THE IMPACT OF TEACHER PARTICIPATION IN PROFESSIONAL LEARNING COMMUNITIES ON TEACHER PRACTICES AND STUDENT LEARNING

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Dedication

This study is dedicated to my family as they have meant so much to my personal and professional journey. They have been and continue to be my "why."

My parents were my first teachers and have dedicated their lives to the education of others. Early on in life they instilled in me the fact that "your education is something that no one can take from you." I draw strength and persistence from their example and love.

My children, Kyle and Eric, are a source of great joy and pride. They have grown into tremendous adults. Thank you for your patience with me throughout this process. I want to be a better father and person because of you!

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Abstract

Professional learning communities (PLCs) are in their fifth year of implementation at Avon Grove High School. DuFour et al. (2010) define a professional learning community (PLC) as an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). The purpose of this research is to determine the impact of PLCs on teacher practices and student learning. In order to make this determination, the following research questions were investigated: What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices? When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs? A mixed-methods research approach was used to answer the research questions. The Professional Learning Communities Assessment – Revised was administered twice during the school year, semi-structured interviews were conducted with teachers, and student results on the Classroom Diagnostic Tool (CDT) were collected over the last five years. The analysis of this data suggests that teachers feel their pedagogical practices have expanded and improved, student achievement has seen positive gains in two out of three measured content areas, PLC meeting time during the school day has been a necessary condition for success, and resources are available and necessary to help grow and sustain PLCs in the school.

CHAPTER I

Overview of the Research Study

DuFour et al. (2010) defined a professional learning community (PLC) as an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). As identified by DuFour et al. (2010) there are six necessary elements of the PLC process:

- a focus on learning created by a clear vision, collective commitments, and goal-setting,
- a collaborative culture with a focus on learning for all,
- collective inquiry into best practice and current reality,
- action orientation: learning by doing,
- a commitment to continuous improvement, and
- a results orientation. (p. 11)

A considerable amount of research supports the positive impact the successful implementation of PLCs in school settings has on student learning and the pedagogical practices used by teachers to drive student achievement. For a school district to consider how to best implement PLCs in order to maximize student achievement there must be an understanding of how the PLC process is perceived by teachers, how student learning is impacted, and what conditions are necessary for the successful implementation of the PLC framework.

Background

Four years prior to this study, Avon Grove High School identified the initiation of PLCs within academic content areas as a building goal. The master schedule provided for PLC meeting time at least once per week and PLCs developed norms, identified specific, measurable, achievable, realistic, timely (SMART) goals, and used protocols to answer the four questions of the PLC framework. Those questions are:

1. What is it we want our students to learn?
2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?
3. How will we respond when some of our students do not learn?
4. How will we enrich and extend the learning for students who are already proficient? (DuFour, 2005, p. 15)

Building on this progress, two years prior to the study a building goal was to develop common formative assessments in those PLCs where they had yet to be developed and continue to refine the common assessments in those PLCs where they had been created and implemented. While progress could be identified, the suspension of in-person teaching and learning during the 2019-2020 school year due to the coronavirus pandemic interrupted the work towards that goal.

The implications on teaching and learning due to the ongoing pandemic continued to influence professional development during the 2020-2021 school year. In addition to the interruption of the professional focus on PLC development at Avon Grove High School, the disruption to teaching and learning during the past two school years will drive schools to concentrate on supporting the academic growth of all students to a greater

extent during the year of this study than in previous years. School-wide professional development will be focused on strengthening PLCs while continuing the emphasis on the development and use of common assessments. The focus of this research is to determine the impact of the focus on the PLC framework on the pedagogical practices of teachers and student academic achievement.

Avon Grove High School consists of slightly more than 1,700 students and is located in southeastern Pennsylvania. The student body has a reasonable amount of diversity as slightly more than 26 percent of students are identified as Hispanic, almost 26 percent of students are considered to be economically disadvantaged, and more than five percent of the students are English language learners (Pennsylvania Department of Education, 2018). The understanding of how to best meet the broad needs of the student body is paramount to student success. As the school principal since 2015, I am keenly interested in how the PLC framework can drive student achievement, expand and improve the pedagogical practices of teachers, and create the best conditions for learning.

Capstone Focus

The overall goal of the project was to determine how the PLC framework impacted student achievement and the pedagogical practices of teachers. Were the academic departments within the high school truly using the PLC framework to drive student learning? Did the PLC process consider how to best support learners who were struggling with the acquisition of class content and basic skills while at the same time designing learning experiences for students who already had mastery over the same class content? This action research project would lead to a greater understanding of the structures, resources, and conditions in the PLC framework that contribute to teacher

growth. Finally, the research revealed the need for appropriate and differentiated professional learning experiences based on the data collected through the administration of the Professional Learning Communities Assessment – Revised and semi-structured teacher interviews.

Research Questions

Indicators of effectiveness will be determined based upon the three research questions that have been established for this study:

1. What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?
2. When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?
3. What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

Fiscal Implications

Growth in pedagogical practices and improved student learning are anticipated outcomes from the successful implementation of the PLC framework at Avon Grove High School and this capstone project. Valuable professional development opportunities related to the PLC framework are integral to sustaining and building upon these outcomes. Professional learning needs will be identified through the administration of the Professional Learning Communities Assessment – Revised, responses to the semi-structured interview questions, and analysis of the Classroom Diagnostic Tool (CDT) performance by students. The identified professional learning opportunities could be delivered by an independent organization or by personnel from the Chester County

Intermediate Unit. In this case, there would be a cost associated with the training. In the instance where professional learning topics could be delivered by professional educators within the district, there would be little to no cost associated with the delivery of instruction.

By answering the research questions associated with this action research project, new understandings about the PLC process at Avon Grove High School will be gained. In 2018, interested teachers came together to develop a guide – or handbook – to support every professional employee with the implementation of the PLC framework in all content areas at Avon Grove High School. Another cost will be related to the updating, reprinting, and redistribution of this handbook to educators at the high school.

As with any endeavor there are also indirect costs associated with this capstone project. The PLC framework relies on time in the Avon Grove High School master schedule to allow PLCs to meet during the school day. Furthermore, the ability of all teachers in a PLC to meet during the school day means that the teachers cannot be scheduled for any student supervision or duties during this time. During the meeting time of each PLC these responsibilities will need to fall to building administrators or other teachers in the building.

In addition to providing time in the master schedule for PLCs to meet during the school day, for this project to be successful professional development time needs to be set aside in a purposeful and deliberate manner. By consistently allotting professional development time to the work of PLCs, this could result in other initiatives not being pursued. Or, it could result in the building administration needing to find other time (e.g. faculty meetings) for other initiatives or professional development experiences.

Summary

PLCs guide teachers in working collaboratively to analyze student learning. Prior research shows that the successful implementation of the PLC framework leads to increased student achievement and growth in the effective pedagogical practices used by teachers. The data collected in answering the research questions associated with this project will lead to a greater understanding of the influence PLCs have on the pedagogical practices of teachers, how the challenges and benefits of PLCs impact student achievement, and what structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs.

Chapter II

Review of Literature

The purpose of this study is to examine how a focus on the professional learning community (PLC) framework will impact the pedagogical practices of teachers and student academic achievement in a public high school. The structures, resources, and conditions within the PLC framework that are most favorable for teacher growth will also be investigated. The three research questions that will be investigated to determine the impact of PLCs are as follows: What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices? When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

Avon Grove High School initiated the implementation of the PLC framework in the 2017-2018 school year. During that school year professional learning was focused on defining PLCs, providing an overview of the major concepts and practices related to PLCs, and implementing a common planning time for content area teachers. Professional learning has more recently been dedicated to the development of common assessments and rubrics. While the ongoing pandemic has disrupted teaching and learning and interrupted the professional learning focus on PLC development at Avon Grove High School, the renewed emphasis on PLCs and the impact on both student achievement and teacher practices will be the focus of this action research project. This literature review will focus on the following areas: the history of school reform efforts, PLCs and teacher

collaboration, the characteristics of effective PLCs, teacher perceptions of PLCs, the benefits of PLCs, and the cautions related to PLCs.

History of School Reform Efforts

The focus on greater access to educational opportunities and increased achievement by public school students is not a new concept. The Elementary and Secondary Education Act (ESEA) was passed by the United States Congress in 1965 and increased funding for schools. Last reauthorized in 2015, the act included guides developed to provide accountability across schools and close achievement gaps in math, reading, and writing (Caffey, 2020). Congress enacted the Education Consolidation and Improvement Act (ECIA) in 1981. The purpose of the ECIA was to consolidate federal programs and shift more control back to states and local school boards. A particular emphasis was placed on aiding migratory students, students with special needs, and students experiencing poverty with basic skills in reading and math (Dougherty, 1985).

A Nation at Risk was produced in 1983 by the National Commission on Excellence in Education. This report asserted that America's schools were failing and in need of great reform (National Commission on Excellence in Education, 1983). The report further defined academic content, emphasized more stringent admissions standards at post-secondary schools, and focused on teacher preparation programs (Blake, 2008). The No Child Left Behind Act of 2001 substantially increased accountability standards for schools and measured academic progress for students and various subgroups. States were required to develop rigorous standards and tests to measure student progress towards meeting these standards (Linn et al., 2002). More recently, the Every Student Succeeds Act (ESSA) was signed into legislation by President Obama in 2015. With an

emphasis on preparing students for college and careers, ESSA required high academic standards for all students, prescribed annual assessments to provide information on student progress to educators, caregivers, and communities, and maintained "an expectation that there will be accountability and action to effect positive change in our lowest-performing schools, where groups of students are not making progress, and where graduation rates are low over extended periods of time" (United States Department of Education, n.d., ESSA Highlights section). Legislative actions are only one step towards achieving reform in schools.

School reform literature delineated two broad models for achieving school improvement. One model emphasized the use of scientific or research-based curriculum and instructional methods to improve student growth and achievement. O'Neill (2004) described a decentralized model that focused on preparation for mandated standardized tests and a shift away from the local control of curriculum. In this model, teachers were expected to follow the curriculum and use instructional strategies to prepare students for the mandated test; their purpose is not to determine student needs and individualize curriculum and instruction to meet such needs (O'Neill, 2004). Student growth and achievement tended to be measured through the use of summative assessments developed at the state or federal level.

Another model featured an approach that is characterized by teams of professionals working together within schools. Schmoker (2004, p. 48) shared that improvement in schools:

> starts with a group of teachers who meet regularly as a team to identify essential and valued student learning, develop common formative assessments, analyze

current levels of achievement, set achievement goals and then share and create lessons to improve upon those levels.

Structured collaboration by teachers is the best method for improving pedagogy and influencing student learning. Teachers meeting regularly "to share, refine and assess the impact of lessons and strategies continuously to help increasing numbers of students learn at higher levels" (Schmoker, 2004, p. 48) described the type of collaboration that was to occur.

While the models of school reform are distinct there are commonalities between the two. One commonality is the importance of the classroom teacher in the success of all students. Schmoker (2018) pointed to three fundamental elements that require the skills of a strong educator in the classroom: coherent curriculum, structured lessons, and purposeful reading and writing in all content areas.

A second commonality between the school reform approaches is the emphasis on student outcomes – the identification of performance measures. The planning process needed to start with a focus on learning outcomes and determine what success will look like when students achieve these outcomes (Bradley et al., 2015).

Another commonality of both school reform approaches is the focus on the value of systemic improvement. As systems improve and are aligned the achievement of all students will improve. Leadership development, improvement in teacher practices, and updated legislation all impact the level of systemic reform (Fullan, 2009).

While the importance of the classroom teacher, the emphasis on learning outcomes, and the value of systemic improvement have been identified as commonalities among the two broad models for school improvement, there are differences in these

models as well. While not a comprehensive list, the differences between the model that described a decentralized model that focused on preparation for mandated standardized tests and a shift away from the local control of curriculum (O'Neill, 2004) and Schmoker's (2004) model emphasizing structured teacher collaboration include, respectively:

- a positivist view versus a constructivist view,
- the use of summative assessments versus formative assessments, and
- the importance of external resources versus internal resources.

Positivists, as described by O'Neill (2004, p. 142), believe that "science objectivity is the 'gold standard'" and the use of scientific and research-based practices confirmed through the improvement of scores on standardized tests is a true commitment to learning for all students. Furthermore, the focus on annual test scores will lead to a greater level of proficiency by all learners (O'Neill, 2004). The positivist view aligns with the use of scientific or research-based curriculum and instructional methods to improve student growth and achievement.

Constructivists characterize learning as a process by which students develop and build their own meaning. The teachers' role is not to outline a specific formula or to provide students with facts and answers. Rather, the teacher asks questions and poses problems to lead students to a solution. Finally, students draw upon their prior knowledge and experiences to guide their learning and, eventually, modify their own understanding (Kretchmar, 2021). The constructivist theory of learning can also include the contribution of others to the learning process and the importance of understanding both culture and context (Peppers, 2015). The constructivist view matches the school

reform approach that is characterized by teams of professionals working together within schools.

Summative evaluation is used at or near the conclusion of a teaching unit in order to grade or certify students or evaluate a curriculum (Black & Wiliam, 2003). No Child Left Behind (NCLB) is an example of a reform model that required summative testing of students in certain grade levels on an annual basis. The goal of this legislation and summative assessment strategy was to have all students score at or above predetermined proficiency levels by the end of the 2013-2014 school year. Criticisms of NCLB and the summative evaluation strategy were that the tests did not adequately reflect the curriculum taught in schools and that the feedback provided to students and educators was not helpful in making educational decisions (Zimmerman & Dibenedetto, 2008). The use of summative evaluation strategies matches O'Neill's (2004) focus on using the results of such assessments to measure student growth and achievement.

Formative assessment strategies are used by teachers to provide feedback to students and adjust instruction to meet their specific needs. Formative assessment is often used by teacher teams in professional learning communities or similar models of collaboration. Such strategies are responsive and support the day-to-day learning process (Black & Wiliam, 2003). Reeves (2003) argued that appropriate assessment strategies "can be provided at the school and classroom level throughout the year, accompanied by immediate feedback" (p. 16) followed by the necessary adjustments to teaching strategies. The formative approach involves teachers using multiple assessments in order to support student learning and truly determine if students have met the learning standards. This approach aligns with a collaborative teaching model.

The use of scientific or research-based curriculum and instructional methods to improve student growth and achievement was a requirement of NCLB. Another requirement of NCLB directed the United States Department of Education to create an organization "that would review and evaluate research as a means to assist states and school districts in meeting their obligation to adopt materials that have been demonstrated to be effective" (Edyburn, 2008, p. 60). The What Works Clearinghouse was the result of this directive. Concerns related to this reliance on external methods and resources include a dependence on the "knowledge of experts external to school environments" (Horn, 2004, p. 199) and the possibility that research would be directed towards issues of limited importance to the overall educational community (Horn, 2004).

The opposite approach involves teachers working together on an established set of standards that are taught on a very similar schedule. These teacher teams utilize common assessments to help them provide ongoing feedback to students and make appropriate instructional decisions (Schmoker, 2006). While the use of scientific or research-based materials and resources may be a component of the work done by such teams, the formative assessment process guides the instructional decision-making procedure. Fullan and Miles (1992) emphasized the importance of reform happening locally when they stated, "local implementation by everyday teachers, principals, parents, and students is the only way that change happens" (p. 752). It is important to understand what exactly a professional learning community looks like in definition and practice in order to understand the potential impact on teacher practices and student achievement.

Professional Learning Communities and Teacher Collaboration

There is a close relationship between schools that learn (Senge, 2012) and schools that define themselves as professional learning communities (DuFour, 2010). The purpose of this section of the literature review is to describe that relationship and the characteristics of each. The terms professional learning community and collaborative model can be used interchangeably.

Senge (2012) defined a school that learns as one in which all involved in the system work together toward a commonly understood goal or outcome. Five disciplines can be practiced and leveraged to create organizations that learn. These disciplines - systems thinking, personal mastery, working with mental models, building shared vision, and team learning – provide a great deal of leverage for those who want to foster and build better organizations and communities. Specifically, Senge (2012) defined team learning as "a discipline of practices designed, over time, to get the people on a team thinking and acting together" (p. 115). Learning organizations are characterized by trust, complementary strengths, selflessness, common goals, and the achievement of significant results (Senge, 2006).

Hord (1997) spoke to the value of teachers feeling supported through collaboration and networking with colleagues as it created a greater sense of efficacy. The concept of shared decision-making is a significant factor in planning instruction and sharing feedback. Structured time is provided for teachers to work together around a focus on improved student learning. Other benefits of this collaborative environment included greater teacher morale and a reduction in absenteeism (Hord, 1997).

Such teams are most commonly referred to as professional learning communities (Hord, 1997). There is a great deal of literature that describes the characteristics of these collaborative groups of educators. DuFour et al. (2010) defined a professional learning community as an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). DuFour et al. (2010) identified six elements of the PLC process:

- a focus on learning created by a clear vision, collective commitments, and goal-setting,
- a collaborative culture with a focus on learning for all,
- collective inquiry into best practice and current reality,
- action orientation: learning by doing,
- a commitment to continuous improvement, and
- a results orientation. (p. 11)

All learning organizations make a commitment to the learning of all students. Hord (1997) shared five attributes of learning communities:

- shared and supportive leadership,
- collective creativity,
- shared values and vision,
- supportive conditions, and
- shared personal practice. (p. 15)

While educational reform is focused on improved student outcomes, educators also need an environment where they can share about their practice, take risks, and grow as professionals (Hord, 1997).

DuFour (2004) identified three core principles that define the PLC process and lead to PLCs becoming a sustained part of a school's culture and practice. The first principle - or "big idea" (p. 8) - is to ensure that "all students learn" (p. 8). To achieve this principle, schools must shift from a focus on teaching to a focus on student learning. Schools find themselves asking and continually looking for answers to the following questions:

> What school characteristics and practices have been most successful in helping all students achieve at high levels? How could we adopt those characteristics and practices in our own school? What commitments would we have to make to one another to create such a school? What indicators could we monitor to assess our progress? (DuFour, 2004, p. 8)

Schools that effectively and successfully engage in PLCs are deliberate about how they respond when students are struggling with their learning. The staff in these schools make sure there are strategies in place to guarantee that students receive the support that is needed. Such intervention is characterized by being "systematic, timely, and directive" (DuFour, 2004, p. 8).

DuFour (2004) identified the second core principle as "a culture of collaboration" (p. 9). Such collaboration is much more than a spirit of collegiality, a consensus on school rules, and the formation of committees. PLCs are characterized by:

> a systematic process in which teachers work together to analyze and improve their classroom practice. Teachers work in teams, engaging in an ongoing cycle of questions that promote deep team learning. This process, in turn, leads to higher levels of student achievement. (DuFour, 2004, p. 9)

While the second core principle, effective and successful PLCs cannot last if such a culture does not exist.

This collaborative culture concentrates on the use of frequent formative assessments to analyze the progress of individual students and determine who needs additional time and support. DuFour (2004) described an environment in which educators "make public what has traditionally been private" (p. 9) by deliberately discussing their classroom practice. According to DuFour (2004), educators in a collaborative culture find themselves asking each other, "How will we know when each student has learned?" (p. 9).

DuFour (2004) defined the third core principle as a focus on results. Each teacher on the collaborative team identifies the learning goal, works together so the goal can be achieved, and periodically reviews progress. This focus on results is characterized by the development of common formative assessments. Teachers compare results and work with their colleagues when student learning did not meet the specified goals. An outcome of this process is that "each teacher has access to the ideas, materials, strategies, and talents of the entire team" (DuFour, 2004, p. 10).

The three core principles of a PLC are: ensuring that all students learn, a culture of collaboration, and a focus on results (DuFour, 2004). DuFour et al. (2010) shared four key questions educators use to meet these core principles and achieve a purposeful focus on student learning:

1. What is it we want our students to learn?
2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?

3. How will we respond when some of our students do not learn?
4. How will we enrich and extend the learning for students who are already proficient? (p. 15)

In answering these questions, educators review curriculum standards in order to determine what students must learn during each unit, make decisions about the pace at which instruction is to occur, and individually determine the instructional strategies to be used.

There are similar terms used to describe the work educational professionals engage in with the goal of improved student learning. The concept of professional learning teams (PLTs) most closely mirror the PLC process. PLTs reflect and work collaboratively, examine student learning, and make changes to teaching and learning based on this information (Sather & Hord, 2009). These teams consist of four to six teachers from the same academic department or grade level, although teams can form based on a common instructional interest. PLTs select one or two instructional strategies to use for the year based on their review of student data. They also collaborate to determine how the effectiveness of the strategies will be evaluated. Successful strategies are shared school-wide in an effort to have other staff members adopt the instructional strategies as well (Sather & Hord, 2009).

Whole-faculty study groups (WFSG) were started in 1987 with the purpose of supporting teachers with the implementation of new strategies in their classrooms (Lick et al., 2007). The WFSG process "is a job-embedded, self-directed, student-driven approach to professional development" (Lick et al., 2007, p. 3). The goal of the groups is to improve schools and student achievement through a continuous process of professional

development and learning. Groups are small (approximately three to eight faculty members) and often cross-discipline and cross-grade level. Participation in a WFSG is mandatory. Study groups share responsibility among all members of the group. However, it is possible for each study group to have a different focus (Blankenship & Ruona, 2007). There are five principles that guide the WFSG process:

- students are first,
- everyone participates,
- leadership is shared,
- responsibility is equal, and
- the work is public.

WFSG has been described as a "comprehensive framework for implementing the concept of professional learning communities" (Blankenship & Ruona, 2007, p. 3).

Brown and Duguid (1991) shared that organizations need to see themselves as being made up of many groups. Work, learning, and innovation can come from the informal structures within these "communities of practice" (Brown & Duguid, 1991, p. 40). Compared to PLCs and WFSGs, the communities of practice described by Brown and Duguid are much more informal and membership is voluntary (Blankenship & Ruona, 2007). Not limited to educational organizations, these communities of practice are narrative, collaborative, and socially constructed (Brown & Duguid, 1991).

Offering a slightly different definition of communities of practice, Wenger et al. (2002) explained that "communities of practice are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in the area by interacting on an ongoing basis" (p. 1). Communities of

practice can take place in any type of organization. Wenger et al. (2002) shared that they are often informal and leadership can come from individuals inside or outside of the organization. Knowledge sharing and innovation are valued in these communities of practice (Blankenship & Ruona, 2007).

The critical friends group (CFG) concept is another example of individuals within an organization coming together to influence practice and growth. Franzak (2002) described a CFG as a diverse group of teachers coming together "to prompt and support one another's professional growth" (p. 259). Such groups come together to question, to challenge, to collaborate, and to dialogue around their teaching practice (Carlson, 2019). A typical CFG consists of approximately twelve teachers who meet monthly to discuss their practice and student learning. The group uses protocols to examine student learning, conduct peer observations, and measure student growth (Franzak, 2002).

Supovitz and Christman (2003) used the term communities of instructional practice to refer to teams of teachers working with a specific group of students. One school they studied consisted of teams of three to five teachers working with students over several years. Another school also worked with students over several years, but had a larger number of teachers on the team than the first group. In both cases the researchers found that the structure used did not create an increased instructional focus. Supovitz and Christman (2003) noted that "Practitioners working in communities need ongoing opportunities to reflect on and analyze their teaching as well as strategies that will help them plan, assess, and revise their individual and collaborative efforts" (p. 651).

Characteristics of Effective Professional Learning Communities

Necessary Conditions for Instructional Improvement

A review of research for school reform efforts, as well as collaborative teams, shows that a number of characteristics need to be present in order for instructional improvement to occur. This section will review the literature that identifies the conditions for instructional improvement, the influence of school leadership, the importance of teacher leadership, the usefulness of real and relevant professional learning, and the sustainability of the integration of PLCs into the fabric of the school community.

Senge (2012) maintained that "it is possible to create organizations that learn through the ongoing practice of five 'learning disciplines' for changing the way people think and act together" (p. 5). These five disciplines can be used interconnectedly to create better school organizations and communities. The five disciplines are personal mastery, shared vision, mental models, team learning, and systems thinking. Senge (2012) defines personal mastery as "the practice of developing a coherent image of your personal vision – the results you most want to create in your life – alongside a realistic assessment of the current reality of your life today" (p. 7). All learners – students and adults - in the school community need to be engaged in the learning process in order to develop a commitment to lifelong learning (Thompson et al., 2004). Shared vision involves the coming together of people with a common purpose or goal. Schools with a shared vision have a common understanding of a preferred future expressed in strategies or practices (Senge, 2012). A shared vision must be just that – shared – and not just the idea of a charismatic leader (Thompson et al, 2004). A mental model allows a learner to

"more clearly and honestly define current reality" (Senge, 2012, p. 8). Mental models allow educators to have the fortitude to try new strategies and programs. Similarly, mental models can be obstacles to change in individuals and organizations (Thompson et al., 2004). Team learning relates to the interaction between individuals in the learning process. Not limited to classrooms, this can be cultivated outside of the classroom, inside the classroom, and between other members of the school community (Senge, 2012). The foundation of team learning is the use of "techniques such as dialogue and skillful discussion" (Senge, 2012, p. 8). The fifth discipline, systems thinking, is defined as "a body of knowledge and tools that help us see underlying patterns and how they can be changed" (Thompson et al., 2004, p. 4). Individuals come to understand how variables are related and can be changed within a system or systems. Senge (2012, p. 8) stated, "Systems thinking is a powerful practice for finding the leverage needed to achieve the most constructive change." The successful integration of these five disciplines can be leveraged by all members of the school community in order to grow and recreate schools to best serve students who will be entering "a postindustrial and increasingly connected world" (Senge, 2012, p. 9).

In addition to Senge's description of a learning organization, others offered insight into the necessary conditions for improving classroom instruction through collaborative efforts. Supovitz and Christman (2003) outlined what school leaders and systems can do to support teachers in learning communities to impact instructional outcomes. First, professional learning experiences that emphasize systems and protocols to analyze student learning need to be provided for all educators. While these systems and protocols are essential they will not prove beneficial if teachers are not provided with

"blocks of protected time together in order to engage in conversations about standards for student performance and how their instruction produces the student learning that they find represented in their students' work" (Supovitz & Christman, 2003, p. 7). Second, districts and schools need to provide information about student learning to teachers through access to meaningful student data. Without access to quality data, collaborative teams are missing an essential ingredient to the PLC process. Third, a process needs to be in place to provide feedback to teacher teams to promote a cycle of continuous improvement and identify areas where professional learning can support team growth and development. Supovitz and Christman (2003) also identified two elements essential to the strength of collaborative teams in terms of leadership and scope. In terms of leadership, a team leader should be identified to guide team decision-making and determine team roles and responsibilities. Teams will also benefit from both a horizontal and vertical component. Teams benefit from members teaching at the same grade level (horizontal component) in order to collaborate around the same curriculum with a similar group of students. A vertical component exists when teachers can collaborate around curricular and instructional objectives over several grade levels.

Similar to Senge's (2012) identification of disciplines in learning organizations, Huffman et al. (2001) described characteristics that are foundational to a school's readiness to become a professional learning community. The themes of "proactive principal and teacher leadership, purposeful decision making, and job-embedded professional development" (Huffman et al., 2001, p. 454) were identified by schools and teachers. School leaders were purposeful in building a context for PLCs in schools and formed a culture of collaboration by producing structures for such teams. Teachers in

these schools were actively involved in decision-making about curriculum, instruction, and improvement planning. As Supovitz and Christman (2003) found in their work, principals in schools identified as having the elements to work as effective PLCs reorganized time in the school day to allow teachers time to collaborate about student learning. Principals were careful to give support to teachers by providing appropriate instructional materials and even placing certain classrooms near one another to allow teachers to capitalize on collaborative opportunities. Teachers and principals in these schools worked together to identify programs that met the school's vision and helped teachers increase their effectiveness. Consequently, professional learning tended to focus around student learning and was led by educators within the school. This professional learning took the shape of formal training sessions, coaching relationships, and group studies (Huffman et al., 2001).

Influence of School Leadership

School leaders need to take an active role in establishing and sustaining learning communities. Whether through the development of a shared vision (Senge, 2012), the "provision of time and resources" (Supovitz & Christman, 2003, p. 7), or the implementation of professional learning (Huffman et al., 2001), effective school leadership is foundational to effective PLCs. Thompson et al. (2004) described a school leader who develops a strong learning organization (Senge, 2012) as one who provides job-embedded professional learning opportunities based on teacher feedback and input. Such a learning organization is also characterized by a team decision-making model where all stakeholders have the opportunity to play a role. A leader who "understands and encourages the five disciplines, along with data informed decisions, relationships,

and risk taking" (Thompson et al., 2004, p. 12) is one who creates a learning organization that positively impacts student outcomes.

Grissom et al. (2021) shared similar insight about principal leadership. To support student learning, school principals must understand high-quality instruction, be able to evaluate the extent to which it can be observed in a school, and provide actionable feedback to teachers. To support high-quality instruction, principals must understand adult learning and provide "high-impact professional development offerings" (p. 54). Professional learning that creates and sustains PLCs needs to be prioritized. To support and foster productive collaboration, principals must be able to provide teachers with data about student learning and growth. As with Senge's (2012) discipline of shared vision, Grissom et al. (2021) identified the cultivation of a shared sense of responsibility by principals when teachers were provided with time to collaborate, access to data in order to analyze student learning, and the ability to make decisions about curriculum, instruction, and assessment practices.

Fullan et al. (2014) validated the importance of the school principal in improving student learning through the PLC process. Teachers working together in "purposeful ways" (Fullan et al., 2014, p. 65) over time can produce improvement in student learning. The school principal is integral in making this practice explicit and creating the link to student learning. If the school principal is unable to make this link then a PLC will fail. The way the school principal creates this link is through providing professional learning experiences that allow teachers to analyze learning data in order to meet the individual learning needs of students (Fullan et al., 2014).

Importance of Teacher Leadership

The importance of the teacher as the heart of any school improvement process – whether PLCs or any other type of reform – is obvious. Teachers often are the first to recognize the change that is needed and can identify what is necessary to improve student learning outcomes. Shared leadership allows teachers to see greater meaning in the work of PLCs (Wilson, 2016). Teacher leaders are able to support collaboration and "are the backbone of a purposeful and sustainable professional learning plan" (McBrayer et al., 2018, p. 32). When teacher leaders are trusted with facilitating the PLC process and professional learning experiences, teacher buy-in and ownership of the process then leads to "purposeful and sustainable" (McBrayer et al., 2018, p. 42) PLCs. Teacher leaders are further supported when school leaders are transparent with the entire school about the purpose of the work of such leaders within PLCs (Wilson, 2016). This teacher leadership is further entrenched in the culture of the school and in PLCs as teachers identify their expertise in school improvement and increasingly share their instructional practices (Berry et al., 2005).

Professional Development and Adult Learning

Professional learning is integral to the development of a learning organization particularly as it can lead to greater personal mastery, shared vision, mental models, team learning, and systems thinking (Senge, 2012). Schools have used a variety of methods to contribute to professional learning with mixed results. Westover (2009) described that effective professional learning experiences for adult learners involve a needs assessment, and consider "motivation, reinforcement, retention, transference, and evaluation" (p. 436). Educators are more likely to participate in professional learning when they can see

the value of the learning on their practices and student experiences in their classrooms. Similarly, if a professional learning experience is developed specifically to help provide solutions for a current problem, educator motivation to participate will be increased. While educators have not always given positive feedback on workshops, this model of professional learning is effective when research-based practices are shared, the participants take an active role in the learning, and teachers are given the opportunity to apply the learning to their own settings (Guskey & Yoon, 2009). Professional learning experiences need to be consistent and consider the prior knowledge of the adult learner (Westover, 2009). Guskey and Yoon (2009) reinforced this idea of consistent follow up on professional learning experiences and stated positive improvements occur in student learning when such experiences are both structured and sustained over a significant amount of time. Analysis shows that at least 30 or more contact hours – hours spent specifically focused on content or instructional improvement in an organized and purposeful manner - are critical to the success of a professional learning initiative or program (Guskey & Yoon, 2009).

Sustainability of Effective PLCs

In order to sustain the PLC process at an effective level, it needs to become part of the culture of the school (Hipp et al., 2008; Roy & Hord, 2006; Willis & Templeton, 2017) and be supported at a high level by school leadership (Hargreaves & Fink, 2004; Hipp et al., 2008; Raywid, 1993; Roy & Hord, 2006; Willis & Templeton, 2017).

Sustainable and effective PLCs are characterized by a transparency of practice as educators review lessons with one another, provide feedback, and continually seek to learn more about the progress of their students. A sustainable PLC process requires

teachers to share openly with one another, ask for support from colleagues, and observe teacher practices throughout the school (Roy & Hord, 2006). As schools develop and embed a shared vision (Senge, 2012), a shared experience and common language develops and leads to collective learning through the PLC process (Hipp et al., 2008). In such an environment, conflict over ideas and philosophies is inevitable. Members of a sustainable PLC are able to manage and resolve conflicts over educational philosophy, school and student learning goals, and improvement strategies (Roy & Hord, 2006). Trust among PLC members is paramount to this process. Furthermore, the element of trust needs to exist throughout the learning organization. Principals identify the ability to trust teachers as foundational to the PLC process. Principals need to trust that teachers will fulfill their responsibilities inside and outside of the classroom. Teachers also identify that principals need to listen to teacher input and feedback as this practice leads to feelings of mutual respect and value (Willis & Templeton, 2017). The culture of a school is not static but is continually changing over time. The school culture impacts the sustainability of PLCs as the established norms, values, and relationships influence the PLC process. The establishment of the PLC process becomes rooted in school culture and becomes a guide for strategies, goals, and outcomes (Hipp et al., 2008).

In addition to the establishment of a trusting culture throughout the school, sustainable PLCs are characterized by supportive and shared leadership (Roy & Hord, 2006). Supovitz and Christman (2003) identified that school leaders who provide structures, strategies, and supports positively influence the sustainability of PLCs. Structures are identified as practices that protect time and create conditions that lead to collaboration and involvement. School leaders must share strategies and techniques that

link instruction and student performance. Supports include job-embedded professional learning that improves instruction and equips teachers with impactful skills (Hipp et al., 2008). The concept of shared leadership includes teachers in the facilitation of the PLC process. Mutual trust is a hallmark of shared leadership in that school principals trust teachers in their PLC work and teachers trust principals in their leadership of the school. Mutual trust creates buy-in from teachers as well (Willis & Templeton, 2017).

Sustainability of leadership is also important as a school strives to become a PLC and is a key factor in long-term change (Hargreaves & Fink, 2004). The school leader is a driving factor in continuous improvement. Principals who "maintain learning and growth over time embrace change and provide supports for staff and students throughout the change process" (Hipp et al., 2008, p. 176). Willis and Templeton (2017) found that some school leaders believe "that consistent leadership was the most important element to the sustainability of PLCs" (p. 34).

Sustainable and effective PLCs have time built-in to the school day so teachers can focus on student learning, analyze data, and review the results of their instruction (DuFour et al., 2010). Raywid (1993) noted that the time provided for this important work must be part of the school day and must occur for a sustained interval – it cannot be divided or interrupted by teacher duties or related tasks. The allotted time must be adequate enough to provide the opportunity for reflection, the identification of corrective action when necessary, and the ability to respond to new decisions. Teachers and school leaders share agreement about the importance of time to collaborate around student learning. Principals must find and create time in the schedule in order for PLCs to be effective and sustainable (Willis & Templeton, 2017).

Teacher Perceptions of PLCs

As described previously, there is a close connection between the definition of a learning organization (Senge, 2012) and a professional learning community (DuFour, 2004). A professional learning community is defined as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (DuFour et al., 2010, p. 11). As introduced earlier in this review, DuFour et al. (2010) identify six elements of the PLC process:

- a focus on learning created by a clear vision, collective commitments, and goal-setting,
- a collaborative culture with a focus on learning for all,
- collective inquiry into best practice and current reality,
- action orientation: learning by doing,
- a commitment to continuous improvement, and
- a results orientation. (p. 11)

Senge (2012) define a learning organization as one in which all involved in the system work together toward a commonly understood goal or outcome. Five disciplines are practiced and leveraged to create organizations that learn. These disciplines - systems thinking, personal mastery, working with mental models, building shared vision, and team learning – provide a great deal of leverage for those who want to foster and build better organizations and communities (Senge, 2012).

Research suggests that teachers generally perceive involvement in PLCs to address the six elements of a PLC (DuFour et al., 2010) and the disciplines involved in

learning organizations (Senge, 2012). Teachers report an increase in collegiality and a greater shared learning environment when engaging in a learning community. Professional dialogue increased and job-embedded professional learning occurs in a more consistent manner. Teachers also shared that active engagement in PLCs led to greater professional knowledge and the ability to achieve greater student outcomes (Peppers, 2015). Stollar (2014) noted that teachers had a positive perception of PLC implementation in the sense that the process created a common language, vision, and goals around student outcomes and learning, increased feelings of teacher effectiveness, and made the use of data for instructional decision-making a more common practice. Stollar (2014) also explained that teachers felt a greater level of trust with their colleagues. Teachers also perceive that collective responsibility and shared decision-making in the PLC process is correlated with the involvement of the school leader in creating a shared vision and purpose (Davis, 2017).

As teachers report a greater sense of effectiveness, increased collaboration, and collective responsibility, they also report a greater confidence in their capability to positively impact student learning. This effect, defined as collective efficacy, fosters a greater commitment to student learning (Goddard et al., 2004). Collective efficacy has been identified to be one of the most powerful predictors of student success (Donohoo et al., 2018).

Benefits of PLCs

Vescio et al. (2008) conducted a comprehensive review of the literature to examine the impact of PLCs on teacher practice and student learning. The following questions guided their research:

1. In what ways does teaching practice change as a result of participation in a PLC? What aspects of the PLCs support these changes?
2. Does the literature support the assumption that student learning increases when teachers participate in a PLC? And, what aspects of the PLCs support increased student learning? (Vescio et al., 2008, p. 81)

In this review, it was concluded that instructional practices of teachers became more student-centered over time. Teachers utilized more flexible student groupings and adjusted the pace of instruction in order to accommodate the varying needs of students. Staff members are more likely to identify where students are struggling and prioritize intervention strategies (Roy & Hord, 2006). The presence of PLCs in schools has been shown to increase the social support for greater achievement while also increasing the use of higher ordering thinking and depth of knowledge observed in classrooms (Louis & Marks, 1998). Strahan (2003) described in a case study analysis that teachers reported a change in attitude regarding student learning and a greater receptiveness by teachers to be more transparent about their instructional practices. Another positive change to teacher practice is the sense of a greater authority by teachers in making decisions around curriculum, instructional strategies, and methods of assessment (Vescio et al., 2008). Supovitz and Christman (2003) found that giving teachers the power to be decision makers in the learning process was integral to achieving greater student learning outcomes. Another element of PLCs that impact the overall school culture is the participation in continuous learning (Vescio et al., 2008). Vescio et al. (2008) indicated that “participation in learning communities facilitates professional development that is

driven by the needs of teachers as they are naturally engaged in efforts to accomplish their goals" (p. 86).

Berry et al. (2005) described the evidence of the impact on student achievement in an elementary school over a 4-year period. Assessment results from this school indicate that just more than 50% of students were at or above grade level at the onset of the case study. After four years of PLC implementation, greater than 80% of students were reported to be at or above grade level (Berry et al., 2005). Further evidence of student learning growth can be found in a comparison between elementary-aged students in a district where a target school implemented PLCs and another school did not. Hollins et al. (2004) reported an increase of 28% of second-grade students that scored above the 25th percentile on a state assessment in the target school over a two-year period. The other school in the district only reported a 12% increase over the same period of time. Similar results were reported by third-grade students in the target school (Hollins et al., 2004). Supovitz and Christman (2003) cited evidence that "those communities that did engage in structured, sustained, and supported instructional discussions and that investigated the relationships between instructional practices and student work produced significant gains in student learning" (p. 5) in the two sites they studied. Specifically, it was noted that student literacy gains were evident. To achieve such growth, teachers implemented learning centers and provided targeted assistance to all students. Professional learning occurred within the PLC structure along with creating a shared purpose among the teachers (Supovitz & Christman, 2003). To summarize, participation in PLCs is shown to impact teaching practice as instruction becomes more student-centered over time. Increased collaboration, greater teacher authority, an intense focus

on student learning, and professional learning experiences positively influence the school culture. Students are also impacted as an improvement in student achievement can be linked to the focus on student learning and growth in the PLC process (Vescio et al., 2008).

Professional learning communities provide teachers with the opportunity to discuss learning as it applies to specific academic content areas. Teachers share lesson plans, discuss instructional strategies, and engage in curriculum writing. In one school, teachers reported growth in curriculum writing and professional development opportunities. It was also shared that there was greater alignment in the curriculum since the teachers had been meeting weekly (Battersby & Verdi, 2015).

Cautions Related to PLCs

While positive impacts in teacher practices and student outcomes can be identified in the literature, the implementation of the PLC process does have challenges and obstacles of which to be aware. While a learning organization is defined by personal mastery, shared vision, the development of mental models, team learning, and systems thinking (Senge, 2012), conflict can exist at any point and at any place in the organization.

Achinstein (2002) defined conflict as "a situation and an ongoing process… whereby individuals or groups come to sense that there is a difference, problem, or dilemma and thus begin to identify the nature of their differences of belief or action" (p. 425). Conflict over ideas and information is not to be avoided. A learning organization needs to be able to manage and navigate conflicts of philosophies, goals, and strategies (Roy & Hord, 2006). Simply working towards a collaborative culture can naturally lead

to conflict. The practice of reflection may reveal differing philosophies and values which could result in ongoing conflicts (Achinstein, 2002). A clear challenge in collaborative work is the idea of conflict. PLC members need to engage in transparent and honest discussions and not allow these discussions to elicit tension between group members (Dooner et al., 2008).

Conflict can also be created when borders are defined within the PLC – some members are considered to be insiders while other members are considered to be outsiders. This process can lead to a definition of opposing groups or ideas. Conversely, this type of conflict can lead to an expansion of ideas or the consideration of alternative philosophies by group members. How the PLC responds to this type of conflict often dictates if the conflict builds or inhibits the development of the collaborative team (Achinstein, 2002). More research needs to be undertaken in order to fully comprehend the challenges associated with starting PLCs (Dooner et al., 2008).

Another caution related to the implementation of PLCs is the thought that the process can lead to a positivist approach to reform (Servage, 2009). Positivists believe in the use of scientific and research-based practices confirmed through the improvement of scores on standardized tests is a true commitment to learning for all students (O'Neill, 2004). PLCs emphasize three core principles or ideas:

- a focus on student learning,
- a culture of collaboration, and
- a focus on results (DuFour, 2004, p. 8).

DuFour et al. (2005) also shared four key questions educators use to meet these core principles and achieve a purposeful focus on student learning:

1. What is it we want our students to learn?
2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?
3. How will we respond when some of our students do not learn?
4. How will we enrich and extend the learning for students who are already proficient? (p. 15)

While the focus on the three core principles and the responses to the four questions maximize the efficiency of the PLC process and create evidence of work, this can be viewed by educators as too limiting and not trusting teachers to engage in work on the behalf of students without this level of structure (Servage, 2009). Peppers (2015) shared that this process can stifle teacher creativity. The concern becomes that educators will reject this approach and the PLC process due to the focus on standardization of "assessments, reporting practices, intervention protocols, and pedagogical best practices" (Servage, 2009, p. 164). Teachers are also sensitive to the time that meetings take in the PLC process which can take away from time to plan for instruction and to intervene with struggling students (Peppers, 2015).

Another caution has been identified with implementing PLCs in the academic department structure of American high schools. Talbert and McLaughlin (1994) described that the traditional culture sometimes developed in the department structure makes it hard for teachers to consider alternative ways to support the academic growth of students. The beliefs teachers hold about the ability of all students to learn can help to facilitate the PLC process or "actively undermine" (Talbert & McLaughlin, 1994, p. 140) the implementation of PLCs. High school departments vary greatly in their culture and,

consequently, the successful implementation of PLCs can be inconsistent. Those departments which embrace traditional instructional practices and have differing philosophies on the ability of all students to learn often find that their thinking interferes with a "commitment to meeting the needs of growing proportions of nontraditional students who are often unprepared to learn" (Talbert & McLaughlin, 1994, p. 143).

As schools of all sizes consider implementing the PLC process, there is a question about how to meet the collaboration needs of those teachers who are the only teacher of a specific subject (Hansen, 2015) in the school. Similarly, a teacher could teach multiple grades or a number of different courses which limit time for or the ability to participate in collaboration (Willis & Templeton, 2017). In these cases, it can be commonplace for educators in these situations to be excluded from the PLC process. Naturally, these teachers tend to become resistant to the implementation of PLCs in the organization (Hansen, 2015). Or, these educators are placed in learning communities that are tailored to teachers of other subjects. Such an approach is a missed opportunity for teacher development (Battersby & Verdi, 2015).

Summary

As long as schools have existed, there has been a focus on improving student outcomes. Hallmarks of reform efforts in the United States of America include the Elementary and Secondary Education Act, No Child Left Behind, and the Every Student Succeeds Act. *A Nation at Risk* asserted that America's schools were failing and in need of great reform (National Commission on Excellence in Education, 1983). Over time both a positivist model of reform, characterized by the use of scientific and research-based practices confirmed through the improvement of scores on standardized tests, and a

constructivist model of reform, defined as a process by which learners develop and build their own meaning, have been general approaches to improving student learning outcomes.

Teams of teachers, defined as professional learning communities, have taken a constructivist approach to school reform by ensuring that all students learn, creating a culture of collaboration, and focusing on results (DuFour, 2004). When implemented, facilitated, and grown effectively PLCs have created the elements found in a successful learning organization (Senge, 2006). Huffman et al. (2001) included the components of supportive school leadership, shared decision-making, and authentic professional development as conditions that improve instruction and student outcomes in schools. Successful PLCs have supportive structures such as time in the school day for collaboration, consider trust as a characteristic of their collaborative teams, and are transparent about their instruction and the corresponding impact on student learning.

When such components are evident within PLCs and are a part of the overall school culture, student experiences are prioritized in the learning environment. Trust and transparency among the members of the PLC leads to an identification of successful instructional strategies and a positive impact on student learning. Furthermore, educators in the learning organization are able to identify the structures, resources, and conditions necessary in PLCs that lead to favorable teacher and student growth.

CHAPTER III

Methodology

This chapter will describe the surveys, interviews, and data used in this mixed-methods research study to answer research questions related to the professional learning community (PLC) framework being utilized in a large public high school. Included in the chapter is an explanation of the research setting and a description of those who participated in the study.

Purpose of the Study

The purpose of this study is to determine how the focus on the professional learning community (PLC) framework impacts both the pedagogical practices of teachers and student academic achievement. The structures, resources, and conditions within the PLC framework that are most favorable for teacher growth will also be investigated. The results of this study will be shared with professional educators in the school, district level administrators responsible for teaching and learning, and building level administrators in other schools within the district. The outcomes of this study will aid in strengthening the PLC framework, positively impacting student academic achievement, and identifying professional learning experiences that will grow and expand the effectiveness of PLCs throughout the school.

The review of literature revealed a significant amount of research that described the characteristics of PLCs. DuFour et al. (2010) defined a professional learning community as an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). Additionally, DuFour et al. (2010) identified six elements of the PLC

process. All learning organizations make a commitment to the learning of all students. Hord (1997) identified five attributes of professional learning communities.
While educational reform is focused on improved student outcomes, educators need an environment where they can share about their practices, take risks, and grow as professionals (Hord, 1997).

DuFour (2004) outlined the three core principles of a PLC as: ensuring that all students learn, a culture of collaboration, and a focus on results. DuFour et al. (2010) shared four key questions educators use to meet these core principles and achieve a purposeful focus on student learning:

1. What is it we want our students to learn?
2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?
3. How will we respond when some of our students do not learn?
4. How will we enrich and extend the learning for students who are already proficient? (p. 15)

In answering these questions, educators review curriculum standards in order to determine what students must learn during each unit, make decisions about the pace at which instruction is to occur, and individually determine the instructional strategies to be used. These elements, attributes, and principles provided the foundation for the implementation of PLCs at Avon Grove High School.

The literature review also outlined the change in teacher practices and impact on student achievement through teacher participation in a PLC. Roy and Hord (2006) shared that school staff members are more likely to identify where students are struggling and

prioritize intervention strategies through PLC involvement. Another change in teacher practice is the greater sense of authority by teachers in making decisions around curriculum, instructional strategies, and methods of assessment (Vescio et al., 2008). Evidence of student learning growth can be found in a comparison between elementary-aged students in a district where a target school implemented PLCs and another school did not. In the target school, Hollins et al. (2004) reported a 28% increase of second-grade students that scored above the 25th percentile on a state assessment over a two-year period. The other school in the district, which did not implement PLCs, only reported a 12% increase over the same period of time. Similar results as those realized by second-grade students were reported by third-grade students in the target school (Hollins et al., 2004).

Research and the literature review done as part of this study supported the use of the PLC framework to grow teacher practices and increase student achievement. Through a shared mission and collective commitment to collaboration and student learning, PLCs provide a framework for continuous improvement. The researcher is interested in learning how teacher practice has changed in a public high school and how student academic achievement has been impacted since the implementation of the PLC framework four years prior to the start of this study. Additionally, the analysis of this information will allow the researcher to describe the structures, resources, and conditions conducive to the successful implementation of PLCs and to identify professional learning experiences to better support teachers and PLCs throughout the school.

Within the PLC framework, structures are identified as practices that protect time and create conditions that lead to collaboration and involvement. Conditions that support

the PLCs include the components of supportive school leadership, shared decision-making, and authentic professional development as conditions that improve instruction and student outcomes in schools (Huffman et al., 2001). Resources can be defined as the provision of timely and authentic professional learning experiences and access to data that will guide instructional decision-making.

Research Questions

The three research questions that will be investigated to determine the impact of PLCs are as follows:

1. What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?
2. When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?
3. What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

Research Setting and Participants

Avon Grove High School is the lone high school in the Avon Grove School District. The school is located in a suburban area in the southeastern region of Pennsylvania. Students who attend the school reside in two boroughs and five surrounding townships. The enrollment consists of 1,743 students in grades nine to twelve. There are 107 classroom teachers in the school. Over 5,000 students are enrolled in the entire school district.

Over 90 classroom teachers completed the survey used as part of this study. Those who completed the survey represented each academic content area in the school.

Follow up interviews were conducted with nine classroom teachers. As with the survey, all academic content areas were represented in this portion of the study. Also included were students who completed the Classroom Diagnostic Tool (CDT) as part of the benchmarking data collected in each class with a year-end Keystone Exam. Those classes are Algebra One, Biology, and tenth grade English/Language Arts. Data from the CDT was collected for the last five school years.

Project History

The implementation of PLCs at this school started formally at the beginning of the 2017-2018 school year. In the previous year (2016-2017) the school's bell schedule was changed and created the opportunity for academic departments to have a common planning time. This time was not available with the bell schedule used prior to the 2016-2017 school year.

First Year of Implementation

The concept of initiating PLCs at the school was identified as a building goal for the 2017-2018 school year. In order to prepare to meet this goal, nine staff members including the principal, assistant principal, teachers, instructional coaches, and a technology specialist traveled to Adlai Stevenson High School in Lincolnshire, Illinois, in May, 2017. The purpose of this trip was to attend a professional learning experience that examined the policies and procedures Adlai Stevenson High School used to support professional learning communities. Dr. Richard P. DuFour, considered a pioneer of PLCs, was principal and superintendent of this school from 1983 to 2002 (Adlai Stevenson High School, n.d.). The group that went to Adlai Stevenson High School met throughout the summer of 2017 in order to consider how to best implement professional

learning communities at Avon Grove High School. This committee continued to meet throughout the 2017-2018 school year to determine goals, identify ongoing professional learning needs, and facilitate professional learning experiences for the faculty and staff of the school.

At the start of the 2017-2018 school year the four questions of the PLC framework were shared to form the foundation of PLC work at the school. Those questions are:

1. What is it we want our students to learn?
2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?
3. How will we respond when some of our students do not learn?
4. How will we enrich and extend the learning for students who are already proficient? (DuFour, 2005, p. 15)

Additionally, in order to support the understanding of the four questions and the PLC framework, school faculty members learned about the six essential characteristics of a PLC (DuFour et al., 2010).

As this was the first time academic departments were working together in a sustained and collaborative manner, each PLC established group norms within the first few weeks of the school year. These norms included commitments to being fully present during team meetings and listening to each other respectfully. Each PLC also developed collective commitments to describe specific behaviors educators would exhibit as members of a PLC. Examples of collective commitments determined by PLCs in the

school included a commitment to use a variety of data sources in making instructional decisions and a commitment to administering common assessments whenever possible.

Working towards a collaborative culture can naturally lead to conflict. Strong teams will recognize this conflict and work to face conflict as a productive struggle. Roy and Hord (2006) noted that a learning organization needs to be able to manage and navigate conflicts of philosophies, goals, and strategies. The development of norms and collective commitments are a proactive step towards productively and appropriately responding to obstacles and challenges. Once determined by each PLC, norms and collective commitments were shared with the school's administrative team.

Each PLC reviewed protocols to keep meetings focused on student learning. Meeting protocols focused on five areas that related to the four questions of the PLC framework. Those areas were further broken down with guiding questions (DuFour et al., 2010). The PLC focus areas and guiding questions were:

1. Reflection
    a. What's working?
    b. What are instructional challenges?
2. What do students need to know and be able to do?
    a. What is the task or instructional focus?
    b. What is the standard or learning target?
    c. What are the instructional strategies?
3. How will we know that they learned it?
    a. How is the task supporting the learning outcome?
    b. What student samples or data are we reviewing?

   c. What is our common formative assessment?

4. What will we do when they haven't learned it?
   a. Which changes in instructional practices do we need to consider?
   b. What Tier 1 academic or behavioral supports shall we consider?
5. What will we do when they already know it?
   a. What instructional practices or academic extensions will we consider to enrich learning?

To further focus the work on student learning, each PLC developed SMART (specific, measurable, attainable, results-based and relevant, and time-bound) goals. Each SMART goal specified what students would be able to do (a specific, measurable action) and what would be the evidence of students reaching that goal. PLCs shared their SMART goals with two other PLCs in order to receive feedback prior to sharing them with the building administrative team.

Early feedback from teachers and academic department chairpersons indicated that PLCs were struggling with determining specific learning targets from curricular standards. In order to address this concern, a professional learning experience was designed by building administrators, instructional coaches, and teachers to support all educators with this work. Teachers who had experience writing curriculum and developing learning targets were asked to model the process of determining learning targets for their peers. Several teacher pairs were identified so the learning groups could be as small as possible to promote the sharing of ideas and a safe environment for inquiry. The following process and guiding questions were used to unpack the standards,

determine the depth of knowledge associated with the standard, and identify performance tasks linked to the standard (Boyles, 2018):

1. Identify the standard.
    a. What would student mastery of this standard look like?
    b. Are there any released items for this standard (SAS, College Board, etc.)?
2. Based on number 1, what is the depth of knowledge (DoK) of this standard?
    a. DoK 1 - What Is “The Knowledge”?
        i. What, who, when, where?
        ii. Acquisition and gathering of knowledge, but does not involve much processing or creation?
        iii. Questions are usually asked in a way to arrive at a correct or incorrect answer?
        iv. Recall or reproduction of a procedure?
    b. DoK 2 - How Can “The Knowledge” Be Used?
        i. Demonstrate and communicate concepts and procedures?
        ii. Students think critically about how they could use the concepts to answer questions or address problems?
        iii. Emphasis is on the application of ideas and concepts, not just the content itself?
    c. DoK 3 - Why Can “The Knowledge” Be Used?
        i. Shift from application to analysis and evaluation?
        ii. Not just how to use a concept or procedure, but why it can/should be used?

iii. Thinking can become more creative and strategic, as well as critique the thinking and points of view of others?

3. Based on number 1 and number 2, what performance task would show mastery of this standard?
4. What would student progress look like (sub-steps) throughout the learning (variety of experiences and DoK)?
    a. What then are the student look-fors on the way to mastery for this standard?
    b. Are these then the learning targets for this standard?

Near the conclusion of the 2017-2018 school year another group of educators and administrators from the school visited Adlai Stevenson High School. While the purpose of this visit was the same as the initial experience – to examine the policies and procedures this school used to support PLCs - a secondary purpose was to gain additional capacity to build, grow, and sustain PLCs in the school.

Through the development of PLC norms and collective commitments, the use of meeting protocols, and the practice of unpacking standards to determine learning targets and performance tasks, a great deal was accomplished in the first year of implementation at the school. Identified priorities for the second year of implementation included the production of a PLC handbook for all educators in the school, further development of common assessments, and the connection of a SMART goal to a student learning objective (SLO). This work was overseen by a group of building administrators, instructional coaches, and district administrators. The team met weekly to plan, facilitate, and assess the professional learning goals and practices of the school.

Second Year of Implementation

Similar to the start of the previous year, all PLCs redeveloped their norms and collective commitments. There were two main reasons for this:

- Most PLCs had new and different team members
- The learning and experience from the first year of implementation may lead to adaptations and adjustments to the norms and collective commitments.

A team of educators representing both groups who had visited Adlai Stevenson High School came together in the summer prior to the start of the school year to develop a resource that would promote common language and a common purpose for the PLC framework throughout the school. This group researched materials, resources, and best practices in order to develop a tool that would be helpful and useful to all educators in the school. This information was put in a binder and provided to each professional staff member at the opening inservice session of the school year. The binders were expected to be taken by professional staff members to each PLC meeting. The following topics were covered in the handbook:

I. Overview
    A. Six essential characteristics of a PLC
    B. Three big ideas
    C. Four essential questions
    D. Team building
    E. Roles and expectations
II. Launching your PLC
    A. Norms

B. Assessing your current reality (PLC self-evaluation rubric)

C. Dealing with consensus and conflict in Your PLC

III. Engaging in the PLC Cycle

A. SMART goals

B. Plan collaboratively (meeting agenda examples)

C. Guaranteed and viable curriculum

D. Common formative assessment (using an assessment calendar)

E. Data analysis (process/protocol examples)

F. Plan and provide intervention and/or enrichment (Multi-tiered Systems of Support)

IV. Reflection and self-evaluation tools

V. Frequently asked questions

SMART goal development was emphasized and planned for each unit of instruction. From the SMART goals, PLCs constructed common formative assessments when possible. A challenge to this process was noted by those PLCs where teachers did not teach the same or similar classes as their colleagues. For example, a single art teacher teaches only ceramics classes while another art teacher teaches only graphic design and digital arts.

Teachers were encouraged to tie their SMART goal and common assessments to the SLO development. A SLO is "the implementation of a long-term academic goal or set of goals created by a teacher or group of teachers using data about students and their learning over a defined period of time" (National Education Association, 2022, What are SLOs? section). In order to support teachers and PLCs with this process, SMART goals

and SLOs were shared with the building administrative team. The building administrative team reviewed both the SMART goals and the SLOs and suggested, when necessary, revisions to one or both.

In the spring of this year another group of professional educators from the school attended a professional learning experience at Adlai Stevenson High School in Lincolnshire, Illinois. Similar to the previous trips, the purpose of this visit and professional learning experience was to examine the policies and procedures this school used to support PLCs and the secondary purpose was to gain additional capacity to build, grow, and sustain PLCs in the school.

Third Year of Implementation

A group of building administrators, instructional coaches, and district administrators met weekly to plan, facilitate, and assess the professional learning goals and practices of the school. The implementation goals for PLCs this year were:

- continued unpacking of curriculum standards to determine learning targets and performance tasks
- continued development of common assessments
- the development of an asynchronous professional learning course focusing on the characteristics of high-performing PLCs.

Inservice time was provided to teachers in the fall of this year to allow them to work together on the continued goals of unpacking curriculum standards and developing common assessments. PLCs were encouraged to use their meeting times to continue this work as the unpacking of standards supports the first question of the PLC framework (What is it we want our students to learn?) and the development of common assessments

supports the response to the second question of the PLC framework (How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential?).

The asynchronous course was developed by the building principal and was required of all professional educators in the school. Participants accessed the course via the learning management system utilized by the school district. The course considered:

- What are the indicators of effective teams?
- What does teacher autonomy look like in a high-performing PLC?
- How do high-functioning teams spend their time?
- What does data collection look like in a high functioning PLC?

In this course, professional educators:

- reviewed research on teacher collaboration,
- considered teacher autonomy as it relates to curriculum, instructional strategies, formative assessment, and summative assessment,
- learned about the practices of high-performing teams,
- described the connection between the four questions of the PLC framework and the use of data.

This course was delivered and completed in the spring of that year.

In summary, the focus of the third year of PLC implementation in the school was a commitment to continuous improvement as identified by DuFour et al. (2010, p. 11). Unfortunately, the progress towards these goals was interrupted by the suspension of in-person learning in the school on March 13, 2020, due to the coronavirus pandemic.

Fourth Year of Implementation

As the coronavirus pandemic continued during the school year, the transitions between virtual, hybrid, and in-person learning were the focus of educators in all schools. PLCs continued to meet during this time. Naturally, the focus was more on adapting to the variety of instructional challenges being faced due the pandemic. However, educators found it helpful to meet with PLC colleagues as this time was still provided as part of the school's daily schedule – regardless of the mode of instruction.

Research Plan

Teams of teachers, defined as professional learning communities, have taken a constructivist approach to school reform by ensuring that all students learn, creating a culture of collaboration, and focusing on results (DuFour, 2004). When implemented, facilitated, and grown effectively PLCs have created the elements found in a successful learning organization (Senge, 2006). Huffman et al. (2001) included the components of supportive school leadership, shared decision-making, and authentic professional development as conditions that improve instruction and student outcomes in schools. Successful PLCs have supportive structures such as time in the school day for collaboration, consider trust as a characteristic of their collaborative teams, and are transparent about their instruction and the corresponding impact on student learning.

PLCs are in their fifth year of implementation at Avon Grove High School. The purpose of this study is to measure the impact of PLCs on teacher pedagogical practices and student achievement. In order to determine the answers to the research questions, participants completed a survey twice during the school year. Some participants also participated in a semi-structured interview. The impact on student achievement was

measured by comparing cohort scores on the Classroom Diagnostic Tool (CDT) for each year of PLC implementation.

The researcher administered the Professional Learning Communities Assessment – Revised (PLCA–R) survey to teachers in October and May during a faculty meeting. The PLCA-R measured staff perceptions of school practices related to six dimensions of a PLC and its related attributes. The survey consisted of statements about practices that can occur in schools. Respondents used a 4-point scale to indicate the extent to which they agree or disagree with each statement.

The PLCA-R reports scores along the following six dimensions:

1. Shared and Supportive Leadership
2. Shared Values and Vision
3. Collective Learning and Application
4. Shared Personal Practice
5. Supportive Conditions-Relationships
6. Supportive Conditions-Structures

A semi-structured interview was conducted with teachers participating in this action research project. Questions in the interview specifically sought to understand the perception of teachers on the impact of PLCs on their pedagogical practices. These interviews were conducted in March.

The Classroom Diagnostic Tool (CDT) was administered to students in courses with end-of-course Keystone Exams. The CDTs are a series of assessments administered in all Algebra 1, Biology, and 10th-grade English/Language Arts classes in order to provide educators with information to guide instruction and identify areas for

intervention or enrichment. The CDTs are administered up to three times per year. These assessments provide quantitative data that measure student achievement and growth over time. These results were compared to the growth of cohorts from the four previous school years in order to determine any change in academic achievement since PLCs have been implemented in this school.

Research Design

This mixed-methods research study used surveys, semi-structured interviews, and student achievement data to answer the following research questions:

1. What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?
2. When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?
3. What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

The mixed-methods approach allowed the researcher to use both quantitative and qualitative data in order to answer these research questions. Quantitative research is used "to investigate a particular topic or activity through the measurement of variables in quantifiable terms" (Mertler, 2019, p. 92). Qualitative research is used "to investigate the quality of a particular topic or activity" (Mertler, 2019, p. 77). The strengths of using a mixed-methods approach include: (a) the possibility to provide more clarity than using only one research methodology, (b) the ability to use both types of data to thoroughly answer the research questions, and (c) the weaknesses present in one type of data can be limited due to the strengths associated with another type of data (Mertler, 2019).

One strategy for collecting quantitative data used in this study was through the administration of the Professional Learning Communities Assessment – Revised (PLCA–R) survey. The PLCA-R is included in Appendix A. The PLCA-R was administered online to research participants twice during the school year. The PLCA-R measures staff perceptions of school practices related to six dimensions of a PLC and its related attributes. The survey consisted of 52 statements about practices that can occur in schools. Respondents used a four-point scale to indicate the extent to which they agree or disagree with each statement.

The PLCA-R provided data to answer research question one (What are teachers' perceptions of PLCs in terms of the impact on their pedagogical practices?) and research question three (What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?). As the PLCA-R is an online survey all collected data is available only to the researcher through a secure server on a password-protected website.

Additional quantitative data was collected by examining the performance of student cohort groups on the Classroom Diagnostic Tool (CDT). The CDT was administered to students in courses with end-of-course Keystone Exams. The CDT are a series of assessments administered in all Algebra One, Biology, and 10th-grade English/Language Arts classes that provide educators with information to guide instruction and identify areas for intervention or enrichment. The CDT are typically administered three times per year. These assessments provided data that measured student achievement and growth over time. The results of the final CDT administration for each student cohort group were compared for the five years of PLC implementation in

the school. The CDT answered research question two: When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? As the CDT is administered in an online format, all collected data is available only to the researcher through a secure server on a password-protected website.

The qualitative portion of this mixed-methods study sought to answer all three research questions: What are teachers' perceptions of PLCs in terms of the impact on their pedagogical practices? When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? What structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs? The interview consisted of seven open-ended questions. The researcher asked additional clarifying questions when necessary in order to promote the understanding of the interviewee's responses. The interview questions were developed by the researcher and reviewed by both the internal committee member and the external committee member. The interview questions are included in Appendix B. Each interview was recorded and transcribed. The transcriptions were reviewed by the researcher and themes in interviewee responses were identified. Table 1 describes the alignment of the research questions, the data collection methods, and the data sources.

Table 1

Alignment of Research Questions, Data Collection Methods, and Data Sources

RESEARCH QUESTIONS	DATA COLLECTION METHOD	DATA SOURCES
What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices? What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?	Quantitative (52 questions), Qualitative (comments from respondents are available for each dimension)	Questions 1 – 52 on the Professional Learning Communities Assessment – Revised (PLCA–R).
When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?	Quantitative	Results from the Classroom Diagnostic Tool (CDT) administered to students in courses with end-of-course Keystone Exams. Five years of results were analyzed.
What are teachers' perceptions of PLCs in terms of the impact on their pedagogical practices? When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? What structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?	Qualitative	Semi-structured interview questions 1 – 7. Additional clarifying questions may be asked to deepen understanding.

Prior to conducting any research, approval was obtained from the California University of Pennsylvania Institutional Review Board. The Avon Grove School District also reviewed and approved the request to conduct research within the school district. The potential participants were each provided with a letter that outlined the purpose of the study, the anticipated level of involvement by research participants, the expectation of

anonymity, the ability to withdraw from the study at any point, and the potential benefits of participating in the study. All potential participants were asked to complete two electronic surveys – a pre-survey in September and a post-survey in April – and to take part in an interview. The electronic communication from the California University of Pennsylvania Institutional Review Board indicating that a request for approval was submitted by the researcher and approved is in Appendix C.

A cost to the researcher associated with this study was the purchase of 100 online versions of the PLCA-R survey. This $200 cost allowed the researcher to administer the PLCA-R to up to 100 participants at the start of the study and at the conclusion of the study. An additional cost was incurred by the researcher through the transcription of the interviews completed as part of the study.

There are also indirect costs associated with this study. The implementation of PLCs relies on time in the school's master schedule to allow PLCs to meet at during the school day. Furthermore, the ability of all teachers in a PLC to meet at during the school day means that the teachers cannot be scheduled for any student supervision or duties during this time. During the meeting time of each PLC these responsibilities fall to substitute teachers, other teachers in the building, and building administrators.

The provision of consistent and purposeful professional learning time is important to the implementation and growth of PLCs. Consistently allotting professional learning time to the work of PLCs can potentially result in other initiatives not being pursued or being provided with an appropriate amount of professional learning. Or, it could result in the building administration needing to find other time (e.g. faculty meetings) for other initiatives or professional development experiences.

Validity

Action research is depended upon to be useful to its intended audience. Mertler (2010) defines this level of usefulness or quality as rigor. In action research, rigor is determined by checking to ensure a lack of bias in results and that the outcomes of the research are representative of only the perspective of the researcher (Stringer, 2007). This action research project included data compiled from two administrations of the Professional Learning Communities Assessment – Revised (PLCA-R), results from the Classroom Diagnostics Tool (CDT) administered over the last five years, and information derived from a semi-structured interview. The collection of data from multiple sources using a variety of methods is referred to as triangulation (Mertler, 2010).

The Professional Learning Community Assessment (PLCA) was developed to assess how classrooms and schools function as PLCs across a variety of dimensions. The initial version of the PLCA was revised in 2010 in order to include more items that allowed for "the collection, interpretation, and use of data in order to focus improvement efforts" (Hipp & Huffman, 2010, p. 37). Subsequently, a revised version of the PLCA, the PLCA-R, has replaced the original PLCA. Hipp and Huffman (2010) describe the following in terms of the internal consistency of the PLCA-R:

> Our most recent analyses of this diagnostic tool has confirmed internal consistency resulting in the following Cronbach Alpha reliability coefficients for factored subscales (n=1209): Shared and Supportive Leadership (.94); Shared Values and Vision (.92); Shared Personal Practice (.87); Supportive Conditions – Relationships (.82); Supportive Conditions – Structures (.88); and a one-factor solution (.97). (Hipp & Huffman, 2010, p. 37)

The PLCA-R asks participants to respond to 52 questions using a four-point scale to indicate the extent to which they agree or disagree with each statement. The PLCA-R allowed the researcher to collect data related to research questions one and three: What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices? What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

Following the first administration of the PLCA-R, the data was reviewed with the participants. In addition to allowing participants to share their thinking about survey results and a connection to desired future professional learning, the researcher was able to assess if the participants felt that the PLCA-R results matched their expectations. According to Mertler (2010), the "rigor of the research is enhanced by allowing participants to verify that various aspects of the research process adequately and accurately represent their beliefs, perspectives, and experiences" (p. 145).

The Classroom Diagnostic Tool (CDT) is a series of online assessments administered in the content areas of Algebra One, Biology, and 10th grade English/Language Arts. The assessment is a computer adaptive test meaning the items adjust to a student's instructional level based on how that student responds to the first few items. The CDT data can be used in conjunction with other data to determine how a student is progressing with acquiring eligible content. According to the Pennsylvania Department of Education website (n.d., Purpose section), since the CDT is "composed of multiple-choice items, the CDT is designed to provide real-time results, ensuring valid and reliable measures of student's skills."

While training is available to educators who may be administering the CDT, it is unknown how many take advantage of this resource. Consequently, it is hard for the researcher to conclude that each administration of the CDT follows best practices for test administration. The procedure for CDT question development is facilitated by the Pennsylvania Department of Education (PDE). A team of teachers participates in a repeated process to produce test questions that are fair and sensitive, are field-tested, and modified as necessary.

The collection of student cohort group CDT scores over the five years that PLCs have been implemented in the school allowed the researcher to analyze data in response to research question number two: When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? Keystone Exams are end-of-course assessments given to students at the end of Algebra 1, Biology, and 10th-grade English/Language Arts classes. The researcher chose not to use this data in response to research question number two as Keystone Exams were not administered to students at the end of the 2019-2020 school year. Thus, there would be a gap in the necessary data.

The qualitative portion of the action research was a semi-structured interview. The interview consisted of 7 open-ended questions developed in conjunction with and reviewed by the researcher's internal committee member and external committee member. The semi-structured format allowed the researcher to ask the same questions to all participants while following up with an additional question or questions depending on the situation. The semi-structured interview consisted of questions that provided responses to research questions one, two, and three: What are teachers' perceptions of

professional learning communities (PLCs) in terms of the impact on their pedagogical practices? When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement? What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs? The data derived from the semi-structured interview has a great degree of generalizability as one can conclude the results can be extended to other public high school settings.

The process of using a variety of instruments, methods, and sources to collect data is referred to as triangulation (Mertler, 2010). The three sources of data utilized in this study – the PLCA-R, the CDT, and semi-structured interviews – allowed for multiple responses to the three research questions of this study. Such triangulation of the data enhanced the findings related to these research questions.

Summary

This mixed-methods research study used surveys, semi-structured interviews, and student achievement data to answer the research questions. The study took place during the fifth year of PLC implementation at Avon Grove High School. Quantitative data was collected through the administration of the PLCA-R to educators in the school. Additional quantitative data was gathered by analyzing the CDT scores of students over the last five years. Qualitative data was gathered through semi-structured interviews conducted with educators in the school. The following chapter will provide a description of the results of this research as well as an interpretation of the findings based on an analysis of the data.

CHAPTER IV

Data Analysis and Results

The purpose of this project was to determine how the PLC framework impacted the pedagogical practices of teachers and student learning. Were the academic departments within the high school truly using the PLC framework to drive student learning? Did the PLC process consider how to best support learners who were struggling with the acquisition of class content and basic skills while at the same time designing learning experiences for students who already had mastery over the same class content? This action research project would lead to a greater understanding of the structures, resources, and conditions in the PLC framework that contribute to teacher growth. Finally, appropriate and differentiated professional learning experiences can be designed based on the data collected through the administration of the Professional Learning Communities Assessment – Revised and semi-structured teacher interviews.

This chapter will describe the data collection methods for this mixed-methods project. The quantitative and qualitative data collected will allow the researcher to answer the research questions listed below.

Research Questions

The research questions that have been established for this study are:

1. What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?
2. When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?

3. What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

Data Analysis

A mixed-methods research design was utilized to collect quantitative and qualitative data in order to respond to each of the research questions. The first quantitative measurement was the administration of the Professional Learning Communities Assessment – Revised (PLCA-R). The PLCA-R was administered to high school educators at the beginning of the 2021-2022 school year and near the conclusion of the 2021-2022 school year. During the first administration in October, 2021, 92 participants completed the PLCA-R and 80 participants completed the PLCA-R in May, 2022.

For the purpose of this study, specific statements from the PLCA-R were selected for analysis due to their relevancy to the research questions. The same statements were analyzed on the first and second administration of the PLCA-R. The strength of agreement was determined by finding the sum of the number of responses indicating either “agree” or “disagree” on each analyzed statement and dividing that number by the total number of responses. The strength of agreement was expressed as a percentage for each statement. Then, the percent change from the first administration to the second administration for each selected statement was measured. Of particular interest to the researcher were those statements with the greatest increase in percent change and the greatest decrease in the percent change from the first administration to the second administration.

The overall results for the two administrations of the PLCA-R are listed in Figure 1.

Figure 1

Overall PLCA-R Results by Dimension and Administration

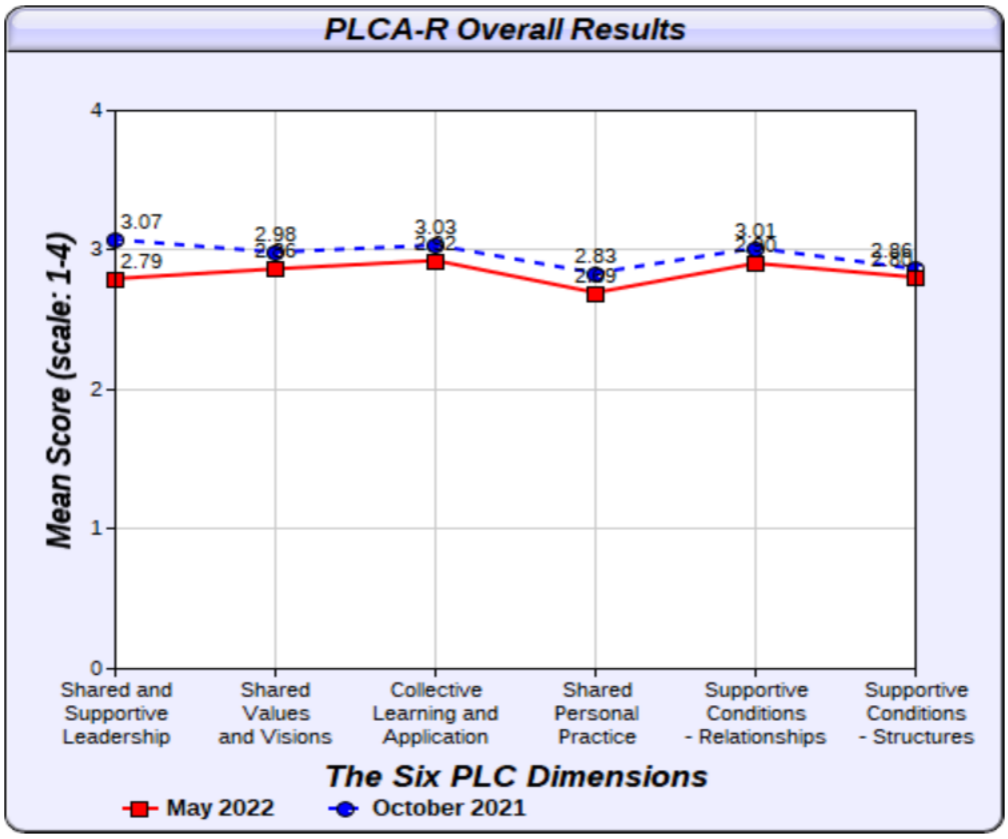


Table 2 describes the mean scores and standard deviations for the six dimensions measured by the PLCA-R.

Table 2

PLCA-R Mean Scores and Standard Deviations by Dimension

Dimension	First Administration		Second Administration	
	Mean	SD	Mean	SD
Shared and Supportive Leadership	3.07	.68	2.79	.67
Shared Values and Visions	2.98	.62	2.86	.60
Collective Learning and Application	3.03	.64	2.92	.59
Shared Personal Practice	2.83	.78	2.69	.72
Supportive Conditions – Relationships	3.01	.68	2.90	.67
Supportive Conditions – Structures	2.86	.73	2.80	.72

A second quantitative measurement involved the collection of student achievement data from the Classroom Diagnostic Tool (CDT). The CDT is administered to high school students as part of the benchmarking data collected in each class with an end-of-course Keystone Exam. Those classes are Algebra One, Biology, and 10th grade English/Language Arts (Literature). Performance data was collected for a five-year period in order to assess student growth. It is important to note that each year of data represented a different cohort of students. The quantitative research methods allowed for a large amount of data to be collected and minimized the researcher's bias. The sample size for the CDT is indicated in Table 3.

Table 3

CDT Sample Size by Year and Content

Content Area	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Algebra	314	305	289	285	262
Biology	480	401	447	292	275
Literature	616	773	726	431	730

Student scores on the CDT are reported as a scale score. For the purpose of this research study, student scale scores from the first year of PLC implementation (2017-2018) were compared with the scale score in each year of PLC implementation concluding with the current year of PLC implementation (2021-2022) for the Algebra, Biology, and Literature CDT. In order to determine if a change in student achievement occurred, an average score on the Algebra, Biology, and Literature CDT was determined and compared for each school year.

Individual interviews were conducted with high school teachers in order to collect qualitative data related to the three research questions. The interview followed a semi-structured format to allow the researcher to follow up on interviewee responses with additional questions when necessary. Nine participants completed an interview.

The researcher recorded and transcribed the responses for each interviewee. Then, the responses to each individual interview question were analyzed in order to identify the common themes expressed through the interview process. The researcher highlighted and categorized the common themes and was able to use this data in

combination with the responses to the statements on the PLCA-R and the student scale scores from 2017-2018 to 2021-2022 on the Algebra, Biology, and Literature CDT.

This study examined three research questions in order to measure the impact of teacher participation in PLCs on teacher practices and student learning. Multiple data sources were included in this study in order to triangulate the data. For the first research question, the change in strength of agreement to statements on the PLCA-R and responses to the semi-structured interview were considered. This allowed the researcher to examine the quantitative data from the PLCA-R and add to this data with the qualitative data compiled from the semi-structured interviews. The change in student scale scores on the Algebra One, Biology, and Literature CDT from the 2017-2018 school year through the 2021-2022 school year were analyzed for research question number two. In order to add to triangulate this data themes identified from specific questions on the semi-structured interview were included in the analysis. Similar to question one, for question three the researcher analyzed the change in strength of agreement to statements on the PLCA-R. Responses to the semi-structured interview and themes identified from the analysis of the responses added to the data considered for research question three.

The mixed-methods approach used in this study enhanced the validity of the research data and findings. Table 4 describes the link between the data collection instruments and the research questions.

Table 4

Link between Data Collection Instruments and Research Questions

RESEARCH QUESTIONS	DATA SOURCES
What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?	PLCA–R, Semi-structured interview
When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?	CDT, Semi-structured interview
What structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?	PLCA-R, Semi-structured interview

Results

Research Question One: What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?

The goal of programs, structures, methods, and processes implemented in any organization is to create a positive outcome. In the case of the implementation of PLCs in the school setting, an indicator of a positive outcome would be the determination of the impact on the pedagogical practices of educators.

One method used to determine teachers' perceptions of PLCs in terms of the impact on their pedagogical practices was the administration of the PLCA-R at the beginning of the school year and at the end of the school year. As previously described, the PLCA-R reports scores in six dimensions.

Pedagogical practices are measured in the Collective Learning and Application dimension and the Shared Personal Practice dimension. Specifically, the following

statements within these dimensions on the PLCA-R assess the impact of PLCs on pedagogical practices:

- Staff members work together to seek knowledge, skills, and strategies and apply this new learning to their work.
- Staff members plan and work together to search for solutions to address diverse student needs.
- A variety of opportunities and structures exist for collective learning through open dialogue.
- Staff members collaboratively analyze multiple sources of data to assess the effectiveness of instructional practices.
- Staff members collaboratively analyze student work to improve teaching and learning.
- Staff members provide feedback to peers related to instructional practices.
- Staff members informally share ideas and suggestions for improving student learning.
- Staff members collaboratively review student work to share and improve instructional practices.
- Individuals and teams have the opportunity to apply learning and share the results of their practices.

Strength of agreement can be determined based on the percentage of respondents who indicated “strongly agree” or “agree” to each statement. The percentage change in the number of participants who indicated “strongly agree” or “agree” to these statements from the first administration of the PLCA-R to the second administration of the PLCA-R

provided one measurement of teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices. The change in strength of agreement for each statement noted above is described in Table 5.

Table 5

Change in Strength of Agreement from First to Second Administration – Pedagogical Practices

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
Staff members work together to seek knowledge, skills, and strategies and apply this new learning to their work.	94.5%	90.1%	-4.4%
Staff members plan and work together to search for solutions to address diverse student needs.	84.7%	90.1%	5.4%
A variety of opportunities and structures exist for collective learning through open dialogue.	70.4%	77.6%	7.2%
Staff members collaboratively analyze multiple sources of data to assess the effectiveness of instructional practices.	74%	75.1%	1.1%
Staff members collaboratively analyze student work to improve teaching and learning.	74%	77.5%	3.5%
Staff members provide feedback to peers related to instructional practices.	60.9%	52.4%	-8.5%
Staff members informally share ideas and suggestions for improving student learning.	96.7%	96.3%	-.4%
Staff members collaboratively review student work to share and improve instructional practices.	59.8%	62.5%	2.7%
Individuals and teams have the opportunity to apply learning and share the results of their practices.	85.8%	82.5%	-3.3%

The strength of agreement described in Table 5 grew for five of the nine statements. The greatest increase in agreement was for the statement indicating that a variety of opportunities and structures exist for collective learning through open dialogue. Those participants indicating either "strongly agree" or "agree" increased by 7.2%. The greatest decrease in agreement from the first administration to the second administration was for the statement indicating that staff members provide feedback to peers related to instructional practices. Those participants indicating either "strongly agree" or "agree" with this statement declined by 8.5%.

The PLCA-R does allow respondents to include comments for each of the six dimensions measured by the survey. Participants did include comments in the "Collective Learning and Application" dimension and the "Shared Personal Practice" dimension that should be explored further. Regarding the analysis of student work to improve teaching and learning a participant shared, "I would have liked a 'somewhat agree' for #30. I feel like this happens sometimes, but often gets pushed to the wayside because of time constraints." Another participant responded similarly by adding:

> While it has been directed, suggested, and discussed for numerous years – there is no sharing of student work among the team. There is no shared evaluating of student samples to ensure common grading practices and then review of student data.

As with the comments shared previously, in terms of the analysis of student work to improve instructional practices, a participant indicated:

> We want to do this more! I am hoping as we have 2 (two) PLC days now we will have more time for this, but am concerned for other departments that 1(one) day out of 8 (eight) is not often enough to be consistent.

Qualitative data related to the first research question was gathered through interviews with teachers in the school. Interview participants were asked, "In regards to your pedagogical practices, do you think they have changed or not based on your PLC involvement? Why or why not? If so, how? Please explain in detail."

Participants unanimously expressed that their pedagogical practices had positively changed based on their PLC involvement during the semi-structured interviews. Specifically, the manner in which student learning data was gathered and analyzed had improved since the implementation of PLCs in the school. Participant nine indicated, "We have common assessments that we look at and it helps me know that I am meeting the standards and targets that I need to. I feel like a lot of our students have very similar experiences." Participant one shared, "We are looking at the data to change our practices within the classroom so we can meet the standards and learning targets." Another interview participant explained that the assessments her colleagues give to their students are "comprehensive and very standardized" which allows for consistent data analysis within the department. This level of analysis has also led the department to offer targeted intervention to small groups of students based on identified learning needs. One interview participant noted that 100% of her students in one class "grew on the second round of the CDT" as a result of a focus on student data.

In addition to the implementation of common assessments and the development of a data culture, interview participants shared the growth in new teaching strategies based

on their PLC involvement. "Collaboration has really allowed us to change some of the things that we do and the way we think about how we are going to instruct the students" was mentioned by participant four. In speaking about the growth of teaching practices and pedagogy, participant seven shared that due to involvement in the PLC process one feels that they are "working from a broader base of knowledge" and have learned about different perspectives and strategies from colleagues.

Research Question Two: When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?

The impact on student achievement was a second question posed as part of this research project. While PLCs are in the fifth year of implementation, has a positive impact on student achievement data been realized during this time period?

To make such a determination student achievement data were collected over a five-year time period on the CDT. The CDT is administered to high school students as part of the benchmarking data collected in each class with an end-of-course Keystone Exam. Those classes are Algebra One, Biology, and 10th grade English/Language Arts (Literature). The assessment includes multiple-choice questions and selected response questions. The CDT provides "a picture or snapshot of how students are performing in relation to the Pennsylvania Assessment Anchors & Eligible Content and Keystone Assessment Anchors & Eligible Content" (PDE, 2022). Scale scores were gathered for this research as scale scores are most useful when comparing scores over time (PDE, 2021). Scale scores on the CDT range from a low scale score of 200 to a high scale score of 2000.

Table 6 shows the data generated from the Algebra One CDT over the last five school years. The average scale score was determined from the final assessment taken by a student during that school year.

Table 6

Algebra One CDT Average Scale Score, Median, Mode, and Range

	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Sample Size	314	305	289	285	262
Average Scale Score	1142	1065	1052	975	1130
Median	1177	1108	1096	1002	1146
Mode	1,186	1176	1225	943	1146
Range	680 - 1408	626 - 1555	547 - 1349	624 - 1326	611 - 1411

The data in Table 6 shows that following the highest average scale score in the 2017-2018 school year (1142) with decreases the next three school years, the 2021-2022 scale score was the highest average scale score year since the first year this data was gathered. It is likely that the average scale score in the 2019-2020 school year was impacted by the interruption to in-person learning initiated on March 13, 2020. Furthermore, it is likely that the average scale score in the 2020-2021 school year was impacted by both the interruption to in-person learning in the 2019-2020 school year and the different mode of teaching and learning incorporated that school year. During the 2020-2021 school year caregivers were able to select if they wanted their children to learn virtually by participating in classes via zoom or by engaging in in-person learning. Classroom teachers taught students engaging in their learning by zoom or in-person at the

same time. The 2021-2022 school year is the first year of full in-person learning since the 2018-2019 school year.

Table 7 shows the data generated from the Biology CDT over the last five school years. The average scale score was determined from the final assessment taken by a student during that school year.

Table 7

Biology CDT Average Scale Score, Median, Mode, and Range

	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Sample Size	480	401	442	292	275
Average Scaled Score	1057	999	983	1017	1042
Median	1072	1016	1008	1036	1046
Mode	1066	984	1052	1034	973
Range	578 - 1389	630 - 1254	611 - 1329	476 - 1337	582 - 1465

Similar to the data attributed to the Algebra One CDT, the data in Table 7 shows that following the highest average scale score in the 2017-2018 school year (1057) with decreases the next three school years, the 2021-2022 scale score was the highest average scale score year since the first year this data was gathered. As with the results on the Algebra One CDT, it is likely that the average scale score in the 2019-2020 school year was impacted by the interruption to in-person learning that school year. It is also likely that the average scale score in the 2020-2021 school year was impacted by both the interruption to in-person learning in the 2019-2020 school year and the hybrid mode of teaching and learning incorporated that school year.

Table 8 shows the data generated from the Literature CDT over the last five school years. As with the Algebra One CDT and the Literature CDT, the average scale score was determined from the final assessment taken by a student during that school year.

Table 8

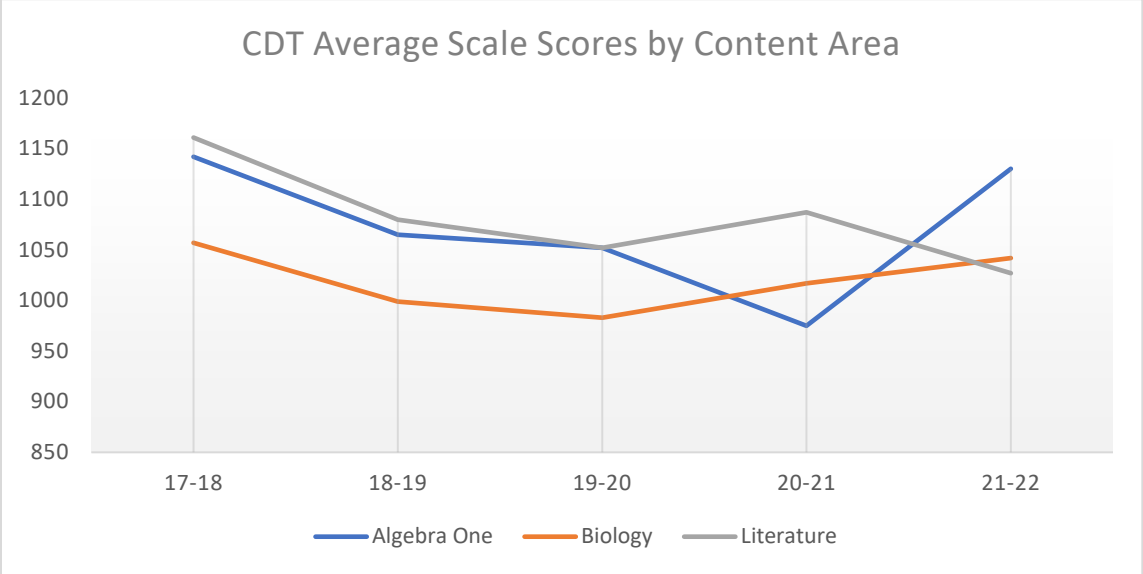
Literature CDT Average Scale Score, Median, Mode, and Range

	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Sample Size	616	773	726	431	730
Average Scaled Score	1161	1080	1052	1087	1027
Median	1153	1101	1075	1118	1056
Mode	1058	1109	1082	1159	1104
Range	1033 - 1435	635 - 1440	617 - 1455	622 - 1409	582 - 1394

The average scale scores by content area for the last five school years are depicted in Figure 2. As described in the details provided above, the highest average scale score for each content area was achieved in the 2017-2018 school year. Both Algebra One and Biology achieved their next highest average scale score in the 2021-2022 school year. Algebra One had the lowest average scale score in the 2020-2021 school year. Biology had the lowest average scale score in the 2019-2020 school year. Both content areas could have feasibly been impacted by the interruption to in-person learning that occurred in the 2019-2020 school year due to the pandemic. However, the lowest average scale score in Literature occurred during the 2021-2022 school year. This may be an area for further research and will be explored in Chapter Five.

Figure 2

Average CDT Scale Scores by Content Area



Qualitative data was collected related to research question two by asking interview participants to respond to the following questions related to student achievement:

- What are the benefits of PLCs and how do those benefits impact student achievement?
- What are the challenges of PLCs and how do these challenges impact student achievement?
- Do you believe that your participation in a PLC has positively impacted the academic achievement of your students? Why or why not?

Several themes can be identified by the responses to these questions. Interview participants described that a benefit of PLCs was the ability to address the first two questions of the PLC framework. Those questions are:

1. What is it we want our students to learn?

2. How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed most essential? (DuFour, 2005, p. 15)

Specifically, one participant shared, "We are really fleshing out what that actually looks like and identifying just what does that mean. How do we know if they actually achieved it so that we can actually see student growth?" Related to measuring student learning, another participant indicated that, through common assessments, the members of the PLC are able to "compare apples to apples instead of apples to oranges." Multiple interview participants described that they have witnessed students experiencing greater success as teachers have expanded their knowledge of impactful instructional strategies due to their PLC involvement.

In terms of the challenges of PLCs and how these challenges impact student achievement, the common themes of mindset and time emerged from the interviews. Difficulties adapting to change, circumstances – whether new or previously existing – that lead PLC members not to trust one another and difficulties when PLC members do not teach the same course were described by the interview participants. Participant six shared, "Humans who do not like change and who do not embrace change for the benefit of the students" was a challenge of PLCs that impacts student achievement. Participant five noted, "I think the challenges can be mindset. I think there are teachers that just do not really understand the purpose of PLCs." Participant four summarized the challenges of PLCs related to mindset by stating, "Sometimes the challenge can be getting everyone on board."

Another challenge identified through the interviews was related to the lack of time in the daily schedule for PLC members to meet. When referring to the lack of time

participant one stated, “I would say it is impacting student achievement. They are not getting the benefits that we could by having more time together. For example, we could use additional time planning together and delving into our common assessments.” Participant four shared, “I am glad that the Chemistry department was able to add a PLC meeting to our cycle. I do not know how other departments are productive meeting once every eight (school) days.” A respondent to the PLCA-R shared “One PLC every week and a half is not enough time to begin to collect and analyze data. Meetings are too spread out to then initiate a plan using the collected data.”

Sharing, discussing, and evaluating student work is a function of PLCs. It can be an obstacle for those departments where PLC members do not teach the same courses to be able to take this step. “That is a big challenge. What do you do when it is not as easy to compare your work with other teachers?” was a concern expressed by participant three. Comments shared by respondents on the PLCA-R also reflected a concern related to evaluating student work by writing, “I am not sure how beneficial it is to see artifacts of students work for students that are not on a teacher's roster.” Another respondent stated, “There is no shared evaluating of student samples to ensure common grading practices.” Greater exploration into this theme will be explored in Chapter Five.

While benefits and challenges of PLCs and their impact on student achievement were identified, interview participants agreed about the positive impact on learning through participation in a PLC.

I have continued to develop summative assessments over the years. Just the other

> day I was discussing formative assessment results with my peers. Because of that discussion my students will now get a better product in class. I think that impacts what they are able to do. (Participant four)

Participant one mentioned, "We can talk about academic growth in PLCs. But the pandemic has taught us that there all so many other factors, too." This teacher also described the academic growth observed in her classes since the pandemic by stating, "I definitely see it – especially more so in the classes where I collaborate with other teachers."

In summary, the quantitative data collected by analyzing the Algebra One, Biology, and Literature CDT results indicated somewhat contradictory information related to positive student achievement. In the 2021-2022 school year, the Algebra One and Biology CDT average student scale scores were the highest since the 2017-2018 school year. However, the average student scale score on the Literature CDT for the 2021-2022 school is the lowest it has been in five years. It is important to consider the further information provided through the teacher interviews in order to fully assess the responses to research question two.

Through the interviews participants indicated agreement that the benefits of PLCs positively impact student achievement. These benefits include the ability to specifically address the first two questions of the PLC framework and learn about impactful instructional strategies from their colleagues. Interview participants also noted that the mindset of team members and the overall lack of time for PLC meetings are challenges to the PLC process and could negatively impact student achievement.

Research Question Three: What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

In order to promote the growth of teachers through their participation in the PLC process, it is important to understand the structures, resources, and conditions that are necessary for such growth. Within the PLC framework, structures are identified as practices that protect time and create conditions that lead to collaboration and involvement. Conditions that support PLCs include the components of supportive school leadership, shared decision-making, and authentic professional development. These conditions improve instruction and student outcomes in schools (Huffman et al., 2001). Resources can be defined as the provision of timely and authentic professional learning experiences and access to data that will guide instructional decision-making.

One method used to determine which structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs was the administration of the PLCA-R at the beginning of the school year and at the end of the school year. As mentioned previously in this chapter, the PLCA-R reports scores along six dimensions. Items on the PLCA-R that address structures, resources, and conditions are in the following three dimensions:

- Shared and Supportive Leadership
- Supportive Conditions-Relationships
- Supportive Conditions-Structures

The statements listed below within these three dimensions on the PLCA-R specifically assess the structures, resources, and conditions most favorable for teacher growth in the implementation of PLCs:

- Staff members use multiple sources of data to make decisions about teaching and learning.
- Caring relationships exist among staff and students that are built on trust and respect.
- A culture of trust and respect exists for taking risks.
- Outstanding achievement is recognized and celebrated regularly in our school.
- School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.
- Relationships among staff members support honest and respectful examination of data to enhance teaching and learning.
- Time is provided to facilitate collaborative work.
- The school schedule promotes collective learning and shared practice.
- Fiscal resources are available for professional development.
- Appropriate technology and instructional materials are available to staff.
- Resource people provide expertise and support for continuous learning.
- The proximity of grade level and department personnel allows for ease in collaborating with colleagues.
- Communication systems promote a flow of information among staff members.
- Communication systems promote a flow of information across the entire school community including: central office personnel, parents, and community members.
- Data are organized and made available to provide easy access to staff members.

The percentage change in the number of participants who indicated “strongly agree” or “agree” to these statements from the first administration of the PLCA-R to the second administration of the PLCA-R provided one measurement of what supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs. This change is described in Table 9.

Table 9

Change in Strength of Agreement from First to Second Administration – Structures, Resources, and Conditions

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
Staff members use multiple sources of data to make decisions about teaching and learning.	92.4%	90.0%	-2.4%
Caring relationships exist among staff and students that are built on trust and respect.	97.8%	90.0%	-7.8%
A culture of trust and respect exists for taking risks.	88.1%	81.2%	-6.9%
Outstanding achievement is recognized and celebrated regularly in our school.	85.8%	83.8%	-2.0%
School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.	58.7%	68.8%	10.1%
Relationships among staff members support honest and respectful examination of data to enhance teaching and learning.	81.8%	75.1%	-6.7%
Time is provided to facilitate collaborative work.	87.0%	78.8%	-8.2%
The school schedule promotes collective learning and shared practice.	76.1%	78.8%	2.7%
Fiscal resources are available for professional development.	69.5%	72.6%	3.1%
Appropriate technology and instructional materials are available to staff.	93.5%	90.1%	-3.4%
Resource people provide expertise and support for continuous learning.	82.6%	77.5%	-5.1%
The proximity of grade level and department personnel allows for ease in collaborating with colleagues.	77.2%	73.8%	-3.4%

Communication systems promote a flow of information among staff members.	78.2%	80.0%	1.8%
Communication systems promote a flow of information across the entire school community including: central office personnel, parents, and community members.	70.7%	86.3%	15.6%
Data are organized and made available to provide easy access to staff members.	67.4%	77.6%	10.2%

The strength of agreement described in Table 9 grew for six of the 15 statements. The greatest increase in agreement was for the statement indicating that communication systems promote a flow of information across the entire school community including: central office personnel, parents, and community members. Those participants indicating either "strongly agree" or "agree" with this statement increased by 15.6%. The greatest decrease in agreement from the first administration to the second administration was for the statement indicating that time is provided to facilitate collaborative work. Those participants indicating either "strongly agree" or "agree" with this statement declined by 8.2%.

The PLCA-R does allow respondents to complete comments for each of the six dimensions measured by the survey. Participants did include comments in the "Supportive Conditions – Structures" dimension and the "Shared Personal Practice" dimension that have need for further exploration. Regarding collaborative time for collective learning and shared practice one participant indicated, "Special education rarely gets to meet altogether to discuss issues like all of the rest of the departments." Another participant commented, "PLC time is not enough in duration or frequency to

begin to analyze student data." Additionally, another response related to the collaborative time available for collective learning and shared practice was:

> If I need to collaborate with a staff member in a different department, this can be difficult (depending on schedules). I realize it is impossible to accommodate everyone in this way. Sometimes when we have our Wednesday department time, it is right after a PLC meeting. Perhaps this would be time to consider inter-departmental meetings (when appropriate).

Qualitative data related to the third research question was gathered through interviews with teachers in the school. Interview participants were asked, "What structures and conditions in our school are most favorable for PLCs? What structures and conditions are missing?" In addition, interview participants were asked, "What resources have been beneficial to the implementation of PLCs? What resources are missing or would be helpful to you and/or your PLC?"

The structure that exists in the school providing time for PLCs to meet as a scheduled part of the school day was commonly shared as a favorable condition for PLC implementation. One interviewee shared that "having the time together, during our planning time, it has been phenomenal to us." The value of having PLC time as part of the schedule was further emphasized as another interviewee commented "the fact that we prioritize it and have it built into the schedule is helpful." Building further on the theme that having PLC time as part of the school day is favorable another teacher added, "There was an emergency situation and we couldn't meet on our PLC day. There were two other days we could meet because we all had prep the same time." To further stress the value of having PLC time as part of the school day another teacher indicated:

> I think the block scheduling has been very helpful – the dedicated time is huge. When you're meeting so regularly you can get in a groove and decide on what you're going to work on the next time and have a consistent flow. (Participant seven)

A second theme that emerged from the answers to this question considered the effectiveness of the PLC meetings. One interview participant shared that the emphasis on developing norms for meetings "has been accepted across the building." Having a protocol to follow and a written agenda for each meeting is another condition the interviewees mentioned that adds to the effectiveness of the PLC meeting time.

In response to the second part of the interview question – "What structures and conditions are missing?" – the issue of time was again prevalent. Two large content areas, Science and Math, arranged their schedules so that the PLCs within these departments were able to meet twice every eight school days. However, the majority of the PLCs in the building were only able to meet once every eight school days. In all cases, PLC meetings were scheduled for 45 minutes. "Time this year just hasn't been enough" was expressed in different ways by several interviewees.

Strong agreement can also be found in the struggle faced by those PLCs where teachers share a content area (e.g., Art) but all teach different courses within that content area. Interview participants mentioned that since they did not administer common assessments it was difficult to respond to the four questions of the PLC framework. Leadership became more of a need in these PLCs and one interviewee expressed, "there can be a lack of communication and we tend to go back to doing our own thing."

Additionally, the logistics of team dynamics was seen as an obstacle by some of the teachers interviewed. "I think sometimes teachers are not held accountable for their lack of an ability to work with others" was mentioned by participant nine. This individual noted that their curriculum work has been held up "because there was a lot of conflict." In terms of conflict, another interviewee commented that a norm in one PLC within the school is to make decisions based on a majority vote. However, this individual also mentioned "I don't want people to do what they think they shouldn't be doing. I am hoping we can get on the same page with our curriculum and that the conflict will dissipate." Participant five mentioned that "attitude really plays into it" and that a "growth mindset" needs to be adopted by PLC members.

Interview participants were also asked to answer the question, "What resources have been beneficial to the implementation of PLCs? What resources are missing or would be helpful to you and/or your PLC?" Again, multiple themes emerged from their responses.

The use of the PLC handbook by PLCs was mentioned unanimously in response to this question. During the second year of PLC implementation a group of teachers researched materials, resources, and best practices in order to develop a tool that would be helpful and useful to all educators in the school. This information was put in a binder and provided to each professional staff member at the opening inservice session of the school year. "The binder was especially helpful at the beginning of the process" and "The binder is a great resource" were some of comments mentioned. Interviewees mentioned specifically that they used the guidance from the handbook to create norms, meeting agendas, and PLC goals.

Mentioned as both a beneficial resource and one that was missing was the knowledge gained by those educators who had the opportunity to visit Adlai Stevenson High School. On three separate occasions educators attended professional development experiences at the school for the purpose of learning about the policies and procedures Adlai Stevenson High School used to support professional learning communities. Interview participants mentioned that "this was very beneficial" and that "we saw a model of what a PLC looked like, what it sounded like in an authentic way, and learned what is the ultimate goal of a PLC." The interviewees also expressed that this would be a beneficial resource to their colleagues. Participant seven mentioned that this experience would "help others develop a vision" for a PLC. Similarly, participant four mentioned that "being able to see what a high-functioning PLC looked like" was helpful and that anyone leading a PLC "could go out and see what a well-functioning PLC looks like in order to know where they're aiming" was a resource missed by others.

Comments on the PLCA-R also helped identify a missing resource that would be beneficial to the implementation of PLCs. One respondent to the PLCA-R shared, "There are a lot of resources for the data which sometimes feels overwhelming, honestly I don't think there is a good way to compile it all." In terms of the organization of data, another respondent mentioned it could be, "possibly better organized or better awareness of the data might help." Another comment stated, "Available information is not centralized but rather found in various places (pages, slideshows, emails) that are difficult to hunt down and locate."

Summary

Chapter Four has presented the results of this study and a discussion of those results. The data were generated from the administration of the PLCA-R to educators at the high school at the beginning of the 2021-2022 school year and the end of the 2021-2022 school year, the collection of five years of student achievement data from the CDT, and individual interviews with high school teachers.

Chapter Five will state conclusions of the effectiveness of PLCs related to the research questions and detail how this learning will be applied to both this school and the entire school district. Limitations in terms of research design and external factors will be described. Finally, recommendations for future research will be will be shared.

CHAPTER V

Conclusions and Recommendations

Chapter Five will discuss the conclusions that can be derived from the data that was collected in response to each research question. The fiscal impact of PLCs within the school and the school district will also be reviewed. Recommendations will be discussed for both the school where the research was conducted and for the entire school district. Limitations of the research project will be shared in terms of the impact they may have had on the research outcomes. Finally, recommendations for further research and consideration will be described.

Avon Grove High School is the lone high school in the Avon Grove School District. The enrollment consists of 1,743 students in grades nine to twelve. There are 107 classroom teachers in the school. PLCs are in their fifth year of implementation in the high school and are being implemented to varying degrees in the three other schools in the district. The purpose of this research study was to consider the impact of teacher participation in PLCs on teacher practices and student achievement.

In order to meet the purpose of the study, the following three research questions were developed:

1. What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?
2. When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?
3. What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?

A mixed-methods approach consisting of a survey, a review of student achievement data for the five years of PLC implementation, and teacher interviews was used to provide data related to each question. The three sources of data utilized in this study – the PLCA-R, the CDT, and semi-structured interviews – allowed for multiple responses to the three research questions of this study. Such triangulation of the data enhanced the findings related to these research questions.

Conclusions

As noted previously, PLCs are in the fifth year of implementation in this school. As resources such as time in the daily schedule and continued professional learning experiences have been a key part of the implementation, it is important to assess the impact of these resources on teacher practices and student achievement.

Research Question One

Research question one asked, "What are teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices?" In order to assess these perceptions, teachers were asked to complete the PLCA-R in October, 2021, and May, 2022. Additionally, nine teachers also participated in a semi-structured interview with a specific question related to the impact on pedagogical practices. That question asked, "In regards to your pedagogical practices, do you think they have changed or not based on your PLC involvement? Why or why not? If so, how?"

There were nine statements within the Collective Learning and Application dimension and the Shared Personal Practice dimension on the PLCA-R that addressed pedagogical practices. The growth in the number of participants who indicated "strongly

agree" or "agree" to these statements from the first administration of the PLCA-R to the second administration of the PLCA-R provided one measurement of teachers' perceptions of professional learning communities (PLCs) in terms of the impact on their pedagogical practices. The strength of agreement was determined by finding the sum of the number of responses indicating either "agree" or "disagree" on each analyzed statement and dividing that number by the total number of responses. The strength of agreement was expressed as a percentage for each statement. Table 10 describes the growth in strength of agreement on five of these statements.

Table 10

Growth in Strength of Agreement from First to Second Administration – Pedagogical Practices

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
A variety of opportunities and structures exist for collective learning through open dialogue.	70.4%	77.6%	7.2%
Staff members plan and work together to search for solutions to address diverse student needs.	84.7%	90.1%	5.4%
Staff members collaboratively analyze student work to improve teaching and learning.	74%	77.5%	3.5%
Staff members collaboratively review student work to share and improve instructional practices.	59.8%	62.5%	2.7%
Staff members collaboratively analyze multiple sources of data to assess the effectiveness of instructional practices.	74%	75.1%	1.1%

One can conclude that this growth in collective learning is a strong indicator that pedagogical practices are changing due to PLC involvement by teachers. From the growth in strength of agreement to the statement, "Staff members plan and work together to search for solutions to address diverse student needs." it can be concluded that pedagogical practices have changed due to PLC involvement. Growth was also realized based on responses to the following two statements:

1. Staff members collaboratively analyze student work to improve teaching and learning.
2. Staff members collaboratively review student work to share and improve instructional practices.

Finally, there was also growth in strength of agreement attributed to the statement, "Staff members collaboratively analyze multiple sources of data to assess the effectiveness of instructional practices." As this agreement relates to "the effectiveness of instructional practices" it can also be in indicate growth in pedagogical practices.

Strong evidence exists to indicate a change in pedagogical practices based on the responses provided by interview participants to the question, "In regards to your pedagogical practices, do you think they have changed or not based on your PLC involvement? Why or why not? If so, how?" As shared in the previous chapter, interviewees agreed unanimously that their pedagogical practices had changed based on their PLC involvement. Interview participants also discussed the growth in the use of new teaching strategies due to their PLC involvement.

However, the researcher noted only some evidence that teacher pedagogical practices have changed based on PLC involvement due to the change in strength of

agreement to specific statements on the PLCA-R as well as some of the comments shared on the PLCA-R. Four statements decreased in strength of agreement from the October, 2021, administration of the PLCA-R to the May, 2022, administration of the PLCA-R. Table 11 describes the decrease in strength of agreement for these statements.

Table 11

Decrease in Strength of Agreement from First to Second Administration – Pedagogical Practices

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
Staff members provide feedback to peers related to instructional practices.	60.9%	52.4%	-8.5%
Staff members work together to seek knowledge, skills and strategies and apply this new learning to their work.	94.5%	90.1%	-4.4%
Individuals and teams have the opportunity to apply learning and share the results of their practices.	85.8%	82.5%	-3.3%
Staff members informally share ideas and suggestions for improving student learning.	96.7%	96.3%	-.4%

The decrease in strength of agreement to the statement, “Staff members provide feedback to peers related to instructional practices.” speaks to the lack of opportunity to discuss peer observations and feedback during PLC meetings. This will be further discussed in the recommendations section of this chapter.

Three other statements saw a decrease in strength of agreement from the first administration of the PLCA-R to the second administration of the PLCA-R. Each of these statements relate to the need for consistent procedures and protocols to be used

during PLC meetings. Professional learning opportunities need to be made available to staff and reinforced through coaching and supervision.

In summary, the data gathered in response to this question show some evidence that teacher pedagogical practices have changed based on PLC involvement as noted by the increase in strength of agreement to five statements on the PLCA-R. However, there were four statements on the PLCA-R with a decrease in strength of agreement from the first administration to the second administration. There is very strong evidence from the interview participants that their pedagogical practices have grown and improved due to their PLC involvement.

Research Question Two

Research question two asked, "When it comes to the implementation of PLCs within academic content areas, how do the challenges and benefits impact student achievement?" In order to evaluate this question, five years of assessment data were captured from the Classroom Diagnostic Tool (CDT). Scale scores were gathered for this research as scale scores are most useful when comparing scores over time (PDE, 2021). Three questions were asked of the nine interview participants as well. The three questions were:

1. What are the benefits of PLCs and how do those benefits impact student achievement?
2. What are the challenges of PLCs and how do these challenges impact student achievement? How can these challenges be addressed?
3. Do you believe that your participation in a PLC has positively impacted the academic achievement of your students? Why or why not?

For this study, the CDT average scale scores in Algebra One, Biology, and Literature were collected over a five-year period. The highest average scale scores for each of the three content areas occurred in the 2017-2018 school year. Following a three-year decline since the 2017-2018 school year, the Algebra One average scale score increased in the 2021-2022 school year. The average scale score on the Biology CDT increased during the 2020-2021 and 2021-2022 school years.

The Literature CDT scores followed a somewhat different pattern. As with the Algebra One and Biology average scale scores, the Literature average score was highest in the 2017-2018 school year and decreased in both the 2018-2019 and 2019-2020 school year. After an increase in average scale scores in the 2020-2021 school year, the lowest average score on the Literature CDT over the past five years inclusive occurred in the 2021-2022 school year.

The qualitative information compiled through teacher interviews supports the idea that PLC involvement positively impacts academic achievement. Teachers identified the benefits to include the ability to analyze common assessments and "compare apples to apples instead of apples to oranges." Teachers are then able to individualize remediation efforts based on this analysis. Many interview participants communicated that they have witnessed students experiencing greater achievement due to the growth in the quality and quantity of impactful instructional strategies being used by teachers due to their collaboration with peers in PLCs. Regarding greater academic achievement, participant one mentioned, "I definitely see it – especially more so in the classes that I collaborate with other teachers." Such qualitative data supports the growth in student academic achievement as it related to the PLC involvement of teachers.

However, there was also evidence provided to indicate that there are limiting factors related to the academic achievement of students. Teachers shared that since some PLCs meet only once every eight school days it can impact their ability to carefully analyze student learning information and develop plans based on this analysis. While the inclusion of PLC time in the daily bell schedule is vital, the frequency of that time is foundational to the impact of PLCs on student achievement.

Another factor that may limit the academic achievement of students could be the mindset of educators towards PLC involvement. Interview participants stressed that educators "who do not like change and who do not embrace change for the benefit of the students" may not get the full benefit out of their PLC participation and when teachers do not fully understand the purpose of PLCs or are "not on board" with the implementation of PLCs student achievement may not be completely realized.

The quantitative and qualitative data gathered through this research provide some evidence that PLC implementation has positively impacted student achievement. Average student scale scores on the Algebra One and Biology CDT increased in the 2021-2022 school year to their highest levels since the first year of PLC implementation. Teachers shared that their PLC involvement has resulted in a greater ability to analyze data to impact instruction and implement a greater quantity of quality instructional strategies. However, the decrease in average scale scores on the Literature CDT is concerning and should be a topic of further research.

Research Question Three

Research question three asked, "What supportive structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs?" It is

necessary that an organization implementing PLCs know the structures, resources, and conditions that are favorable for teacher growth and be able to assess the quality of each within the learning organization. Data to respond to this question were collected through the administration of the PLCA-R twice during the 2021-2022 school year and through the inclusion of two specific questions included in the semi-structured teacher interviews.

There were fifteen statements on the PLCA-R that assessed the presence of the structures, resources, and conditions favorable for teacher growth in the implementation of PLCs. The growth in the number of participants who indicated “strongly agree” or “agree” to these statements from the first administration of the PLCA-R to the second administration of the PLCA-R provided one measurement of what structures, resources, and conditions are most favorable for teacher growth in the implementation of PLCs. Table 12 describes the growth in strength of agreement on these statements.

Table 12

Growth in Strength of Agreement from First to Second Administration – Structures, Resources, and Conditions

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
Communication systems promote a flow of information across the entire school community including: central office personnel, parents, and community members.	70.7%	86.3%	15.6%
Data are organized and made available to provide easy access to staff members.	67.4%	77.6%	10.2%
School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.	58.7%	68.8%	10.1%
Fiscal resources are available for professional development.	69.5%	72.6%	3.1%
The school schedule promotes collective learning and shared practice.	76.1%	78.8%	2.7%
Communication systems promote a flow of information among staff members.	78.2%	80.0%	1.8%

From the data shared in Table 12, one can conclude that communication systems in the school district, the availability of data, and the effort to impact change are structures, resources, and conditions that improved from the first administration of the PLCA-R to the second administration of the PLCA-R. To a lesser extent, the availability of fiscal resources for professional development, the collective learning as a result of the school schedule, and the communication flow among staff members are favorable structures, resources, and conditions that also improved from the first administration of the PLCA-R to the second administration of the PLCA-R.

The two interview questions related to supportive structures, resources, and conditions favorable to teacher growth in the implementation of PLCs were:

1. What structures and conditions in our school are the most favorable for PLCs? What structures and conditions are missing?
2. What resources have been beneficial to the implementation of PLCs? What resources are missing or would be helpful to you and/or your PLC?

Through the responses to these questions, one can conclude the following structures, resources, and conditions are favorable for teacher growth:

- the opportunity to have PLC meetings as a scheduled part of the school day
- the effective and efficient facilitation of PLC meetings
- the availability of the PLC handbook
- the ability to visit a school that has successfully implemented PLCs.

Interview participants noted, "I think the block scheduling has been very helpful – the dedicated time is huge." and "The fact that we prioritize it and have it built into the schedule is helpful." Supported by the responses of interviewees and the PLCA-R, the availability of time during the school day is an important structure related to the implementation of PLCs.

The development of norms and the regular use of an agenda contributed to the effectiveness and efficiency of the PLC meetings according to another teacher. Unanimous agreement among the teachers who participated in the interview was indicated for the use of the PLC handbook. Interviewees mentioned specifically the handbook was helpful for creating norms, meeting agendas, and PLC goals.

The ability to visit and observe at a school where PLCs have been successfully implemented was also indicated as a favorable resource. Interview participants mentioned that "this was very beneficial" and that "we saw a model of what a PLC looked like, what it sounded like in an authentic way, and learned what is the ultimate goal of a PLC." In support of additional visits, interviewee seven suggested this experience would "help others develop a vision" for a PLC.

The statements on the PLCA-R and the responses to the two interview questions also provided the researcher with details about what supportive structures, resources, and conditions might be missing. On the PLCA-R, the decrease in the number of participants who indicated "strongly agree" or "agree" to certain statements is described in Table 13.

Table 13

Decrease in Strength of Agreement from First to Second Administration – Structures, Resources, and Conditions

Statement	October 21 Agreement	May 2022 Agreement	Percent Change
Time is provided to facilitate collaborative work.	87.0%	78.8%	-8.2%
Caring relationships exist among staff and students that are built on trust and respect.	97.8%	90.0%	-7.8%
A culture of trust and respect exists for taking risks.	88.1%	81.2%	-6.9%
Relationships among staff members support honest and respectful examination of data to enhance teaching and learning.	81.8%	75.1%	-6.7%
Resource people provide expertise and support for continuous learning.	82.6%	77.5%	-5.1%
Appropriate technology and instructional materials are available to staff.	93.5%	90.1%	-3.4%
The proximity of grade level and department personnel allows for ease in collaborating with colleagues.	77.2%	73.8%	-3.4%
Staff members use multiple sources of data to make decisions about teaching and learning.	92.4%	90.0%	-2.4%
Outstanding achievement is recognized and celebrated regularly in our school.	85.8%	83.8%	-2.0%

The time to meet during the school day was indicated as a favorable condition related to teacher growth in the implementation of PLCs. However, the decrease in agreement to the statement “Time is provided to facilitate collaborative work” supports

the concern voiced through the teacher interviews that some PLCs in the school do not have enough meeting time.

Statements associated with relationships, trust, and respect in the school saw a decrease in strength of agreement as well. Each of these statements is related to culture within the school community and PLCs. As identified in the research about PLCs, trust is paramount to this process and trust needs to exist throughout the learning organization (Willis & Templeton, 2017). A focus on relationships, trusts, and the overall culture in PLCs through professional learning would be beneficial to the entire learning organization.

The decrease in strength of agreement to the statement, "Resource people provide expertise and support for continuous learning." highlights the importance of providing support to teachers and PLCs. One step already taken to improve this level of support has been addressed as a third Supervisor of Teaching and Learning position has been approved for the upcoming school year. The addition of this staff member will provide more support to teachers through curriculum development, data analysis, and targeted professional learning experiences.

A high strength of agreement exists for the statements "Appropriate technology and instructional materials are available to staff." and "Staff members use multiple sources of data to make decisions about teaching and learning." It is important to recognize a decrease from the first administration of the PLCA-R to the second administration of the PLCA-R was realized. To support the maintenance of this agreement to each statement, it is important to review the technology replacement cycle and the curriculum review cycle.

A decrease in strength of agreement to the statement, “The proximity of grade level and department personnel allows for ease in collaborating with colleagues.” Will be addressed through the move of the high school into a new building at the start of the 2022-2023 school year. This move has allowed the high school administration to address this concern and create greater proximity for both grade level and department personnel. This proximity will instantly allow for additional collaborative opportunities.

Two interview questions included allowed the opportunity for interview participants to identify what resources, supports, and conditions for favorable teacher growth in the implementation of PLCs may be missing. Those questions were:

1. What structures and conditions are missing?
2. What resources are missing or would be helpful to you and/or your PLC?

Confirming what was reported on the PLCA-R, interview participants identified the need for a greater quantity of time provided for PLC meetings. While two PLCs were able to meet once every four school days, most PLCs were only able to meet once every eight school days.

Art, technology education, and music are examples of PLCs where there are no instances of educators teaching the same classes. In these cases, interview participants mentioned that PLC members can struggle to collectively address the four questions of the PLC framework. Leadership became more of a need in these PLCs and one interviewee expressed, “there can be a lack of communication and we tend to go back to doing our own thing.” Such concerns highlight the need for professional learning experiences specific to these PLCs. The topics of this professional learning could include

developing common rubrics for assessing student work and developing virtual PLCs with teachers in other schools.

The ability to visit Adlai Stevenson High School in Lincolnshire, Illinois, on three occasions was indicated as a favorable resource by interview participants. Conversely, the interviewees also noted that the inability of all educators in the school to have this professional learning experience as a missing resource. Making this opportunity or similar experiences available to educators in the school will be beneficial.

The two administrations of the PLCA-R during the 2021-2022 school year and two interview questions provided information to identify the supportive structures, resources, and conditions that are most favorable for teacher growth in the implementation of PLCs. The data also supported the identification of those structures, resources, and conditions related to favorable teacher growth which may be missing. Survey respondents and interview participants indicated the following supportive structures, resources, and conditions as being favorable for teacher growth:

- communication throughout the school district and within the school
- the opportunity to have PLC meetings as a scheduled part of the school day
- the availability of student learning data
- the effective and efficient facilitation of PLC meetings
- the availability of the PLC handbook
- the ability to visit a school that has successfully implemented PLCs.

The survey respondents and interview participants also identified the following supportive structures, resources, and conditions as missing in the school:

- an increase in the time and frequency for PLC meetings

- instances of a lack of trust or accountability in some PLCs
- the lack of an easily accessible program to track student, school, and district performance in order to support instructional and operational decisions.

Fiscal Implications

Growth in pedagogical practices and improved student learning are anticipated outcomes from the successful implementation of the PLC framework at Avon Grove High School and this capstone project. There are direct and indirect costs associated with project and the potential for further development and support.

The PLCA-R was administered twice during the school year. The cost for 200 licenses was $400.00. As there were 180 completed surveys, the cost per survey was approximately $2.22. Based on the amount of information provided by the results, the school district may consider administering this survey at least once each school year to the entire faculty. The results could be used to monitor the overall implementation of PLCs and identify potential professional learning needs. Even if administered to all educators in the district, the cost is relatively minimal.

Indirect costs associated with administering the survey include the time for personnel to purchase the survey and prepare the survey for administration in each school. An additional indirect cost would be incurred related to the time allocated for survey administration (approximately five to ten minutes). The total indirect costs should not be considered a reason for not administering the survey to the faculty throughout the school district as the overall time described above is minimal.

Professional learning needs have been identified from the data collected for this project. There are direct costs associated with the facilitation of professional learning

experiences facilitated by an independent organization or by personnel from the Chester County Intermediate Unit. If professional learning experiences were delivered by professional educators within the district, there would be little to no cost associated with the delivery of instruction. There could be direct costs associated with substitute teachers needed for the classes of the professional learning facilitators and indirect costs associated with the time to prepare lesson plans for substitute teachers.

The ability to use data to make decisions is critical to creating a learning organization that positively impacts student outcomes (Thompson et al., 2004). Additional access to a greater amount of data and training on how to best use the information could result in the decision to hire additional personnel. Such a decision would result in greater direct costs than other costs associated with the ongoing implementation of PLCs.

The implementation of PLCs does have ongoing indirect costs. The PLC framework requires time in a daily schedule to allow PLCs to meet during the school day. If all teachers are going to available to meet during the school day, teachers cannot be scheduled for any student supervision or duties during this time. During the meeting time of each PLC these responsibilities will need to fall to building administrators or other teachers in the building. A direct cost would be realized if the decision was made to hire additional personnel to take on these responsibilities.

In addition to providing time in the master schedule for PLCs to meet during the school day, indirect costs may be realized by scheduling time for consistent professional learning. By regularly allotting professional development time for PLCs and related topics, it could result in other initiatives not being pursued. Or, it could result in the

building administration needing to find other time (e.g. faculty meetings) for other initiatives or professional development experiences.

Recommendations

The administration of the PLCA-R twice during the school year, the collection of five years of student scale scores on the CDT, and the conducting of semi-structured interviews answered the three research questions associated with this project. The collection and analysis of this data has led to further recommendations for consideration at both the school and district level.

As the development of PLCs throughout all schools in the district is being pursued, administering the PLCA-R annually would provide a great deal of data to teachers, building administrators, and district administrators. The data could be used to assess the progress of PLCs in each school, reveal areas of strength and opportunities for growth, identify professional learning needs, and consider personnel impact and needs. At a cost of $2 per survey it would only cost the school district approximately $750 to administer the test to all educators in the district.

Having time for PLCs to meet during the school day was identified as a favorable condition for teacher growth on responses to the PLCA-R and the interview questions. An increase in the frequency of these meetings was noted as a potential improvement, however. In building the schedule for the upcoming school year, the high school administration should consider strategies that would allow the PLCs in the building to meet once every four school days instead of once every eight days. While meeting once every eight days was considered to be adequate, there was a great deal of agreement that

the frequency of PLC meetings be increased in order to further grow pedagogical practices and student achievement.

A number of professional learning needs were also identified through this process. Those identified needs related to PLCs within a content area where all teachers instruct different topics, creating sustainable PLCs, providing training for PLC facilitators, allowing time for peer-to-peer classroom observations, and providing training related to assessment development and data analysis.

Art, technology education, and music are examples of PLCs with fewer teachers where there are no instances of teachers sharing the same classes. In these cases, PLC members can struggle to collectively address the four questions of the PLC framework. Professional learning experiences for these PLCs could include the creation of common rubrics for assessing student work and development of virtual PLCs with teachers in other schools teaching the same or similar content.

The elements of trust in one another, accountability, and a common purpose are all foundational to the success of PLCs (Willis & Templeton, 2017). Ongoing professional learning to support teachers in building and sustaining these elements is needed to support the effectiveness and impact of PLCs throughout the school.

Similarly, teacher leadership for each PLC is also considered as foundational to the success of PLCs (Huffman et al., 2001). Professional learning to improve the skills of those educators who lead PLCs in the school should be an ongoing consideration. The potential of such professional learning experiences to grow the number of teacher leaders within the school should also be considered.

Interview participants discussed the benefits related to having educators from the school visit Adlai Stevenson High School in Lincolnshire, Illinois, to learn more about the procedures and practices this school uses with PLCs. The high school administration can consider additional trips to Adlai Stevenson High School or explore similar professional learning experiences moving forward in order to increase the leadership capacity within the school.

Peer observation of teaching can provide valuable insights into effective instructional strategies and practices (Drew et al., 2017). Data and comments from the PLCA-R indicated that this type of professional learning experience for teachers would be valued and impactful. Time could be allotted to conduct such observations by providing classroom supervision for teachers by school administrators, other personnel, and substitute teachers. It is suggested that teachers of Algebra One and Biology be observed as student scores on the CDT increased in those classrooms.

A key to the PLC framework is to be able to properly assess student learning and analyze the assessment results to provide opportunities for remediation and enrichment. Common formative and summative assessments are the key to this step. While professional learning has been initiated on the development and use of common assessments, this learning experience needs to be maintained due to changes in staffing, the desire to build and improve skills, and the changing needs of students. Teachers need to be provided with professional learning experiences to analyze the results of assessments, provide feedback to their learners, and implement changes in their instructional strategies related to this analysis. To aid with the data collection and analysis process, the school district has approved the purchase of a data warehouse that

will support teachers and administrators with tracking overall student, school, and district performance in order to simplify instructional and operational decisions. Professional learning regarding the effective use of the data warehouse will be an important part of the upcoming school year.

Limitations

While every effort was taken to ensure validity and reliability throughout this research project, there are limitations to the study that need to be considered.

At the onset of this project, the researcher was the principal of the school where the research was conducted. In addition to the data that was being collected as part of the project, the researcher had intended to be regularly attending PLC meetings throughout the school, providing feedback and support to individual PLCs, and facilitating ongoing professional learning experiences based on the data provided by the PLCA-R and personal observation. On January 1, 2022, the researcher was asked to direct efforts towards the planning of a new high school to be occupied at the beginning of the 2022-2023 school year. Then, as of March 1, 2022, the researcher was promoted to one of the two Assistant Superintendent roles in the school district. While the responsibilities are focused on the secondary schools in the district, it did create an obstacle to accomplishing the expectations the researcher had for PLC implementation throughout the school year.

The PLCA-R was administered in October, 2021, and May, 2022, at the high school. Two administrations were considered in order to measure the impact of professional learning experiences throughout the school year. As previously mentioned, the changing roles of the researcher throughout the year impacted the quantity and quality of the professional learning experiences and may have impacted the results on the second

administration of the PLCA-R. The second administration of the PLCA-R was completed near the end of May. It is possible that the fatigue associated with the end of a school year may have impacted the validity of the responses to the PLCA-R statements. While there is no way to confirm this possibility, it should be considered when looking at the outcomes associated with the second administration of the PLCA-R.

Average scale scores by cohort were gathered for each of the five years of PLC implementation on the Algebra One, Biology, and Literature CDT. A limitation associated with this method of data collection is that the assessed cohorts were comprised of different students each year. While the sample sizes each year were relatively large, the fact that the tested cohorts were different each year should be considered when analyzing this data. Also, the 2021-2022 school year was the first full year of in-person instruction since the 2018-2019 school year. One can assume that the quality of learning was higher in the in-person learning environment compared to the virtual or hybrid learning environment.

There are also limitations related to the data gathered through the semi-structured interviews. Each of the interviews was conducted by the researcher who, at the time the interviews were conducted, was either the high school principal or an assistant superintendent in the school district. As the researcher was in a supervisory role in all cases, this may have impacted some of the responses to the interview questions. Finally, the semi-structured interviews were conducted with nine teachers in the high school. One should consider the smaller sample size of interviewees when compared to the number of respondents to the PLCA-R and the number students who were administered the CDT as part of the data collection process.

Implications for Future Research

This project collected quantitative and qualitative data for the purpose of determining the impact of teacher participation in PLCs on teacher practices and student learning. Two administrations of the PLCA-R, results on the CDT for the five years of PLC implementation, and semi-structured interviews were the methods used for data collection. Future research considerations include:

1. A deeper analysis behind the dramatic increase in scores on the Algebra One CDT in the most recent school year. The average student scale score rose from 975 to 1130 in one school year. Classroom observations, teacher interviews, and PLC meeting attendance could be methods for collecting this information.
2. A deeper analysis behind the decrease in scores on the Literature CDT in the most recent school year. The average student scale score dropped from 1087 to 1027 in one school year. Classroom observations, teacher interviews, and PLC meeting attendance could be methods for collecting this information.
3. Adding the ability to categorize responses on future administrations of the PLCA-R by department and grade level. Such data will assist educators in determining specific professional learning needs for departments and grade levels throughout the school and district.
4. Consideration of the duplication of this study in the other schools throughout the school district. Following the same methodology in each school will allow for a better assessment of strengths and opportunities for improvement

across the school district. It will also allow district administrators to provide effective and efficient support at the school and district level.

Summary and Conclusion

Chapter Five provided a description of the conclusions that were derived from the data that was collected for each research question. This mixed-methods research project did find evidence that teachers pedagogical practices grew and improved due to their participation in PLCs. The data also provided limited evidence that academic achievement grew as an outcome of teacher participation in PLCs. Supportive structures, resources, and conditions were both identified and assessed within the school through results from the PLCA-R and semi-structured interviews.

While there was evidence to support the growth of pedagogical practices and student achievement, opportunities for growth were also identified. Included in this chapter were recommendations to grow the effectiveness of PLCs in the school and across the district. Additionally, strategies for further developing the supportive structures, resources, and conditions were highlighted in the effort to plan for the growth and improvement in the implementation of PLCs throughout the school district.

The research supports the continued implementation of PLCs in the school district. Teachers, building administrators, and district leaders should consider purposefully dedicating human resources, professional learning opportunities, and financial support towards PLCs in an effort to continue the growth of pedagogical practices to positively impact student achievement.

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Appendix A

Professional Learning Communities Assessment – Revised (PLCA-R)

Professional Learning Communities Assessment – Revised

Directions:
This questionnaire assesses your perceptions about your principal, staff, and stakeholders based on the dimensions of a professional learning community (PLC) and related attributes. This questionnaire contains a number of statements about practices which occur in some schools. Read each statement and then use the scale below to select the scale point that best reflects your personal degree of agreement with the statement. Shade the appropriate oval provided to the right of each statement. Be certain to select only one response for each statement. Comments after each dimension section are optional.

Key Terms:
- Principal = Principal, not Associate or Assistant Principal
- Staff/Staff Members = All adult staff directly associated with curriculum, instruction, and assessment of students
- Stakeholders = Parents and community members

Scale: 1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Agree (A)
4 = Strongly Agree (SA)

Olivier, D. F., & Hipp, K. K. (2010). Assessing and analyzing schools as professional learning communities. In K. K. Hipp & J. B. Huffman (Eds.), *Demystifying professional learning communities: School leadership at its best*. Lanham, MD: Rowman & Littlefield.

Professional Learning Communities Assessment - Revised

	STATEMENTS	SCALE			
	Shared and Supportive Leadership	**SD**	**D**	**A**	**SA**
1.	Staff members are consistently involved in discussing and making decisions about most school issues.				
2.	The principal incorporates advice from staff members to make decisions.				
3.	Staff members have accessibility to key information.				
4.	The principal is proactive and addresses areas where support is needed.				
5.	Opportunities are provided for staff members to initiate change.				
6.	The principal shares responsibility and rewards for innovative actions.				
7.	The principal participates democratically with staff sharing power and authority.				
8.	Leadership is promoted and nurtured among staff members.				
9.	Decision-making takes place through committees and communication across grade and subject areas.				
10.	Stakeholders assume shared responsibility and accountability for student learning without evidence of imposed power and authority.				
11.	Staff members use multiple sources of data to make decisions about teaching and learning.				
COMMENTS:					

Professional Learning Communities Assessment - Revised

	STATEMENTS	SCALE			
	Shared Values and Vision	**SD**	**D**	**A**	**SA**
12.	A collaborative process exists for developing a shared sense of values among staff.				
13.	Shared values support norms of behavior that guide decisions about teaching and learning.				
14.	Staff members share visions for school improvement that have an undeviating focus on student learning.				
15.	Decisions are made in alignment with the school's values and vision.				
16.	A collaborative process exists for developing a shared vision among staff.				
17.	School goals focus on student learning beyond test scores and grades.				
18.	Policies and programs are aligned to the school's vision.				
19.	Stakeholders are actively involved in creating high expectations that serve to increase student achievement.				
20.	Data are used to prioritize actions to reach a shared vision.				
COMMENTS:					

Professional Learning Communities Assessment - Revised

STATEMENTS		SCALE			
	Collective Learning and Application	**SD**	**D**	**A**	**SA**
21.	Staff members work together to seek knowledge, skills and strategies and apply this new learning to their work.				
22.	Collegial relationships exist among staff members that reflect commitment to school improvement efforts.				
23.	Staff members plan and work together to search for solutions to address diverse student needs.				
24.	A variety of opportunities and structures exist for collective learning through open dialogue.				
25.	Staff members engage in dialogue that reflects a respect for diverse ideas that lead to continued inquiry.				
26.	Professional development focuses on teaching and learning.				
27.	School staff members and stakeholders learn together and apply new knowledge to solve problems.				
28.	School staff members are committed to programs that enhance learning.				
29.	Staff members collaboratively analyze multiple sources of data to assess the effectiveness of instructional practices.				
30.	Staff members collaboratively analyze student work to improve teaching and learning.				
COMMENTS:					

Professional Learning Communities Assessment - Revised

STATEMENTS		SCALE			
	Shared Personal Practice	**SD**	**D**	**A**	**SA**
31.	Opportunities exist for staff members to observe peers and offer encouragement.				
32.	Staff members provide feedback to peers related to instructional practices.				
33.	Staff members informally share ideas and suggestions for improving student learning.				
34.	Staff members collaboratively review student work to share and improve instructional practices.				
35.	Opportunities exist for coaching and mentoring.				
36.	Individuals and teams have the opportunity to apply learning and share the results of their practices.				
37.	Staff members regularly share student work to guide overall school improvement.				
COMMENTS:					

Professional Learning Communities Assessment - Revised

	STATEMENTS	SCALE			
	Supportive Conditions - Relationships	**SD**	**D**	**A**	**SA**
38.	Caring relationships exist among staff and students that are built on trust and respect.				
39.	A culture of trust and respect exists for taking risks.				
40.	Outstanding achievement is recognized and celebrated regularly in our school.				
41.	School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.				
42.	Relationships among staff members support honest and respectful examination of data to enhance teaching and learning.				
COMMENTS:					

Professional Learning Communities Assessment - Revised

	STATEMENTS	SCALE			
	Supportive Conditions - Structures	**SD**	**D**	**A**	**SA**
43.	Time is provided to facilitate collaborative work.				
44.	The school schedule promotes collective learning and shared practice.				
45.	Fiscal resources are available for professional development.				
46.	Appropriate technology and instructional materials are available to staff.				
47.	Resource people provide expertise and support for continuous learning.				
48.	The school facility is clean, attractive and inviting.				
49.	The proximity of grade level and department personnel allows for ease in collaborating with colleagues.				
50.	Communication systems promote a flow of information among staff members.				
51.	Communication systems promote a flow of information across the entire school community including: central office personnel, parents, and community members.				
52.	Data are organized and made available to provide easy access to staff members.				
COMMENTS:					

Olivier, D. F., & Hipp, K. K. (2010). Assessing and analyzing schools as professional learning communities. In K. K. Hipp & J. B. Huffman (Eds.), *Demystifying professional learning communities: School leadership at its best*. Lanham, MD: Rowman & Littlefield.

Appendix B

Interview Questions

NOTE: Additional clarifying questions may be asked by the researcher in the interview to promote the researcher's understanding of the interviewee's responses.

1. In regards to your pedagogical practices, do you think they have changed or not based on your PLC involvement? Why or why not? If so, how? Please explain in detail.
2. What are the benefits of PLCs and how do those benefits impact student achievement?
3. What are the challenges of PLCs and how do these challenges impact student achievement? How can these challenges be addressed?
4. Do you believe that your participation in a PLC has positively impacted the academic achievement of your students? Why or why not?
5. What structures and conditions in our school are the most favorable for PLCs? What structures and conditions are missing?
6. What resources have been beneficial to the implementation of PLCs? What resources are missing or would be helpful to you and/or your PLC?
7. What have you learned about student achievement from your participation in a PLC?

Appendix C

California University of Pennsylvania Institutional Review Board Approval

Institutional Review Board
California University of Pennsylvania
Morgan Hall, 310
250 University Avenue
California, PA 15419
instreviewboard@calu.edu
Melissa Sovak, Ph.D.

Dear Scott,

Please consider this email as official notification that your proposal titled "The Impact of Teacher Participation in Professional Learning Communities on Teacher Practices and Student Learning" (Proposal #20-049) has been approved by the California University of Pennsylvania Institutional Review Board as submitted.

The effective date of approval is 9/13/21 and the expiration date is 9/12/22. These dates must appear on the consent form.

Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:

(1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)

(2) Any events that affect the safety or well-being of subjects

(3) Any modifications of your study or other responses that are necessitated by any events reported in (2).

(4) To continue your research beyond the approval expiration date of 8/12/22 you must file additional information to be considered for continuing review. Please contact instreviewboard@calu.edu

Please notify the Board when data collection is complete.

Regards,

Melissa Sovak, PhD.
Chair, Institutional Review Board