content/uploads/PDFs/12-1-06.pdf

Knowles, M. S. (1970). *The modern practice of adult education: Andragogy versus pedagogy*. New York, NY: Association Press.

Knowles, M. (1975). *Self-directed learning: A guide for teachers and learners.* Chicago, IL: Follett.

Knowles, M. S. (1984). *Andragogy in action: Applying modern principles of adult education*. San Francisco, CA: Jossey-Bass.

Kotter, J. P. (1997). Leading change: Why transformation efforts fail. *IEEE Engineering Management Review, 25*(1), 34-40.

Krishnan, S., Gabb, R., & Vale, C. (2011). Learning cultures of problem-based learning teams. *Australasian Journal of Engineering Education, 17*(2), 67-77. doi:10.1080/22054952.2011.11464057

Lance, A. (2010). A case study of two schools: Identifying core values conducive to the building of a positive school culture. *Management in Education, 24*(3), 118-123. doi:10.1177/0892020608090407

Learning Forward. (2014a). *Standards for professional leadership: Leadership*. Retrieved from http://learningforward.org/standards/leadership#.UnZlLRBGYQc

Learning Forward. (2014b). *Standards for professional learning*. Retrieved from http://learningforward.org/standards

Leclerc, M., Moreau, A. C., Dumouchel, C., & Sallafranque-St-Louis, F. (2012). Factors

that promote progression in schools functioning as professional learning community. *International Journal of Education Policy & Leadership, 7*(7), 1-14. Retrieved from ERIC database. (EJ990980)

Lee, M. (2010). 7 Principals of highly collaborative professional development. *Science & Children, 47*(9), 28-33. doi:10.2505/4/sc10_047_09_28

LeFevre, D. M. (2014). Barriers to implementing pedagogical change: the role of teachers' perceptions of risk. *Teaching and Teacher Education, 38*, 109-130. doi:10.1187/cbe.12-09-0163

Levasseur, R. E. (2012). People skills: Leading virtual teams—A change management perspective. *Interfaces, 42*(2), 213-216. doi.org/10.1287/inte.1120.0634

Lewis, C. (2009). What is the nature of knowledge development in lesson study? *Professional Development in Education*, *17*(1), 95-110. doi:10.1080/09650790802667477

Liberman, A., & Miller, L. (2011). Learning communities: The starting point for professional learning is in schools and classrooms. *Journal of Staff Development, 32*(4), 16-20. Retrieved from ERIC database. (EJ941372)

Liljenberg, M. (2015). Distributing leadership to establish developing and learning school organizations in the Swedish context. *Educational Management Administration & Leadership*, *43*(1), 152-170. doi:10.1177/1741143213513187

Linder, R. A., Post, G., & Calabrese, K. (2012). Professional learning communities: Practices for successful implementation. *Delta Kappa Gamma Bulletin, 78*(3), 13-

22. Retrieved from EBSCOhost database. (Accession No. 74029559)

Lippy, D., & Zamora, E. (2012). Implementing effective professional learning communities with consistency at the middle school level. *National Forum of Educational Administration & Supervision Journal, 29*(3), 51-72. Retrieved from http://www.nationalforum.com/Journals/NFEASJ/NFEASJ.htm

Liu, K., Miller, R., & Jahng, K. E. (2016). Participatory media for teacher professional development: Toward a self-sustainable and democratic community of practice. *Educational Review*, *68*(4), 420-443. doi:10.1080/00131911.2015.1121862

Lobo, M. A., Moeyaert, M., Cunha, A. B., & Babik, I. (2017). Single-case design, analysis, and quality assessment for intervention research. *Journal of Neurologic Physical Therapy*, *41*(3), 187-197. doi:10.1097/NPT.0000000000000187

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2010). *Methods in educational research: From theory to practice.* San Francisco, CA: Jossey-Bass.

Long, J. S., McKenzie-Robblee, S., Schaefer, L., Steeves, P., Wnuk, S., Pinnegar, E., & Clandinin, D. J. (2012). Literature review on induction and mentoring related to early career teacher attrition and retention. *Mentoring & Tutoring: Partnership in Learning*, *20*(1), 7-26. doi:10.1080/13611267.2012.645598

Loucks, S. F., & Hall, G. E. (1977). Assessing and facilitating the implementation of innovations: A new approach. *Educational technology, 17*(2), 18-21. Retrieved from https://www.jstor.org/stable/i40185756

Loucks, S. F., Hall, G. E., & Newlove, B. W. (1975). *Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters*. Austin, TX: University of Texas.

Lujan, N., & Day, B. (2010). Professional learning communities: Overcoming roadblocks. *Delta Kappa Gamma Bulletin, 76*(2), 10-17. Retrieved from https://www.questia.com/library/journal/1P3-2071788431/professional-learning-communities-overcoming-the

Lunenburg, F. C. (2010). Creating a professional learning community. *National Forum of Educational Administration and Supervision Journal, 28*(1), 1-7. Retrieved from http://www.nationalforum.com/Journals/NFEASJ/NFEASJ.htm

Magnuson, P., & Mota, R. (2011). Promoting professional learning from within. *International Schools Journal, 30*(2), 49-57. doi:10.1080/18334105.2014.11082021

Mandinach, E. B., Parton, B. M., Gummer, E. S., & Anderson, R. (2015). Ethical and appropriate data use requires data literacy. *Phi Delta Kappan*, *96*(5), 25-28. doi:10.1177/0031721715569465

Marsh, J. A., Bertrand, M., & Huguet, A. (2015). Using data to alter instructional practice. *Teachers College Record*, *117*(4), 1-40. Retrieved from http://www.tcrecord.org/library/abstract.asp?contentid=17849

Marzano, R. J. (2016). *Collaborative teams that transform schools: The next step in PLCs*. Bloomington, IN: Marzano Research.

Marzano, R. J., Warrick, P., Simms, J. (2014). *A handbook for high reliability schools: The next step in school reform*. Bloomington, IN: Solution Tree Press.

Masuda, A. M., Ebersole, M. M., & Barrett, D. (2012). A qualitative inquiry: Teachers' attitudes and willingness to engage in professional development experiences at different career stages. *Delta Kappa Gamma Bulletin, 79*(2), 6-14. Retrieved from EBSCOhost database. (Accession No. 84586888)

Maxwell, J. (2013). *Qualitative research design: An interactive approach.* Thousand Oaks, CA: Sage.

McDonald, B., Polnick, B., & Robles-Pina, R. (2013). Impact of instructional practices on students' mathematics achievement in urban middle schools. *Delta Kappa Gamma Bulletin, 79*(2), 52-65. Retrieved from http://www.deltakappagamma.org/NH/bulletin_vol79-2_2013winter.pdf#page=53

McDonough, J. S. (2013). *A case study of how professional learning communities influence morale and rigor in the classroom* (Doctoral dissertation). Retrieved from ProQuest Dissertations database. (UMI No. 3606252)

McGee, J. R., Wang, C., & Polly, D. (2013), Perceptions of Professional Development. *School Science and Math, 113*, 16-28. doi:10.1111/j.1949-8594.2012.00172.x

McLaughlin, M. (2011). Shifts in reform influence how and what teachers learn. *Phi Delta Kappan, 92*(6), 67. doi:10.1177/003172171109200615

McLaughlin, M. W., & Talbert, J. E. (2010). Professional learning communities: Building blocks for school culture and student learning. *Voices in Urban*

Education, 27, 35-45. Retrieved from http://vue.annenberginstitute.org/issues/27

McLester, S. (2012). Sustainable Professional Development. *District Administration, 48*(10), 36-41. Retrieved from ERIC database. (EJ984781)

Mehta, J. (2013). How paradigms create politics: The transformation of American educational policy, 1980-2001. *American Educational Research Journal, 50*(2), 285-324. doi:10.3102/0002831212471417

Meirink, J., Imants, J., Meijer, P., & Verloop, N. (2010). Teacher learning and collaboration in innovative teams. *Cambridge Journal of Education, 40*(2), 161-181. doi:10.1080/0305764X.2010.481256

Mercer, N., & Howe, C. (2012). Explaining the dialogic processes of teaching and learning: The value and potential of sociocultural theory. *Learning, Culture and Social Interaction*, *1*(1), 12-21. doi.org/10.1016/j.lcsi.2012.03.001

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Meyers, C. V., & Smylie, M. A. (2017). Five myths of school turnaround policy and practice. *Leadership and Policy in Schools*, *16*(3), 502-523. doi:10.1080/15700763.2016.1270333

Meyers, N. M., & Nulty, D. D. (2009). How to use (five) curriculum design principles to align authentic learning environments, assessment, students' approaches to thinking and learning outcomes. *Assessment & Evaluation in Higher Education, 34*(5), 565-577. doi:10.1080/02602930802226502

Midkiff, B., & Cohen-Vogel, L. (2015). Understanding local instructional responses to federal and state accountability mandates: A typology of extended learning time. *Peabody Journal of Education*, *90*(1), 9-26. doi:10.1080/0161956X.2015.988522

Mills, A. J., Durepos, G., & Wiebe, E. (Eds.). (2010). Nonparticipant observation. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (2nd ed., number 229). Thousand Oaks, CA: Sage. doi:10.4135/9781412957397

Moller, S., Mickelson, R. A., Stearns, E., Banerjee, N., & Bottia, M. C. (2013). Collective pedagogical teacher culture and mathematics achievement: Differences by race, ethnicity, and socioeconomic status. *Sociology of Education*, *86*(2), 174-194. doi:10.1177/0038040712472911

Monroe-Baillargeon, A., & Shema, A. L. (2010). Time to talk: An urban school's use of literature circles to create a professional learning community. *Education and Urban Society*, *42*(6), 651-673. doi:10.1177/0013124510370942

Moolenaar, N. M., Daly, A. J., & Sleegers, P. J. C. (2010). Occupying the principal position: Examining relationships between transformational leadership, social network position, and schools' innovative climate. *Educational Administration Quarterly, 46,* 623-670. doi:10.1177/0013161X10378689

Moolenaar, N. M., Sleegers, P. J. C., & Daly, A. J. (2012). Teaming up: Linking collaboration networks, collective efficacy, and student achievement. *Teaching and Teacher Education, 28*(2), 251-262. doi:10.1016/j.tate.2011.10.001

Morgan, H. (2015). Creating a class blog: A strategy that can promote collaboration, motivation, and improvement in literacy. *Reading Improvement*, *52*(1), 27-31. Retrieved from ERIC database. (EJ1095743)

Morrison, A. R. (2013). Educational leadership and change: Structural challenges in the implementation of a shifting paradigm. *School Leadership and Management, 13*(45), 412-424. doi:10.1080/13632434.2013.813462

Morison, J. (2009). Why teachers must be data experts. *Educational Leadership, 66*(4), 36-39. Retrieved from http://www.ascd.org/publications/educational-leadership/dec08/vol66/num04/Why-Teachers-Must-Be-Data-Experts.aspx

Morrison, J. A. (2013). Exploring exemplary elementary teachers' conceptions and implementation of inquiry science. *Journal of Science Teacher Education*, *24*(3), 573-588. doi:10.1007/s10972-012-9302-3

Moscoso, S. C., Chaves, S. S., Vidal, M. P., & Argilaga, M. T. A. (2013). Reporting a program evaluation: Needs, program plan, intervention, and decisions. *International Journal of Clinical Health & Psychology, 13*(1), 58-66.

Moss, C. M., & Brookhart, S. M. (2015). *Formative classroom walkthroughs: How principals and teachers collaborate to raise student achievement*. Alexandria, VA: ASCD.

Muñoz, M. A., & Branham, K. E. (2016). Professional learning communities focusing on results and data-use to improve student learning: the right implementation

matters. *Planning and Changing*, *47*(1/2), 37-46. Retrieved from ERIC database. (EJ1145332)

Musanti, S. I., & Pence, L. (2010). Collaboration and teacher development: Unpacking resistance, constructing knowledge, and navigating identities. *Teacher Education Quarterly, 37*(1), 73-89. Retrieved from ERIC database. (EJ872650)

National Commission of Excellence in Education. (1983). *A nation at risk*. Retrieved from http://www2.ed.gov/pubs/NatAtRisk/index.html

Nelson-Holmlund, T., Deuel, A., Slavit, D., & Kennedy, A. (2010). Leading deep conversations in collaborative inquiry groups. *Clearing House, 83,* 175-179. doi:10.1080/00098650903505498

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).

Noel, L. (2015). Using blogs to create a constructivist learning environment. *Procedia-Social and Behavioral Sciences*, *174*, 617-621. doi:10.1016/j.sbspro.2015.01.591

Nohl, A. M. (2015). Typical phases of transformative learning: A practice-based model. *Adult Education Quarterly, 65*(1), 35-49. doi:10.1177/0741713614558582

Nolan, C., & Stitzlein, S. (2011). Meaningful hope for teachers in times of high anxiety and low morale. *Democracy & Education, 19*(1), 1-11. Retrieved from https://democracyeducationjournal.org/home/vol19/iss1/2

O'Malley, G. S. (2010). Designing induction as professional learning community. *Educational Reform, 74*(1), 318-327. doi:10.1080/00131725.2010.483915

Owen, S. M. (2015). Teacher professional learning communities in innovative contexts: 'ah hah moments,' 'passion' and 'making a difference' for student learning. *Professional Development in Education*, *41*(1), 57-74. doi:10.1080/19415257.2013.869504

Parise, L. M., Finkelstein, C., & Alterman, E. (2015). *We always want to get better: Teachers' voices on professional development*. Retrieved from ERIC database. (ED558066)

Patel, N., Franco, S., Miura, Y., & Boyd, B. (2012). Including curriculum focus in mathematics professional development for middle-school mathematics teachers. *School Science & Mathematics, 112*(5), 300-309. doi:10.1111/j.1949-8594.2012.00146.x

Patton, M. Q. (2015). *Qualitative research and methods: Integrating theory and practice* (4th ed.). Thousand Oaks, CA: Sage.

Peurach, D. J. (2016). Innovating at the nexus of impact and improvement: Leading educational improvement networks. *Educational Researcher*, *45*(7), 421-429. doi:10.3102/0013189X16670898

Posavac, E. (2015). *Program evaluation: Methods and case studies*. New York, NY: Routledge.

Prytula, M., & Weiman, K. (2012). Collaborative professional development: An examination of changes in teacher identity through the professional learning community model. *Journal of Case Studies in Education, 3,* 1-19. Retrieved from

http://www.aabri.com/manuscripts/11964.pdf

Psencik, K., & Baldwin, R. (2012). Link data to learning goals: Common district assessments connect teaching effectiveness to student performance. *Journal of Staff Development, 33*(4), 30-34. Retrieved from https://www.learningforward.org /publications/jsd/jsd-blog/jsd/2012/09/05/jsd-august-2012-vol.-33-no.-4

Purzer, S. (2011). The relationship between team discourse, self-efficacy, and individual achievement: A sequential mixed-methods study. *Journal of Engineering Education, 100*(4), 655-679.

Pyle, A., Wade-Woolley, L., & Hutchinson, N. L. (2011). Just listen to us: The role of teacher empowerment in the implementation of responsiveness to intervention. *Alberta Journal of Educational Research, 57*(3), 258-272. Retrieved from https://journalhosting.ucalgary.ca/index.php/ajer/article/view/

Qablan, A., Mansour, N., Alshamrani, S., Aldahmash, A., & Sabbah, S. (2015). Ensuring effective impact of continuing professional development: Saudi science teachers' perspective. *Eurasia Journal of Mathematics, Science & Technology Education*, *11*(3), 619-631. doi:10.12973/eurasia.2015.1352a

Rahman, S. (2011). Influence of professional learning community (PLC) on secondary science teachers' culture of professional practice: The case of Bangladesh. *Asia-Pacific Forum on Science Learning & Teaching, 12*(1), 1-22. Retrieved from http://www.ied.edu.hk/apfslt/v12_issue1/rahman2/

Raman, A., Ying, L. T., & Khalid, R. (2015). The relationship between culture and organizational commitment among Chinese primary school teachers. *Mediterranean Journal of Social Sciences*, *6*(2 S5), 93-100. doi:10.5901/mjss.2015.v6n2s5p93

Ratcliff, N., Costner, R., Carroll, K., Jones, C., Sheehan, H., & Hunt, G. (2016). Causes of and solutions to the achievement gap: Teachers' perceptions. *Teacher Educators' Journal*, *9*, 97-111. Retrieved from ERIC database. (EJ1095644)

Ready, D. D. (2013). Associations between student achievement and student learning: Implications for value-added school accountability models. *Educational Policy, 27*(1), 92-120. doi:10.1177/0895904811429289

Reed, C. J., & Llanes, J. R. (2010). Raising standards for tomorrow's principals: Negotiating state requirements, faculty interests, district needs, and best practices. *Journal of Research on Leadership Education, 5*(12), 391-441. doi:10.1177/194277511000501203

Reed, L. C., & Swaminathan, R. (2016). An urban school leader's approach to school improvement: Toward contextually responsive leadership. *Urban Education*, *51*(9), 1096-1125. doi:10.1177/0042085914553675

Resnick, L. B. (2010). Nested learning systems for the thinking curriculum. *Education Researcher, 39*(3), 183-197. doi:10.3102/0013189X10364671

Richmond, G., & Manokore, V. (2011). Identifying elements critical for functional and sustainable professional learning communities. *Science Education, 95*(3), 543-

570. doi:10.1002/sce.20430

Riveros, A., Newton, P., & Burgess, D. (2012). A situated account of teacher agency and learning: Critical reflections on professional learning communities. *Canadian Journal of Education*, *35*(1), 202-216. Retrieved from ERIC database. (EJ968812)

Roach, A. T., Kratochwill, T. R., & Frank, J. L. (2009). School-based consultants as change facilitators: adaptation of the concerns-based adoption model (CBAM) to support the implementation of research-based practices. *Journal of Educational and Psychological Consultation, 19*(4), 300-320. doi:10.1080/10474410802463304

Rogers, E. (1955). *Diffusions of innovation theory* (1st ed). New York, NY: Free Press of Glencoe.

Rogers, E. (2013). *The origins of development of the diffusions of theory*. New York, NY: Free Press.

Ronfeldt, M., Farmer, S. O., McQueen, K., & Grissom, J. A. (2015). Teacher collaboration in instructional teams and student achievement. *American Educational Research Journal*, *52*(3), 475-514. doi:10.3102/0002831215585562

Royse, D., Thyer, B., & Padgett, D. (2015). *Program evaluation: An introduction to an evidence-based approach*. Boston, MA: Cengage Learning.

Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data* (2nd ed.). Thousand Oaks, CA: Sage.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Thousand Oaks, CA:

Sage.

Santagata, R., & Guarino, J. (2012). Preparing future teachers to collaborate. *Issues in Teacher Education, 21*(1), 59-69. Retrieved from ERIC database. (EJ986816)

Santoro, D. A. (2011). Good teaching in difficult times: Demoralization in the pursuit of good work. *American Journal of Education*, *118*(1), 1-23. doi:10.1086/662010

Sappington, N., Pacha, J., Baker, P., & Gardner, D. (2012). The organized contradictions of professional development and school improvement. *International Journal of Educational Leadership Preparation, 7*(1), 1-11. Retrieved from ERIC database. (EJ971505)

Saylor, L. L., & Johnson, C. C. (2014). The role of reflection in elementary mathematics and science teachers' training and development: A meta□synthesis. *School Science and Mathematics, 114*(1), 30-39. doi:10.1111/ssm.12049

Schalock, R. L., Lee, T., Verdugo, M., Swart, K., Claes, C., van Loon, J., & Lee, C. S. (2014). An evidence-based approach to organization evaluation and change in human service organizations evaluation and program planning. *Evaluation and Program Planning, 45,* 110-118. doi:10.1016/j.evalprogplan.2014.03.012

Schechter, C. (2012). The professional learning community as perceived by Israeli school superintendents, principals, and teachers. *International Review of Education, 58,* 717-734. doi:10.1007/s11159-012-9327-z

Schechter, C., & Feldman, N. (2013). The professional learning community in special education schools: The principals' role. *Educational Research and Reviews*, *8*(12), 785-791. doi:10.1177/1365480217703725

Schildkamp, K., & Poortman, C. L. (2015). Factors influencing the functioning of data teams. *Teachers college record*, *117*(4), 040310. Retrieved from http://www.tcrecord.org/Content.asp?ContentId=17851

Schlechty, P. (2011). *Engaging students: The next level of working on the work.* San Francisco, CA: Jossey-Bass.

Senge, P. M. (1990). *Schools that learn.* New York, NY: Doubleday.

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Senge, P. M., Cambron-McCabe, N., Lucas, T., Smith, B., Dutton, J., & Kleiner, A. (2000). *Schools that learn: A fifth discipline fieldbook for educators, parents, and everyone who cares about education*. New York, NY: Crown Business.

Shakman, K., & Rodriguez, S. M. (2015). *Logic models for program design, implementation, and evaluation: Workshop toolkit* (REL 2015-057). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast & Islands. Retrieved from ERIC database. (ED556231)

Shurr, J., Hirth, M., Jasper, A., McCollow, M., & Heroux, J. (2014). Another tool in the belt: Self-directed professional learning for teachers of students with moderate

and severe disabilities. *Physical Disabilities: Education and Related Services, 33*(1), 17-38. doi:10.14434/pders.v33i1.4855

Slavit, D., Kennedy, A., Nelson, T., & Deuel, A. (2011). Support for professional collaboration in middle school mathematics: A complex web. *Teacher Education Quarterly, 38*(3), 113-131. Retreived from https://www.jstor.org/stable/23479620

Sleegers, P., Thoonen, E. E. J., Oort, F. J., & Peetsma, T. T. D. (2014). Changing classroom practices: the role of school-wide capacity for sustainable improvement. *Journal of Educational Administration*, *52*(5), 617-652. doi:10.1108/JEA-11-2013-0126

Smith, M. L., & Ory, M. G. (2014). Measuring success*:* Evaluation article types for the public health education and promotion section of frontiers in public health. *Frontiers in Public Health, 2,* 1-6. doi:10.3389/fpubh.2014.00111

Spanneut, G. (2010). Professional learning communities, principals, and collegial conversations. *Kappa Delta Pi Record, 46*(3), 100-103. doi:10.1080/00228958.2010.10516704

Spaulding, D. T. (2013). *Program evaluation in practice: Core concepts and example for discussion and analysis* (2nd ed.). San Francisco, CA: John Wiley & Sons.

Steeg, S. M. (2016). A case study of teacher reflection: Examining teacher participation in a video-based professional learning community. *Journal of Language and Literacy Education*, *12*(1), 122-141. Retrieved from ERIC database. (EJ1101024)

Stewart, A., & Aldrich, H. (2015). Collaboration between management and anthropology researchers: Obstacles and opportunities. *Academy of Management Perspectives*, *29*(2), 173-192. doi:10.5465/amp.2013.0161

Stewart, C. (2014). Transforming professional development to professional learning. *Journal of Adult Education*, *43*(1), 28. Retrieved from ERIC database. (EJ1047338)

Stollar, L. J. (2014). *Teachers' perception of a professional learning community model and its impact on teaching and learning* (Doctoral dissertation). Retrieved from ERIC database. (ED557875)

Stürmer, K., Könings, K. D., & Seidel, T. (2013). Declarative knowledge and professional vision in teacher education: Effect of courses in teaching and learning. *British Journal of Educational Psychology, 83*(3), 467-483. doi:10.1111/j.2044-8279.2012.02075.x

Sultana, N. (2015). Application of concerned based adoption model (CBAM) for launching the information technology based teacher education program at AIOU. *Asian Journal of Social Sciences & Humanities*, *4*(3), 153-166. Retrieved from http://www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.4(3)/AJSSH2015(4.3-16).pdf

Tachie, S. A., & Chireshe, R. (2013). High failure rate in mathematics examinations in rural senior secondary schools in Mthatha District, Eastern Cape: Learners' attributions. *Studies of Tribes and Tribals*, *11*(1), 67-73. doi:10.1080/0972639X.2013.11886667

Tam, A. C. F. (2015). The role of a professional learning community in teacher change: A perspective from beliefs and practices. *Teachers and Teaching*, *21*(1), 22-43. doi:10.1080/13540602.2014.928122

Tanner, J. R. (2011). Missing the mark: What test scores really tell us. *School Administrator, 9*(68), 12-16. Retrieved from https://eric.ed.gov/?id=EJ946596

Tarsilla, M. (2016). Practical program evaluation: Theory-driven evaluation and the integrated evaluation perspective, by Huey T. Chen. *Canadian Journal of Program Evaluation, 31*(1), 125-128. https://doi.org/10.3138/cjpe.31.1.125

Taylor, R. T. (2010). Leadership to improve student achievement: Focus the culture on learning. *AASA Journal of Scholarship and Practice, 7*(1), 10-23. Retrieved from http://www.aasa.org/uploadedFiles/Publications/Journals/AASA_Journal_of_Scholarship_and_Practice/JSP_Spring2010_FINAL.pdf#page=10

Teague, G. M., & Anfara, V. A., Jr. (2012). Professional learning communities create sustainable change through collaboration. *Middle School Journal, 44*(2), 58-64. doi:10.1080/00940771.2012.11461848

Tesfaw, T. A., & Hofman, R. H. (2014). Relationship between instructional supervision and professional development. *International Education Journal, 13*(1), 82-99. Retrieved from https://openjournals.library.sydney.edu.au/index.php/IEJ/article/view/6888

Texas Education Agency. (1996). *The development of accountability systems nationwide and in Texas. Statewide Texas Educational Progress Study Report No. 1* (Document No. GE660107). Austin, TX: Author.

Texas Education Agency. (2011). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2012). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2013). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2014). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2015). *Academic Excellence Indicator System*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2016). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Texas Education Agency. (2017). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Thessin, R. A., & Starr, J. P. (2011). Supporting the growth of effective professional Learning communities. *Phi Delta Kappan, 92*(6), 48-54. doi:10.1177/ 003172171109200611

Thomas, L. (2013). 10 good ways to ensure bad professional development. *Journal of*

Staff Development, 34(4), 60-61. Retrieved from ERIC database. (EJ1026261)

Thomas, R. S. (2011). Why school teams don't analyze data. *The School Administrator, 68*(9), 24-27. Retrieved from http://www.aasa.org/SchoolAdministrator Article.aspx?id=20448

Thornton, K., & Cherrington, S. (2014). Leadership in professional learning communities. *Australasian Journal of Early Childhood*, *39*(3), 94. Retrieved from https://search.informit.com.au/fullText;dn=666865224965585;res=IELAPA

Tingle, E., Corrales, A., & Peters, M. L. (2017). Leadership development programs: Investing in school principals. *Educational Studies.* Advance online publication. doi:10.1080/03055698.2017.1382332

Trust, T. (2012). Professional learning networks designed for teacher learning. *Journal of Digital Learning in Teacher Education, 28*(4), 133-138. doi:10.1080/21532974. 2012.10784693

Turan, S., & Bektas, F. (2013). The Relationship between School Culture and Leadership Practices. *Eurasian Journal of Educational Research, 52,* 155-168. Retrieved from ERIC database. (EJ1060393)

Turner, J. C., Kackar-Cam, H. Z., & Trucano, M. (2015). Teachers learning how to support student interest in mathematics and science. In K. A. Renninger, M. Nieswandt, & S. Hidi (Eds.), *Interest in mathematics and science learning* (pp. 243-257). Washington, DC: American Education Research Association.

U.S. Department of Education. (2009, July 24). *President Obama, U.S. Secretary of*

Education Duncan announces national competition to advance school reform [Press release]. Retrieved from www2.ed.gov/print/news/pressreleases/2009/07/07242009.html

Van Wart, M. (2013). Lessons from leadership theory and the contemporary challenges of leaders. *Public Administration Review*, *73*(4), 553-565. doi:10.1111/puar.12069

Vygotsky, L. (1978). *Mind and society*. Cambridge, MA: Harvard University Press.

Waldron, N. L., & McLeskey, J. (2010). Establishing a collaborative school culture through comprehensive school reform. *Journal of Educational & Psychological Consultation, 20*(1), 58-74. doi:10.1080/10474410903535364

Walker, T. A. (2017). Recasting the vision for achieving equity: A historical analysis of testing and impediments to process-based accountability. *Education and Urban Society*, *49*(3), 297-313. doi:10.1177/0013124516643761

Wells, C. M., & Feun, L. (2013). Educational change and professional learning communities: A study of two districts. *Journal of Educational Change*, *14*(2), 233-257. doi:10.1007/s10833-012-9202-5

Werts, A. B., & Brewer, C. A. (2015). Reframing the study of policy implementation: Lived experience as politics. *Educational Policy*, *29*(1), 206-229. doi:10.1177/0895904814559247

White, S. S. (2014). Campus sustainability plans in the United States: Where, what, and how to evaluate? *International Journal of Sustainability in Higher Education*, *15*(2), 228-241. doi:10.1108/IJSHE-08-2012-0075

Wilcox, K. A., Murakami□Ramalho, E., & Urick, A. (2013). Just□in□time pedagogy: teachers' perspectives on the response to intervention framework. *Journal of Research in Reading*, *36*(1), 75-95. https://doi.org/10.1111/j.1467-9817.2011.01494.x

Williams, D. J. (2013). Urban education and professional learning communities. *Delta Kappa Gamma Bulletin, 70*(2), 31-39. Retrieved from https://www.questia.com/library/journal/1P3-2853090971/urban-education-and-professional-learning-communities

Williams, H. S., & Johnson, T. L. (2013). Strategic leadership in schools. *Education, 133*(3), 350-355. Retrieved from ERIC database. (EJ1022251)

Winkelmes, M. A. (2013). Transparency in teaching: Faculty share data and improve students' learning. *Liberal Education*, *99*(2). Retrieved from https://www.aacu.org/publications-research/periodicals/transparency-teaching-faculty-share-data-and-improve-students

Wong, K. Y. (2013, January). *Diverse pathways for life-long teacher professional development.* Paper presented at International Science, Mathematics and Technology Education Conference (ISMTEC 2013), Bangkok, Thailand.

Wood, R. E., & Burz, H. L. (2013). Literacy gets "a" makeover: Engaged learning boosts student achievement at Michigan high school. *Journal of Staff Development*, *34*(4), 38-41. Retrieved from ERIC database. (EJ1026282)

Woodland, R. H. (2016). Evaluating PK-12 professional learning communities: An improvement science perspective. *American Journal of Evaluation*, *37*(4), 505-521. doi:10.1177/1098214016634203

Woodland, R. H., & Mazur, R. (2015). Beyond hammers versus hugs: Leveraging educator evaluation and professional learning communities into job-embedded professional development. *NASSP Bulletin*, *99*(1), 5-25. doi:10.1177/0192636515571934

Woodland, R., Lee, M. K., & Randall, J. (2013). A validation study of the Teacher Collaboration Assessment Survey. *Educational Research and Evaluation, 19*(5), 442-460. doi:10.1080/13803611.2013.795118

Yin, H. B., Lee, J. C. K., & Zhang, Z. H. (2013). Exploring the relationship among teachers' emotional intelligence, emotional labor strategies and teaching satisfaction. *Teaching and Teacher Education*, *35*, 137-145. doi:10.1016/j.tate.2013.06.006

Yin, R. K. (2009). *Case study research and applications: Design and methods* (4th ed.). Thousand Oaks, CA: Sage.

Yin, R. K. (2011). *Applications of case study research*. Thousand Oaks, CA: Sage.

Yin, R. K. (2014). *Case study research and applications: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

Yin, R. K. (2015). *Qualitative research from start to finish*. New York, NY: Guilford Press.

Yin, R. K. (2017). *Case study research and applications: Design and methods* (6th ed.). Thousand Oaks, CA: Sage.

Appendix A: The Project

A Recommendation for the Yearly Evaluation of District PLCs

A Recommendation for the Yearly Evaluation of District PLCs

The following recommendation for GHISD is the result of a case study conducted at Campus A in Green Hill Independent School District (GHISD, pseudonym). The recommendation to evaluate PLCs is a product of findings collected from the Grade 7 mathematics PLC members who were a part of this study. I present a summary of my study and findings as well as solution to address the local problem. A short evaluation that may be returned to the author appears after the presentation of the recommendations and samples. The problem history includes how the need in GHISD was identified.

Background of the Problem

Following 4 years of PLC implementation and district support, student achievement scores in seventh grade mathematics at Campus A have not increased as reflected in the state and local district accountability measures (TEA, 2011-2017). PLCs were introduced in GHISD at the secondary level in each of the four core content areas of mathematics, ELA, social studies, and science at the seven middle schools in the summer of 2011. The intention behind the PLCs was to increase student achievement by improving teacher knowledge and practice in the PLC's collaborative setting

The qualitative case study this project is based upon was conducted between November 2016 and January 2016. Data collection included semi-structured interviews, professional learning community (PLC) observations, document reviews, and a demographic questionnaire with a total of six stakeholders from middle school Campus A in GHISD. Identifying teachers' perceptions of the PLC collaborative processes as related

to their professional knowledge and skills regarding middle school mathematics instruction may enable the district to adjust the PLCs' processes to improve teachers' ability to facilitate increases in Grade 7 students' mathematics achievement. Despite the district administrators' best efforts to support and grow PLCs at each middle school as a resource for teachers, feedback from district administrative staff, instructional coaches, and state achievement scores at the target middle school campus, Campus A, did not appear to be effectively using PLCs to improve student achievement (TEA, 2013; Thomas, 2011, 2013).

Current Status of the Problem

Based on data collected from PLC participants at Campus A and current student achievement outcomes, a need for additional training and PD to support PLCs at the local site is needed. Student achievement outcomes are still a concern for the current 2018-2019 school year. Participants in my study voiced this need and suggested possible options. This study focused on their perceptions of how lesson design and data reflections within their PLC impacted student achievement and helped them identify gaps in student learning.

Problem Definition

The problem I explored in this study concerned teachers' perceptions about seventh grade mathematics lesson design, data reflections, and student mathematics achievement in relation to the PLC environment. The underperforming middle school campus' students have not produced sufficient Grade 7 mathematics achievement scores.

This problem has occurred despite the district administrators' efforts to support and grow PLCs as a resource for middle school mathematics teachers. Campus A, in particular, demonstrated the lowest Grade 7 student mathematics performance and was the focus in this study.

In this study, I explored teacher and administrator perceptions of collaboration and levels of depth regarding teacher dialogue and collaboration related to mathematics instruction, classroom delivery strategies, data reflections of student performance, and lesson design within PLCs. More collaboration equals more specificity on what students need to know and how teachers should deliver content. (Learning Forward, 2014a) This in turn leads to student improvements in learning of mathematics by students, which could possibly result in improving students' performance on the state mathematics assessment (Learning Forward, 2014b). The following questions guided this case study concerning teacher perceptions related to lesson design and data reflection practices in a mathematics PLC environment for supporting the review of data and dialogue in the PLC.

1. How do members of the PLC perceive their collaboration on lesson design within a PLC and its relation to student mathematics achievement?
2. What processes do PLC members perceive they use to reflect on student mathematics data in their PLC?
3. How do members participating in PLCs respond when data reflect a gap in student learning based on PLC observations?

Methodology Used in Analysis

A qualitative exploratory case study design allowed me to investigate the specific elements found within the social unit of the PLC in a natural campus setting. This design was an appropriate approach because the local problem involved understanding teacher and administrator perceptions and their ongoing needs related to the effectiveness of the PLC implementation and processes employed within Campus A's Grade 7 mathematics PLC. This design permitted the opportunity to collect rich descriptive observation and interview data from teachers during a specific period in which teachers engage with PLC meeting processes.

The exploratory case study method aligned well with this project because I asked participants questions about their perceptions, actions, and reflections and observed data reflection and lesson development processes that occur during PLCs. This design involved interviews, questionnaires, a review of artifacts, such as planning documents and observations conducted in the PLC group activities to respond to the research questions and to gain data to understand the phenomena. Teacher interviews, PLC observations, a PLC member demographic survey, and a review of PLC artifacts used by PLC members provided all data associated with Research Questions 1, 2, and 3 revealing teacher beliefs, perceptions, and their experiences with data discussions and lesson designs within the campus' PLCs. Participants' responses in the interview questions also provided a description of processes used by the PLC. With the time-bounded nature of

the exploratory case study established, a discussion of the criteria for participant selection along with procedures of gaining participants was a critical consideration.

Identification of Participants

The five middle school mathematics PLC participants, Grade 7 mathematics teachers, plus one campus administrator, targeted for purposeful sampling were directly involved in grade level specific mathematics content and PLCs (Creswell, 2012). Campus A's PLC participants, who received PLC training prior to the beginning of the school year, were invited to participate in the exploratory case study of the Grade 7 mathematics PLC. Six members of the Grade 7 mathematics PLC volunteered to participate.

To understand the case of the mathematics PLC at the underperforming middle school, I selected participants who had knowledge of the mathematics PLC processes and who could provide insight and understanding (Creswell, 2012; Merriam, 2009). Purposefully recruiting teachers and administrators who met the criteria necessary for this study facilitated its successful execution (Yin, 2014). The primary criteria for participant inclusion were the following: (a) the Grade 7 teachers and administrators assigned to middle school Campus A's mathematics department, and (b) teachers and administrators participating in Campus A's Grade 7 mathematics PLC mathematics PLC. Placing any additional criteria for inclusion upon the study would have reduced the participation rate among the available middle school mathematics teachers and administrators participating in the exploratory case study.

Presentation of Findings

Data collected from participants revealed their perceptions to be positive toward the benefits of collaborating professionally and the impact collaboration has on student achievement. However, participants indicated their processes used in PLCs could be refined to improve effectiveness. Teachers suggested a need for more training in the areas of lesson frame components, ownership of the data reflection processes, and learning focused on using data to recognize student learning gaps. I used a combination of inductive and deductive analysis to generate findings from the data.

Initial codes were derived from the interviews, PLC observations, document reviews, and a demographic questionnaire. The data analysis from all four sources led to three overarching themes providing answers in the form of perceptions to each of the three research questions in this study. The themes in Table 1 represented the teachers' needs or the areas of support to be addressed by the local school district in relation to each research question.

Research Question 1: Lesson Design and Student Mathematics Achievement

The PLC under perceived their collaboration as effective. These data suggested PLC members lacked a specific understanding about the elements needed for developing effective lesson frames. Also, participants did not articulate or directly connect current student mathematics performance to their lesson designs. Clear parameters for monitoring student achievement did not emerge during interviews, observations, or document analysis. Participants were aware of the need to meet student achievement

goals but lacked a focused systemic collaborative approach to defining and measuring such achievement.

Table 1

Emerging Themes by Research Question

Research Questions	Emerging Themes	Number of Participants Discussing Theme
1. Perceptions of lesson design and impact on student mathematics achievement	Theme 1: Collaboration is viewed as supportive in the development of lessons	6
	Theme 2: Collaboration in the PLC influences teacher lesson delivery	5
	Theme 3: Effective lesson plans influence student learning and achievement	5
2. Processes used by the PLC for data reflection	Theme 4: PLC structures and processes are not consistently used by participants	5
	Theme 5: PLC participants lack ownership in the development of reflection processes	5
	Theme 6: PLC members needs PD on supporting teacher collaboration needs related to student data reflection.	5
3. PLC response to gaps in student achievement data	Theme 7: Lack of structure for defining student achievement and proficiency	5
	Theme 8: Teachers have difficulty and need support in recognizing, monitoring, and understanding student data gaps	6
	Theme 9: PLC members desire consensus on goals and clear expectations for how the PLC will focus on student learning	5

Also, participants did not seem to understand or demonstrate any sense of ownership for planning and implementing lessons. Hall and Hord (2011) found educators frequently talk about extensive concepts like policy, systems, and organizational factors

even though change cannot be effective unless it starts and ends with the individuals. At the individual level, the PLC participants expressed the following about their ownership in the program's processes:

- "Just maybe lettings us have an opinion on how data should be collected. Then taking some suggestions on how we can do that versus just giving us something that none of us think works. Everything they give us as far as data, is just that, it's given to us. They don't really ask us how we think data should be collected."
- "The one main thing I would really change is making sure that each teacher has had some type of training about what the frame should look like. My first year teaching I was told to refer to the frames from last year and go off that, nobody sat down with me a talked to me about each piece of the frame, it was so stressful."
- "They talk about breaking down of PA and the TEK and that is a process of lesson planning some teachers use."
- "I don't really have ownership over the lesson planning process."

Research Question 2: Processes and Data Reflection

Knowledge and understanding of data reflection varied among the participants, and the inconsistencies indicated the PLC members may lack purpose and understanding of data outcomes. The PLC members did not appear to understand how to align their daily practices to fit with meeting stated student goals. As with theme 1, participants'

responses did not convey an understanding of how the tasks and processes of the PLC enabled them to attain expected summative (state) and formative (district) student achievement outcomes. The PLC members did not demonstrate a sustained continuous cycle of daily practices that aligned with the mathematics objectives designed for ensuring students attained campus, district, and state achievement goals.

Analyzing data provided through common assessments allowed teachers to modify instruction to correct weaknesses as well as design lessons for improving student performance (Learning Forward, 2015). PLC members seemed to recognize fragments and pieces of a reflection process. An analogy would be they understood what ingredients are needed to bake a cake, but they could not determine exactly what type of cake they were making. Teachers were even less clear about expectations for reflecting on student data. The lack of understanding was exhibited by the participants as follows:

- "We just use it as a guide at our campus; we're supposed to be a little more detailed in the frame about what we're doing and how it's going."
- "Each question we go through and see what percent got it right? What percent got A, B, C, D wrong and why do you think they picked those answers?"
- "We look to see what we want them to know by the end of the week."
- "We're always asked, even during the week, we're asked to do reflection on what we learned."
- "Well we developed something we call the individual growth plan, so we kind of use this document I guess to help guide the reflections."

Other member responses displayed a wide disparity in understanding or articulating a process or meaningful purpose for data reflections. They seemed unclear about how or why PLCs were developed, especially with regards to their own role in the innovation. One PLC member in response to processes stated the district "just came out with this new sheet where we're looking at target scores and teachers need to identify students who either did not meet target, me, or exceeded." Another response from a different participant seems to indicate a lack of clarity for this "new sheet." "I don't know if they're going to continue doing this or not, because I think it was a new thing that people were very unhappy with."

I observed PLCs in November and the following responses seemed to show good intent but a lack of implementation due to lack of understanding:

- "We haven't started it yet but we have a new process that they'll be implementing where they're actually writing down students' names and categorizing it by whether they're meeting their target."
- "I think that this year we have some extra documents and I feel like a lot of them require us to do a lot of things twice so there's a lot of redundancy, double work."

Research Question 3: Responding to Gaps in Student Data Reflections

Recognizing and responding to data gaps was identified as difficult for all PLC participants. The need for learning, purpose, direction, and priority was well documented in the participants' responses. In the data for this research question, participants noted

data reflection to be an area in which they needed improvement and understanding. GHISD has various data systems available to help target student gaps. Participants indicated lacking clarity about what to do with the data they have. Participants used terms associated with student expectations; however, I did not gain any tangible evidence that student data were monitored or used to establish student achievement goals for the year.

Jones and Thessin's (2015) review of change processes found that change is not solely about doing what other organization members do best, or about changing everything done in the organization, changing those involved in implementing the initiative, or modifying how the change is implemented. Rather, change requires rethinking regarding how goals, programs, and services fit together to keep pace with a changing educational and job-ready world. For example, participants seemed to lack specific defined goals that could be linked to identifying gaps in student learning. Participants seemed unsure of exactly how to define a gap in student data. Overall, participants lacked and understanding of how processes fit together to paint a portrait of student performance. The participants lacked appropriate PD for working effectively in a change system (PLC). Therefore, the participants had not gained ownership in to the educational innovation of which they were a part.

Participants exhibited evidence for recognizing and responding to student gaps as follows:

- "I guess that's where we put them in Tiers 1, 2, 3."
- "Gap means they're going down? I've only looked at one."

- "If I'm being perfectly honest, I don't think I've been in a PD that has taught me how to address data gaps."
- "I think it's just by turning in scores. We don't really talk about that (student gaps) much to be honest. Then as far as data to when we're in our PLC, it's just not really discussed."
- "The PD we do have I like are just redundant and unnecessary most of the time. I've only seen one other mathematics data reflection. I've never been to even a different department or campus."
- "To be honest, the PD that we've gotten, I'm assuming its PD, because it happened during our cluster time. It seemed to be very strenuous as far as the process about how everything goes."

Providing effective PD for the three areas of need that include lesson design, data reflection, and student gaps presents a challenge for the district. The findings indicated varying degrees or stages of learning among participants. Meeting the various needs of the individual teachers in all three areas will require the campus and district leaders to set organizational priorities with a well-researched approach to meet this challenge.

Impact and Importance of the Problem

Participants use PLCs as an opportunity to discuss how to implement segments the lesson frame and how to collectively present mathematics content to students. However, members expressed a need for more training in both areas as well as reflecting and understanding how to take action as a PLC with student data outcomes. Participants

did not provide answers leading to an observable systemic and structured approach to lesson design, or how they approached data reflection each 9 weeks, and their responses to identifying gaps in student data also lacked clarity of understanding about of what was expected of them. However, based on the positive response to PLC collaboration, teachers are poised to continue with implementation. The following recommendations emerged from the data provided by the teachers at the site campus. An evaluation of all the district's PLCs will help with future innovations and program implementation in the district.

The lack of PD addressing teachers' perceptions of the PLC process; concerns about PLC process' development, implementation; and lack of PLC evaluation data has contributed to seemly unconstructive processes at the site PLC which in turn affect the teachers' perceptions and teacher retention (Moss & Brookhart, 2015). PD is the engagement of stakeholders in needs-based and strength-based learning to plan, implement, and evaluate strategies that improve student achievement (DuFour & DuFour, 2013; Hargreaves, Lieberman, Fullan, & Hopkins, 2014; Learning Forward, 2015).

Participants expressed frustration with the perception of having no voice in the PD often enacted by administrators or central office personnel in the district. Valuing teacher perceptions is important because a shared vision drives professional development, therefore, giving meaning and direction to the data (Bambrick-Santoyo, 2014a). Teachers must be the first ones consulted when determining PD as seen in the literature addressing the expectations of PD (Darling-Hammond, 2014; Hargreaves, 2014 et. al.),but teachers'

perceptions and the impact of PD on teachers' daily pedagogical practices are rarely been obtained prior to scheduling PD learning.

The findings showed that GHISD would benefit by providing PD for Campus A's PLC members focused on the needs of adult learners aligned with both campus and district student achievement goals. Most importantly, the PD should reflect teacher identified content in order to be focused on the needs of adult learners and to be presented in a manner indicating respect for their professional statuses and experiences. Deciding which evaluation solution provides the best long-term outcome is critical.

The PLC is a democratic process wherein teachers take ownership for their learning. However, in order for stakeholders to determine when a school is truly operating an effective PLC, the stakeholders must be willing to learn from the implementers (Wells & Feun, 2013). Schools must inspect their PLCs and determine strengths and weaknesses so that changes can be made to ensure sustainability. The findings in this study support the need to include the perspectives of PLC members in PD offered as a support to members. Next, I discuss options consider as a solution to the study problem.

Alternative Solutions

Solutions Considered

PD can be used to enable the teachers to bridge their gaps in understand, to enhance their skills with reflection, and to mobilize them to use data effectively. However, teacher learning from PD delivered in the past via district options has not had

the intended outcomes with student achievement. For this reason, I do not expect a 3 to 5-day PLC workshop as scheduled and delivered in past years to meet the individual learning needs of teachers. Participants responses clearly indicate a need for PD in the three areas researched. The need is not the same for every member at Campus A. It's likely that other campus PLCs have varying PD needs as well.

Developing a curriculum plan, designing professional development, or making recommendations for the use of student data would not have served the immediate needs of teachers. The varying degree in teacher understanding is evident that a clear purpose and transparent expectations for the progress of district PLCs and program development is discernable. Clearly, a consistent process for PLC efforts to maintain a cycle of continuous improvement is lacking. Participants are clearly seeking support, ownership, transparent goals, and expectations for PLCs. Having data to support the direction of PD is necessary to provide teachers the support and learning they believe is necessary to improve student achievement. Gathering this data is where the district should start.

GHISD has not evaluated its PLC innovation using a research-based model for supporting programs of innovation. The district did not use a consistent change model to guide the implementation and assessment of PLCs as a new innovation. Also, the district has not enacted an existing PLC assessment or evaluation policy. The district is void of a job-embedded professional development policy linked to PLC expectations or policy (Owens, Pogodzinski, & Hill, 2016). By selecting an evaluation of district PLCs, the ownership of the processes used within PLCs, and data to support a menu of PD options,

the districts' leaders can meet the varying concerns and needs of its individual educators.

GHISD is currently a recognized as a District of Innovation by the state with numerous schools and programs in place as such. Effectively implementing new programs (change) requires more than providing teachers and administrators with materials, resources, and 3-day training opportunities. Johnson (2005) found that change in schools is a qualitative process, people-based emotions and reactions rather than a quantifiable issue. Johnson also pointed out the quality of a school district depends on the ability of stakeholders' to use and expand existing teaching capacities to meet students' achievement goals. Change efficacy also depends on the ability of those leading the organization to reflect on learning (Johnson, 2005). The evaluation method used to access innovation should offer the opportunity to focus clearly and intentionally on the human element as part of the process of change.

Comparison of Alternatives

The type of program evaluation depends on the style of the project and data targets. There are several types of evaluations, but there are four that are commonly used: (a) formative evaluation, (b)process/implementation evaluation, (c) outcome-based evaluation, and (d) impact evaluation (Shulha, Caruthers, & Hopson 2010; Smith, & Ory, 2014). The use of program evaluations provides decision makers with information to determine if a program was successful in accomplishing the goals it was implemented to address (Tam, 2015). For example, outcome-based evaluations are usually conducted following the conclusion of a program and provide information to determine if the

program's objectives were met (Spaulding, 2014). PLCs in GHISD are not intended to have a point of conclusion. Each of the above evaluations were reviewed as possible alternatives.

The mathematics teachers suggested they needed more training for fulfilling all lesson frame components, sharing ownership of a data reflection processes, and becoming learning focused toward applying data reflection to recognize students' learning gaps. A change in the what, how, and when needs to occur for PD to be effective in supporting PLCs. Fullan (1991) found that educational change is theoretically simple, but socially complex. The complexity comes with individuals' learning styles and levels of concern regarding programs seen as change.

Fullan stated that a large part of the problem with educational change may be less a question of stakeholder resistance and bad intent and more about the complications related to planning, coordinating and implementing a multilevel social process involving thousands of people and all their emotions, experiences and perceptions involved in resisting or accepting the change. Fullan stated educators must constantly remind themselves that educational change is a learning experience for the teachers and staff involved.

These rationale suggest an evaluation of teacher concerns and needs as aligned with their PLC experiences is needed to coordinate multilevel PD options for hundreds of educators in GHISD. Results from participants that indicate the intensity and direction of their concerns will inform district administrators about teachers' level of concerns related

knowledge about developing lesson frames, appreciating data reflection, and identifying student learning gaps needs and response. A product from an assessment of teacher concerns will be the development of or offering of PD options designed to meet the individual teachers' levels of understanding or concerns. Consequently, an evaluation of PLCs may lead to development of a robust PD menu for teachers based on their individual levels of understanding about using data. The district can in turn group individuals with similar PD needs and provide options that cater to its teachers.

Constraints

Meeting the various needs of each participant cannot occur in a 3-day PD session project. Attention must first be given to accessing the individual PD needs of participants based on their perceptions. Offering PD in the three identified areas to teachers with 10, 15, 20, or 25 years of experience and with Grade 7 mathematics teachers all attending the same sessions does not support all of these teachers' individual learning needs. Valuing teacher perceptions is important because a shared vision drives professional development, therefore, giving meaning and direction to the data (Bambrick-Santoyo, 2014a). Teachers must be the first ones consulted when determining PD as seen in the literature addressing the expectations of PD (Darling-Hammond, 2014; Hargreaves, et. al.), but teachers' perceptions and the impact of PD on teachers' daily pedagogical practices have rarely been considered.

To this end, I suggest using a program evaluation to gather data district-wide at the teacher level to determine a menu of structured PD options that best meets the

individual learning needs of teachers working within a PLC structure in GHISD. This direction would allow teachers at the local site as well as district wide to be grouped in like cohorts based on their identified immediate needs as one method of considering adult learning needs and valuing the experiences, they bring to collaborative PD. Next, I discuss PLC evaluations as a recommendation for all district PLCs to gather PLC feedback.

Recommendations

Description of Recommendation

I am recommending the GHISD leadership team consider the use of the Concerns Based Adoption Model (CBAM) as an evaluation method and change model for their district PLCs. The model is designed on the foundation that change is a process, not a one-time event, and as teachers engage through the process of change, they encounter not only affective stages of concern but also move through different levels of individual use within a new change initiative (George, Hall, Stiegelbauer, & Abdullah, 2006; Hall & Hord, 2011, 2014; Loucks & Hall, 1977; Loucks, Newlove, & Hall, 1975; Shawer, 2013).

The CBAM was established in the 1970s and 1980s by a group of researchers at the Research and Development Center for Teacher Education at the University of Texas at Austin. “Following the development of CBAM, researchers have tested CBAM for reliability and validity. Today, CBAM continues to be applied in a range of school, organizational, and research settings. CBAM’s tools are commonly used to help leaders, evaluators, and researchers understand, monitor, and guide the complex process of

implementing new and innovative practices" (American Institute for Research, 2015, p. 2). In order to determine whether a PLC is truly functioning as effectively as it was designed, schools should evaluate their PLCs and determine effectiveness and progress with implementation (Learning Forward, 2014; Shakman & Rodriguez, 2015). An evaluation of GHISD's PLCs using CBAM will address the research problem in several ways.

First, the assessment and evaluation of PLCs effectiveness by incorporating CBAM and distributing the Stages of Concern Questionnaire (SoCQ) will generate immediate data for use by stakeholders at the local site and district wide (Hall & Hord, 2011, 2014; 2006). The 35-item SoCQ asks educators to rate the degree to which they agree with statements related to an innovation, in this case the PLC, and in what way they might manage the responsibilities of the innovation (George et al., 2006). This assessment's data enables leaders to examine the concerns of many staff across multiple sites (George et al., 2006). Leaders at the district level can use the data to determine the types of concerns recognized by teachers. The data can be presented district wide offering a transparent view of expectations for PLCs and support for teacher needs. Ultimately, yielding teacher perspective data to be considered in developing a menu of PD options needed at the local site as well as district wide (Bambrick-Santoyo, 2014a).

Second, the SoCQ questionnaire data can be used by the board and superintendent to set clear districtwide PLC expectations based on a formal policy for campuses and provide data for an annual review of the policy expectations. Findings from the CBAM

model enables stakeholders to be confident about the pursuit of change and innovation. Also, CBAM is a packaged program that includes all the materials and guidance needed to successfully engage in the assessment and evaluation of GHISD's PLCs. Following the SoCQ this model provides a tool to review levels of use within the PLC.

Finally, according to the data collected, ownership of the processes was not practiced within the PLC, forming an area of concern, particularly for teachers new to the PLC. PD focused on the needs of adult learners and how the change process impacts learners has the potential to address the process gaps expressed by multiple participants in this study and enable opportunities to collaborate with high performing individuals to clarify and create processes that are valued by all members (Wells & Feun, 2013). When district leaders take teachers' perceptions and learning characteristics into account, teachers begin to develop motivation and action toward their own professional learning (Bleicher, 2014; Cook, Tone, & Zhu, 2014; Haug & Sands, 2013).

Professional learning promotes teachers' ownership and willingness to use their voices. The lack of PD addressing teachers' perceptions and concerns in the PLC process' development, implementation, and evaluation contributed to negative collaborative environment at the site PLC which in turn affect the teachers' perceptions about high workloads and teacher retention (Moss & Brookhart, 2015).

Rationale for Implementation

Society expects public schools to keep pace with change; they just do not want the schools themselves to change beyond current, or alternatively socially normed and

expected, school culture and practices (Hord, 2009). Researchers concur change is not simply about getting better at what educators do because change requires changing everything needing to be done; switching leadership may be involved in implementing the change or adjusting how change has been previously implemented. The culture of schools needs to be diagnosed and understood before meaningful change can take place (G. Hall, 2013). There are many evaluation models to be considered when implementing instructional innovation within a school and district. Teachers are repeatedly called upon to implement and sustain instructional change endeavors. Unfortunately, teachers rarely understand the challenges of change, levels of concern associated with change, or how to manage various stages of change.

Options for Implementation

The PLC evaluation should be implemented in a transparent manner inclusive of representation across the GHISD learning community (Owen, 2015). The result of the evaluation will lead to the development of a district PD menu and create a sense of shared responsibility among PLC members while pursuing outcomes that are more relevant to the participants (Attard, 2012; Moss & Brookhart, 2015; Shurr, Hirth, Jasper, McCollow, & Heroux, 2014) CBAM is a researched-based approach that has shown efficacy. CBAM uses three diagnostic dimensions for gathering specific information related to staff concerns, program of use, and providing supports to give each individual person what they need to ensure success (Hord, 2007). Because the local problem involved gaining the perceptions of people to understand how to cause change, CBAM allows for a

solution that focusses on staff concerns.

By using this approach, PD support can be offered by constant monitoring of teacher concerns and needs leading to choices in PD options that can be based on an individual's abilities, learning style, or needs relative to the change. This option allows a blend of personalization and focuses on teachers' needs as related to the district's vision and expectations for the school's PLCs. This PLC evaluation is based on the documented evidence that PLCs are one professional tool used by teachers to increase students' classroom performance and learning, and this particular model for professional learning can apply within the framework for school improvement (DuFour, 2004; DuFour, R., DuFour, Eaker, & Karhanek, 2010a; Hord, 2007; Smith, 2017).

CBAM's tools are frequently used to help leaders comprehend, guide, and monitor the complex process of program implementation necessary for change and innovation (George et al., 2006). Using data derived from the evaluation will provide a menu of individual PD options for PLC members align with goals to help reach the outcomes of the innovation. The human element in the model is the people, in this case the mathematics teachers, doing the work at the classroom and school level. Figure 1 provides a visual guide to CBAM.

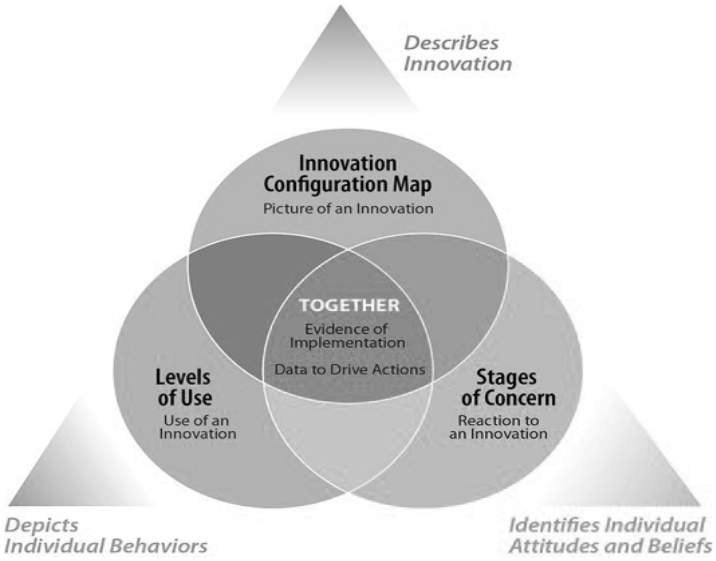

Figure 1. CBAM as presented by Hall (2013)

Offering teachers choices for PD assists in ensuring teachers' maintain engagement throughout all stages of learning. Teachers who engage in the learning process of determining the types of PD offered, facilitating learning, and engaging in reflection changed instructional practices (Cook et al., 2014; Jita & Mokhele, 2014). Choices in PD promotes personal motivation and engagement to increase professional knowledge and increase instructional practices. Top-down mandated professional learning does not address the concerns or needs of teachers (Bradley, 2014; Turner, Koellner, & Jacobs, 2015; Roseler & Dentzau, 2013). The goal of PD is to create a change in teachers' behaviors, when incorporating teachers' perceptions of their needs in PD options a positive increase in teacher approval and implementation of such behaviors is expected (Darling-Hammond, 2014). The goal of CBAMs SOC process is to gain insight about teacher reaction to an innovation such as PLCs.

Understanding of the goals of PD assists in assessing teacher perceptions by providing a foundation for professional learning expectations. Collaboration, teacher growth, and student growth are the expected goals of professional learning (Tam, 2015). PD promotes the changes of teacher behaviors and in pedagogical instructions (Learning Forward, 2015b). Teachers as adult learners have a natural need to interact with one another (Gleason & Gerzon, 2014). Effective and targeted PD promotes the goals of developing a shared vision, increases teacher leadership and learning, and promotes positive student outcomes (Evans 2014).

Finally, grouping PLC participants at the research site into PD options with a wide PD focus lacking goals at the individual teacher level has not moved student achievement in a positive direction. The purpose of this position paper is to provide stakeholders in GHISD with an option to gain data to validate or change their direction with PD as a means of support for their district PLCs (Jita & Mokhele, 2014; Johnson, Hall, Greene, & Ahn, 2013; Tam, 2015). This study may contribute to positive social change by improving PD options in school districts, leading to greater gains in student academic achievement.

SoCQ 075

Stages of Concern Questionnaire

Sample SoC-Q for PLC Evaluation

Stages of Concern Questionnaire: GHISD PLC Members

Participant #: _____ Campus: _____

The purpose of this questionnaire is to determine what people who are using or thinking about using various programs are concerned about at various times during the adoption process.

The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about various programs to many years' experience using them. Therefore, many of the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

This statement is very true of me at this time.	0 1 2 3 4 5 6 7
This statement is somewhat true of me now.	0 1 2 3 4 5 6 7
This statement is not at all true of me at this time.	0 1 2 3 4 5 6 7
This statement seems irrelevant to me.	0 1 2 3 4 5 6 7

Please respond to the items in terms of your present concerns, or how you feel about your involvement with this innovation. We do not hold to any one definition of the innovation so please think of it in terms of your own perception of what it involves. Phrases such as "this approach" and "the new system" all refer to the same innovation. Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with the innovation.

Thank you for taking time to complete this task,

GHISD Leadership

*This example shows the adaptability of SoCQ. I'm using RQ2 data reflection to create 7 sample questions for the purpose of this presentation.

Data Reflection Tool for PLC Innovation Example

Irrelevant	Not true of me now	Somewhat true of me now	Very true of me now
0	1 2	3 4 5	6 7

1.	I am confident in my use of reflection processes used by our PLC.	0 1 2 3 4 5 6 7
2.	I understand the purpose of our reflection process.	0 1 2 3 4 5 6 7
3.	I am concerned about how our PLC uses time to reflect of student data.	0 1 2 3 4 5 6 7
4.	The innovation is taking too much of my time.	0 1 2 3 4 5 6
5.	I understand how our PLC defines student achievement as a result of data reflection.	0 1 2 3 4 5 6 7
6.	I'm satisfied with the PD received related to implementing data discussions or a reflection process in my PLC	0 1 2 3 4 5 6 7

Project Evaluation

Evaluation of Position Paper by Vicki Bridges

Evaluation: Please circle the number that applies 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

The information and recommendation focused on a district need.	**1**	**2**	**3**	**4**	**5**
Please add any comments here:					
The presentation offered a valid solution to the district.	**1**	**2**	**3**	**4**	**5**
Please add any comments here:					
Presentation data accurately illustrated district and campus data.	**1**	**2**	**3**	**4**	**5**
Please add any comments here:					
Information offered a researched implementation option.	**1**	**2**	**3**	**4**	**5**
Please add any comments here:					
The information and recommendation from the paper could be improved.	**1**	**2**	**3**	**4**	**5**
Please add any comments here:					

References

American Institute for Research. (2015). *The Concerns-Based Adoption Model.* Retrieved from https://www.air.org/resource/cbam-concerns-based-adoption-model

Attard, K. (2012). Public reflection within learning communities: An incessant type of professional development. *European Journal of Teacher Education, 35*(2), 199-211. doi:10.1080/02619768.2011.643397

Bailey, D. B., & Palsha, S. A. (1992). Qualities of the stages of concern questionnaire and implications for educational innovations. *Journal of Educational Research, 85*(4), 226-232. doi:10.1080/00220671.1992.9941120

Bambrick-Santoyo, P. (2014a). Build a meaningful student culture from day one. *Phi Delta Kappan*, *95*(8), 72-73. doi:10.1177/003172171409500817

Bleicher, R. E. (2014). A collaborative action research approach to professional learning. *Professional Development in Education, 40*(5), 802-821. doi:10.1080/19415257.2013.842183

Cook, W. D., Tone, K., & Zhu, J. (2014). Data envelopment analysis: Prior to choosing a model. *Omega*, *44*, 1-4. doi:10.1016/j.omega.2013.09.004

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Boston, MA: Laureate Education.

Darling-Hammond, L. (2014). One piece of the whole: Teacher evaluation as part of a comprehensive system for teaching and learning. *American Educator, 38*(1), 4. Retrieved from ERIC database. (EJ1023870)

DuFour, R. (2004). Leading edge: The best staff development is in the workplace, not in a workshop. *Journal of Staff Development, 25*(2), 63-64. Retrieved from https://learningforward.org/docs/jsd-spring-2004/dufour252.pdf?sfvrsn=2dufour252.cfm

DuFour, R., DuFour, R., Eaker, R., & Karhanek, G. (2010a). *Raising the bar and closing the achievement gap: Whatever it takes.* Bloomington, IN: Solution Tree Press.

Evans, L. (2014). Leadership for professional development and learning: enhancing our understanding of how teachers develop. *Cambridge Journal of Education, 44*(2), 179-198. doi:10.1080/0305764X.2013.860083

Fullan, M. (1991). *The new meaning of educational change*. New York, NY: Teachers College Press.

George, A. A., Hall, G. E., Stiegelbauer, S. M., & Abdullah, S. (2006). *Measuring implementation in schools: The Stages of Concern Questionnaire.* Austin, TX: SEDL. Retrieved from http://www.sedl.org/pubs/catalog/items/cbam17.html

Gleason, S. C., & Gerzon, N. (2014). High-achieving schools put equity front and center. *The Learning Professional, 35*(1), 24.

Hord, S. (2009). Professional learning communities. *Journal of Staff Development, 30*(1), 40-43. Retrieve from ERIC database. (EJ827545)

Hall, G. E. (2013). Evaluating change processes: Assessing extent of implementation (constructs, methods and implications). *Journal of Educational Administration*, *51*(3), 264-289. doi:10.1108/09578231311311474

Hall, G. E., & Hord, S. (2011). Implementation: Learning builds the bridge between research and practice. *Journal of Staff Development, 32*(4), 52-57. Retrieved from ERIC database. (EJ941379)

Hall, G. E., & Hord, S. M. (2015). *Implementing change: Patterns, principles and potholes* (4th ed). Upper Saddle River, NJ: Pearson.

Hargreaves, A., Lieberman, A., Fullan, M., & Hopkins, D. W. (Eds.). (2014). *International handbook of educational change: Part 2. Volume 5*. New York, NY: Springer.

Haug, C. A., & Sands, D. I. (2013). Laboratory approach to secondary teacher professional development: Impacting teacher behavior and student engagement. *Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *86*(6), 197-206. doi:10.1080/00098655.2013.826484

Hord, S. (2007). What is a PLC? *Southwest Educational Development Laboratory Letter, 19*(1), 3-5. Retrieved from http://www.sedl.org/pubs/sedl-letter/v19n01/what-is-a-plc.html

Ibrahim, T., & Benrimoh, D. (2016). *Tools and guidelines for position and policy paper development*. McGill University.

Jita, L. C., & Mokhele, M. L. (2014). When teacher clusters work: selected experiences of South African teachers with the cluster approach to professional development. *South African Journal of Education, 34*(2). doi:10.15700/201412071132

Johnson, D. P. (2005). *Sustaining change in schools: How to overcome differences and focus on quality*. Alexandria, VA: ASCD.

Johnson, J., Hall, J., Greene, J. C., & Ahn, J. (2013). Exploring alternative approaches for presenting evaluation results. *American Journal of Evaluation, 34*(4), 486-503. doi:10.1177/1098214013492995

Jones, C. M., & Thessin, R. A. (2015). A review of the literature related to the change process schools undergo to sustain PLCs. *Planning and Changing*, *46*(1/2), 193-211. Retrieved from ERIC database. (EJ1146267)

Koellner, K., & Jacobs, J. (2015). Distinguishing models of professional development: The case of an adaptive model's impact on teachers' knowledge, instruction, and student achievement. *Journal of Teacher Education*, *66*(1), 51-67. doi:10.1177/0022487114549599

Learning Forward. (2014a). *Standards for professional leadership: Leadership*. Retrieved from http://learningforward.org/standards/leadership#.UnZlLRBGYQc

Learning Forward. (2014b). *Standards for professional learning*. Retrieved from http://learningforward.org/standards

Loucks, S. F., & Hall, G. E. (1977). Assessing and facilitating the implementation of innovations: A new approach. *Educational technology, 17*(2), 18-21.

Loucks, S. F., Hall, G. E., & Newlove, B. W. (1975). *Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters*. Austin, TX: University of Texas.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Moss, C. M., & Brookhart, S. M. (2015). *Formative classroom walkthroughs: How principals and teachers collaborate to raise student achievement*. Alexandria, VA: ASCD.

Owens, M. A., Pogodzinski, B., & Hill, W. E. (2016). Job-embedded professional development policy in Michigan: can it be successful? *Professional Development in Education*, *42*(2), 201-217. doi:10.1080/19415257.2014.980008

Roach, A. T., Kratochwill, T. R., & Frank, J. L. (2009). School-based consultants as change facilitators: adaptation of the concerns-based adoption model (CBAM) to support the implementation of research-based practices. *Journal of Educational and Psychological Consultation, 19*(4), 300-320. doi:10.1080/10474410802463304

Roseler, K., & Dentzau, M. W. (2013). Teacher professional development: A different perspective. *Cultural Studies of Science Education, 8*(3), 619-622. doi:10.1007/s11422-013-9493-8

Shakman, K., & Rodriguez, S. M. (2015). *Logic models for program design, implementation, and evaluation: Workshop toolkit* (REL 2015-057). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast & Islands. Retrieved from ERIC database. (ED556231)

Shawer, S. F. (2013). Accreditation and standards-driven program evaluation: Implications for program quality assurance and stakeholder professional development. *Quality & Quantity, 47*, 2883-2913. doi:10.1007/s11135-012-9696-1

Shulha, L. M., Caruthers, F. A., & Hopson, R. K. (2010). *The program evaluation standards: A guide for evaluators and evaluation users*. Thousand Oaks, CA: Sage.

Shurr, J., Hirth, M., Jasper, A., McCollow, M., & Heroux, J. (2014). Another tool in the belt: Self-directed professional learning for teachers of students with moderate and severe disabilities. *Physical Disabilities: Education and Related Services, 33*(1), 17-38. doi:10.14434/pders.v33i1.4855

Smith, J. S. (2017). *A qualitative inquiry of elementary co-teachers' perceptions of professional development for co-teaching* (Doctoral dissertation). Retrieved from ERIC database. (ED580081)

Smith, M. L., & Ory, M. G. (2014). Measuring success*:* Evaluation article types for the public health education and promotion section of frontiers in public health*. Frontiers in Public Health, 2,* 111. doi:10.3389/fpubh.2014.00111

Spaulding, D. T. (2014). *Program evaluation in practice: Core concepts and examples for discussion and analysis* (2nd ed.). San Francisco, CA: John Wiley & Sons.

Tam, A. C. F. (2015). The role of a professional learning community in teacher change: A perspective from beliefs and practices. *Teachers and Teaching*, *21*(1), 22-43. doi:10.1080/13540602.2014.928122

Texas Education Agency. (2013). *Academic excellence indicator system*. Retrieved from http://ritter.tea.state.tx.us/perfreport/aeis/index.html

Thomas, L. (2013). 10 good ways to ensure bad professional development. *Journal of Staff Development, 34*(4), 60-61. Retrieved from ERIC database. (EJ1026261)

Wells, C. M., & Feun, L. (2013). Educational change and professional learning communities: A study of two districts. *Journal of Educational Change*, *14*(2), 233-257. doi:10.1007/s10833-012-9202-5

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.