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Effects of Professional Learning Communities on Instructional Revisions in Secondary Mathematics Classrooms

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EFFECTS OF PROFESSIONAL LEARNING COMMUNITIES ON INSTRUCTIONAL REVISIONS IN SECONDARY MATHEMATICS CLASSROOMS

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Approved by
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APPROVAL OF DISSERTATION

We, the faculty supervising the work of **John Kenneth Bond**, affirm that the dissertation, *Effect of Professional Learning Communities on Instructional Revisions in Secondary Mathematics Classrooms*, meets the high academic standards for original scholarship and creative work established by the EdD Program in **Leadership Studies** and the College of Education and Professional Development. This work also conforms to the editorial standards of our discipline and the Graduate College of Marshall University. With our signatures, we approve the manuscript for publication.

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ABSTRACT

This non-experimental, descriptive study examined the effect(s), if any, that professional learning communities have had on the professional practices of secondary (grades 9-12) mathematics teachers in Boone, Clay, Putnam, and Kanawha counties in West Virginia. Also investigated were the potential differences in instructional-practice change(s) based on selected demographic variables: sex, degree level, the grade level taught, the total years of teaching experience, the total number of years in their current position, the specific math subject taught, the total number of years of PLC participation, and the composition (e.g., departmental, cross-curricular, or both) of participants' PLC. Data were collected from a 19-question researcher-adapted survey administered to 81 secondary mathematics teachers in the participating counties. Results indicated that the majority of participants had changed their instructional practice, their collaborative practice, their data study practice, and their assessment practice as a result of their participation in PLCs.

Chapter One

Educational reform from the late 1950s until the late 1970s focused on reducing the isolation in which most educators practiced their craft and increasing the amount of collaboration which took place in schools (Little, 1993). The subjects of mathematics and science were the focus of much of the need for educational reform (Atkin & Black, 2003), which focused on teacher professional development and collaboration to help teachers build a better understanding of the need for social interaction and how that social interaction would help to improve instruction (DeBoer, 1999).

The release of *A Nation At Risk* in 1983 by the National Commission on Excellence in Education raised many questions among members of the public. The report asserted that national security was at risk because substandard education was being delivered to students by public schools, focusing on alleged deficiencies in content and a perceived absence of rigor in the classroom in most public schools. The purported deficiencies would have, according to the report, a detrimental effect on the United States' perceived place as a leader of the free world. Thus began efforts focusing on content and pedagogical process development for public school teachers. Efforts to improve collaboration, collegiality, and professional development became the focus of school reform efforts of the era (Stoll, et al, 2006). President Bill Clinton, in response to the perception of a failing education system in America, signed the Goals 2000: Educate America Act in 1994. The stated purpose of the act was to "improve learning and teaching by providing a national framework for educational reform" (Heise, 1994, p. 351). In the act, the federal and state governments worked together to establish national goals for public education. While the eight stated goals of Goals 2000 were not reached, the Act marked the first time the federal government had become so involved in what heretofore had been a state and local issue.

In 2002, President George W. Bush signed into law the No Child Left Behind Act (NCLB). This act was the reauthorization of the Elementary and Secondary Education Act of 1965, which was the central federal law in public school education and was the largest federal intervention in schools (U.S. Department of Education, 2001). NCLB forced an "accountability" expectation on schools, districts, and states to show that students were making adequate yearly progress (AYP) toward mastery of content and process. This legislation forced teachers and administrators nationwide to discuss what was being taught in school classrooms and how to measure the students' knowledge of academic standards. The Act also "took particular aim at improving the educational lot of disadvantaged students" (Rebora, 2011, para. 1). While NCLB forced discussions among educators at all levels concerning pedagogical and assessment practices, it may have ignored the reality of schools and classrooms. Research literature is clear that each learner is different and that, because our schools are full of students with diverse psychologies, a one-size-fits-all pedagogical and measurement system was not practical (Rentschler, 2006).

Most reform efforts from 1983 to 2010 were focused on collegiality, collaboration, and accountability (Darling-Hammond and McLaughlin, 1995). Because of these efforts, teachers began to work together to determine what did and did not work in their classrooms. During professional development sessions, teachers worked together to determine pedagogical and assessment practices which were thought to improve the academic outcomes of their students. These practices of collaboration and accountability joined teachers together in what was termed by Hord (1997) as a professional learning community (PLC).

According to DuFour, DuFour, and Eaker (2008), a PLC may be defined as "educators committed to working collaboratively in ongoing processes of collective inquiry and action

research to achieve better results for the students they serve" (p.11). Hord (1997) asserted that the goal of a teacher active in a PLC is to enhance his effectiveness as a professional so that students can benefit from the practice. DuFour (2004a) indicates that educators who build a PLC recognize that they must work together to achieve their collective purpose of learning, which raises a question: To what extent do PLCs genuinely affect professional practice?

In West Virginia, schools which met the criteria for persistently low-performing schools as defined by the West Virginia Department of Education had the opportunity to apply for and receive School Improvement Grants (SIGs) which were awarded to state educational agencies by the United States Department of Education under Section 1003(g) of the Elementary and Secondary Education Act of 1965, which was reauthorized as the No Child Left Behind Act in 2002 under President George W. Bush. According to East (2015), the West Virginia Department of Education defined persistently low-performing schools as institutions "exhibiting a lack of progress in the All subgroup in reading and math on the annual state assessment" (p.2).

Schools which were offered the opportunity to apply for a SIG grant had the freedom to implement their own improvement plans; however, each school was required to include certain mandated requirements in their plan. One of these mandates was the implementation of professional learning communities, based on the model developed and implemented by Richard and Rebecca DuFour in Illinois. West Virginia Department of Education representatives were to supply training and guidance to SIG schools.

Leading researchers in the field have indicated that implementing professional learning communities in schools is an accepted practice in high performing schools and has been an effective means of driving improvement in academically struggling schools (Borko, 2004; Datnow, 2011; DuFour, 2004b; Marzano, 2003; Owen, 2014; Pirtle and Tobia, 2014; Prater,

2010; Strahan, 2003; Wood, 2007). The bulk of the research has focused on teacher perceptions of how PLCs have affected collaboration, or whether they have been implemented with a degree of fidelity to researchers' original designs. Less is known about whether individual teaching practices have been altered as a result of their participation, which is also a goal of the PLC according to Vescio, Ross, and Adams (2008) who indicate "At its core, the concept of a PLC rests on the premise of improving student learning by improving teaching practice" (p. 82).

Problem Statement

Vescio et al. (2008) conducted a review of research concerning the impact professional learning communities have had on teaching practices and student learning, finding that between 1990 and 2005 only 10 empirical studies had been conducted on the subject in the United States. A search of two key sources drove further investigation into the research on the topic. First, a review of various websites, including the Annenberg Institute for School Reform, the Wisconsin Center for Educational Research, and Google Scholar was conducted. Second, an examination of the EBSCO and ERIC databases was completed. These searches (while limited in scope) revealed that since 2006 only 42 studies focused solely on the effects of professional learning communities and professional practices. The results of these searches, while by no means exhaustive, suggest that further research on the topic could prove valuable.

The intent of this study was to survey mathematics instructors who teach in secondary schools in four West Virginia counties (i.e., Boone, Clay, Putnam, and Kanawha) in an examination on the effect(s) professional learning community activities (e.g., improved collaboration, data study, and formative assessment) have on professional practice in mathematics classes. While three studies have been conducted in the last 10 years on professional learning community practice in our state, none focused on professional practice.

Brucker (2013) focused on teacher perceptions of levels of implementation and effectiveness. Monterosso (2014) conducted a study which centered on professional learning communities, common planning time, and their effects on 8th grade reading scores. East (2015) looked at perceived teacher effectiveness in SIG schools in West Virginia.

Research Questions

The primary question for this study is: To what extent are professional practices affected by interactions and collaboration in PLCs. Five research questions guided this study. The questions are:

1. To what extent, if any, have PLCs brought about changes in instructional practice?
2. To what extent, if any, have PLCs brought about increased collaboration among teachers?
3. To what extent, if any, have PLCs brought about changes in data study?
4. To what extent, if any, have PLCs brought about changes in assessment practices?
5. To what extent, if any, do selected demographic characteristics affect participant responses to survey items?

Definitions

College and Career Readiness Standards: educational standards which were adopted by the West Virginia Board of Education in 2014.

Collaboration: a systematic process in which teachers work together, interdependently, to analyze and affect professional practice in order to improve results for their students (DuFour, et al., 2008). Teachers must perceive that their skills, knowledge, talents, and experience are valued and appreciated for the collaboration to be effective. All members of the PLC should feel

attached and committed to their work (Provini, 2012). Collaboration must be voluntary, based on parity of equal value, require shared goals, shared responsibility for decision making, shared accountability for outcomes, shared resources, and be emergent (Carpenter, 2012).

Formative Assessments: a planned process where teachers and students use assessment-based evidence to support individual learning (Popham, 2008).

Instructional Practice: Specific teaching methods which guide the classroom learning process.

Power Standards: standards chosen by the PLC as those which are considered to be most important in the curriculum. A quick examination of the West Virginia mathematics standards shows that in order to teach each mathematics standard in Algebra I in the state of West Virginia, a teacher would have only three days per standard in order to cover all 60 standards. Therefore, it is necessary for each PLC to determine which of those 60 standards are the most beneficial for students to learn.

Professional Learning Community (PLC): educators committed to working collaboratively in an ongoing process of collective inquiry and action research to achieve better results for the students they serve (DuFour et al., 2008).

Summative Assessments: process to determine if students have met intended standards by a specific deadline (Abbott, 2014).

Significance of Study

A paucity of research exists on PLCs' effects on professional practice. Most research from 2011 to 2016 has focused on teacher perceptions of PLCs, administrator perceptions of PLCs, and PLCs' relative effect(s) on student outcomes on standardized assessments. Few studies are found in the research on how PLCs have changed teacher professional practices

specifically. This study is important for the potential results it may generate regarding whether PLCs have significant effects on teacher professional practices.

This study involved secondary mathematics teachers in high schools in Boone, Clay, Putnam, and Kanawha counties in West Virginia. These counties made up the former Regional Education Service Agency (RESA) 3 in south-central West Virginia, and represent a mix of rural, suburban, and urban school districts.

Results of this study provided school and district administrators with information that can be used for assessing, improving, and sustaining effective PLCs. This study may also provide information regarding the continuing importance of PLCs in the classroom and whether the ongoing PLC initiative in West Virginia is having a significant effect on classroom instruction.

Limitations

Limitations are potential weaknesses or problems with the study identified by the researcher. Often, these limitations relate to the number of participants in the survey, errors in measurement, and other factors related to data collection and analysis (Creswell, 2005).

The findings of this study were limited to the perceptions of secondary mathematics teachers in Boone, Clay, Putnam, and Kanawha counties in West Virginia. As such, the results are not generalizable to other academic areas or to other mathematics teachers. Those who responded to the survey may have done so out of a particular bias, either for or against PLCs in general. There may be differences in the implementation of PLCs in the counties and schools being studied (e.g., the DuFour PLC model mandated by the West Virginia Department of Education in 2009 may not be the model used in the schools in this study). An additional limitation was that all schools surveyed were secondary schools, and as such the results do not represent elementary PLC practices in the counties surveyed.

Organization of the Study

An introduction to the study is provided in Chapter One. Chapter Two contains the review of the related literature, while Chapter Three outlines the research method and data collection procedures. Study findings will be presented in Chapter Four, and Chapter Five will include a study summary, conclusions, a discussion and implications section, and recommendations for additional research.

Methods

This non-experimental, descriptive study examined the effect(s), if any, that professional learning communities have had on the professional practices of secondary (grades 9-12) mathematics teachers in Boone, Clay, Kanawha, and Putnam counties in West Virginia.

This study was completed using a one-shot, cross-sectional survey design focused on determining the levels of change in professional practice due to collaboration in PLCs in secondary mathematics classrooms in counties which made up RESA III in West Virginia. Secondary mathematics teachers were asked to provide their perceptions regarding the change(s) in their professional practices due to their participation in professional learning communities. Data based on various demographic variables was also collected.

The data collected from all survey questions were analyzed using measures of central tendency in the form of percentages which will expose majority agreement or disagreement with the statements posed in the questionnaire. The responses from the survey questions were categorized by common themes and demographic responses, which allowed emerging trends and potential relationships between demographics and survey items to be analyzed.

Chapter Two: Literature Review

This chapter will provide a review of literature relevant to the study and is divided into four sections. Section one discusses the history of professional development in the field of education in the United States. Section two discusses the development of professional learning communities in the educational field in the United States. Section three will review characteristics common to successful professional learning communities. Section four will examine implementation and effectiveness of professional learning communities with regard to changing and improving teaching methods in the classroom.

A Brief History of Professional Development

Professional development is the process of learning and keeping up-to-date in one's area of expertise (Murphy-Latta, 2008). High quality professional development is considered the most important component in improving education (Guskey, 1986). Additionally, Schmoker (2004) stated "evidence, research, and practices state that ongoing professional development coupled with professional learning communities show increases in student gains" (p. 424).

The need for professional development for educators first came to the fore in the 1960s as educators struggled to develop the necessary skills to teach a more diverse student population being challenged by increasing government pressure to achieve at ever-higher levels. The *Coleman Report* (1966) compiled the results of over 600,000 interviews with educators and students in the United States, and those results showed that academic achievement was related to social capital, meaning that "achievement was less related to the quality of the student's school, and more related to the social composition of the school, the student's sense of control of his or her environment and future, the verbal skills of teachers, and the student's family background" (Coleman, 1966).

Professional development activities were limited to a few in-service days a year, which were not conducive to improved teaching methods (Corcoran, Fuhrman, & Belcher, 2001). In this model, information was often given to teachers with "little regard to differences in the needs of the individual" (Little, 1995, p. 7). Often, teachers felt underwhelmed at the conclusion of these trainings because the information being given to them did not fit their individual needs. As such, many professional development activities were viewed as a waste of time by the educators (Sparks & Hirsch, 2000; Turchi, 2002). These trainings were often led by an expert in the field, or by a team of well-regarded individuals who dispensed knowledge on such items as school within a school, behavioral strategies, the benefits of group activities, improved family involvement, and classroom management strategies. Killion (2002) indicated that this model was viewed by many in the education field as the most effective manner in which to develop new knowledge and skills which could then be implemented in the classroom. Guskey (2000) asserted that this type of professional development was also considered a great opportunity to provide a large number of people with a shared knowledge base and a common vocabulary.

Murphy-Latta (2008) said that although experts felt the one-day training method was effective at training teachers, the teachers themselves felt a disconnect:

> Teachers are contractually obliged to attend the professional development days and often view these professional activity days filled with numerous activities as a waste of their time. They often state that time could be better spent in their classrooms. Teacher frustrations with professional development activities come from the lack of involvement in planning the activity. Typically, teachers have associated professional development with an ineffective means of contributing to their instruction (p. 21).

Fullan (1995), Guskey (1995), and Joyce & Showers (1995) indicated that teachers have taken the stance that professional development is often detached from the everyday demands of their position. Additionally, teachers felt that professional development was an ineffective use of their time, and felt that professional development was merely an obligation which needed to be filled as a condition of their employment rather than a true learning situation. Adding fuel to the fire, Schmoker (2004) pointed to the lack of focus on evidence-based learning in professional development. He cited a study (Corcoran, Fuhrman, and Belcher, 2001) which found that the "whims, fads, opportunism, and ideology" were more prevalent in deciding what subjects should be covered during professional development rather than "the promotion of coherence and alignment between staff development and academic goals" (p.8).

Others have also concluded that professional development efforts in this country are ineffective at providing meaningful information to teachers. Carpenter (2012) reported that professional development has lacked effectiveness at providing improvement in either student achievement or school effectiveness. Newmann, King, and Yongs (2001) stated that "the case for substantial investment in professional development is vulnerable because of an absence of research that links specific forms of professional development to changes in teacher learning and practice and to student achievement gains" (p. 1.) Tienken (2003) reported that minimal evidence could be found that professional development had any appreciable effect on either student achievement or teacher practice. Guskey (1997) asserted that there were three "particularly notable reasons" why professional development has often failed: a confused criteria of effectiveness, a misguided search for main effects, and a neglect of quality issues.

Guskey's concern that a confused criteria of effectiveness is accurate, according to the literature. Oftentimes the sole measure of the effectiveness of the training is participant

satisfaction, through evaluations given at the end of the trainings. These evaluations call on participants to self-evaluate the relevance of the topic, the presentation skills of the presenters, and the format of the training. Guskey called these criteria "happiness indicators" which evaluate only the locale and format of the presentation, not the information or the relevance to a teaching position. He further asserted that these evaluations are helpful in improving the design and the delivery of the professional development, but they are "extremely limited as a measure of effectiveness" (Guskey, 2000). According to Thompson (1994),

> After more than a decade of marginally effective reform, diverse stakeholders are coming to the same conclusion: Demanding more from our schools is not enough—the system itself (at local, district, and state levels) must be fundamentally changed. Piecemeal reform efforts of the past, some suggest, have been tantamount to applying a band aid to assuage schools' ills when what is needed is major surgery (p. 2).

Nicholson, Harris-John, and Schimmel (2005) questioned whether the public education system has the ability, or capacity, to improve student achievement:

> The majority of reforms aimed at building capacity are provided through routine professional development offerings—most often for teachers. This approach is often predicated on the premise that if educators are exposed to new ideas about teaching and learning, they will improve teaching or leadership practice by themselves and outside experts are the best sources for providing those new ideas (p. 6).

Guskey (2000) asserted that professional development that is job-embedded becomes an ongoing activity and is indispensable to educator effectiveness. Professional development which results in improved student learning is the nexus of educational reform movement and policies (Murphy-Latta, 2008). Research (Joyce & Showers, 1995; Kahle, 1997; Little, 1995) shows that

effective professional development is central to improved student learning, and that teacher buy-in to the professional development is imperative to the success of the training. DuFour (2002) asserted that professional learning communities, nurtured through professional development, are successful at not only improving student achievement but also in the re-culturing of schools.

Background and Development of Professional Learning Communities

A cursory review of the literature reveals that a great deal of information is available on professional learning communities, their development, their implementation, and their successes or failures. Researchers in the field indicate that implementing professional learning communities into schools is an accepted practice in high-performing schools and has been an effective means of driving improvement in academically struggling schools (DuFour, 2004a; Fullan, 2006; Hattie, 2009; Marzano, 2003). Many schools, however, who believe they are participating in professional learning communities have merely relabeled their departmental meetings as professional learning community meetings. The meetings often lack several of the important characteristics which give professional learning communities their educational foundation (Fullan, 2006). This literature review examined existing research on professional learning communities and their affects in the classroom, the efficacy with which they affect instruction in the classroom, the benefits of professional learning community implementation, the barriers to that implementation, and teacher perceptions of professional learning communities, and characteristics which have commonalities among successful professional learning communities.

Much of the current educational reform movement in the United States began with a report from the National Commission on Excellence in Education (NCEE) titled *A Nation at Risk* in 1983. This report detailed failings of our education system as seen through the examination of

relevant factors such as national literacy rate, results of international test scores, and the decline of higher level thinking skills among young adults. The report concluded with the assertion that "The citizen wants the country to act on the belief, expressed in our hearings and by a large majority in the Gallup Poll that education should be at the top of the nation's agenda" (para. 37). Additionally, the report argued that security of the nation was at risk because of "substandard education in American public schools" (DuFour and Eaker, 1998, p. 2) and that it was imperative that the United States focus on school reform.

According to East (2015), "After the publication condemned schools for their failure to adequately teach America's youth, educational reforms were prevalent throughout the next decades" (p.17). The flood of reforms which took place from 1983 to 1993 became known as the Excellence Movement which, as explained by DuFour and Eaker (1998) required schools not to change and adopt innovative teaching techniques, but to merely do more of what they were doing previously. Students needed to earn more credits for graduation in courses that were more rigorous and required more homework. Schools needed to add more days to the school year and lengthen the school day. Schools needed to test students more frequently and expect more of teachers both before offering employment and before extending tenure. (DuFour & Eaker, 1998, p.3).

Little (2002) asserted that the studies which resulted from the Excellence Movement in education determined that high school curriculum was superficial, fragmented, and sacrificed rigor and relevance to focus on maintaining school attendance and social order. "Teachers were forced to teach sterile curriculum that had little meaning in the real life of students. Teachers focused on content, which schools focused on attendance."

Tye and Tye (1984) asserted that the Excellence Movement reform efforts failed to produce desired results due to many factors:

> The reform efforts failed because teachers were isolated from one another, that little in the environment or circumstances of teaching encourages deviation from conventional practices, and that teachers did not often come together in their schools to discuss curricular and instructional changes. (p. 319).

Rosenholtz (1985) found that effective schools had improved student achievement through improved teacher interactions, teacher problem solving, teacher led decisions on pedagogy, and by allowing teachers to make classroom decisions about pedagogical methods which would help to determine how to better help struggling students. She concluded that collaboration and teacher contact were effective in improving academic achievement and that "schools should be considered places of intellectual sharing, collaborative planning and collegial work where staff interaction is characterized as task focused, cooperative and frequent" (p. 365). According to Carpenter (2012), both the Rosenholtz study and the Little study were among the first of their type to suggest that timely teacher collaboration with a focus on student achievement were keys to academic success.

In 1989, a coalition of governors met in northern Virginia to address what they felt was the continued failure of the American public educational system to produce graduates who were to be successful in an ever-advancing technological society. The program they proposed set forth eight national goals, each of which designed to be achieved by the year 2000, and each of which would ensure the success of the typical high school graduate. These goals, adopted by the federal government in 1994 under President Bill Clinton and known by their official title of Goals 2000: Educate America Act delineated what the summit of governors had decided to be most important

in the development of a structure which would insure educational success for the United States. According to Heise (1994) Goals 2000 acted as a decentralization of authority and sent decision making responsibility to the schools, empowering educators to determine the means best suited for accomplishing academic goals in their classrooms. Further, the Act would determine the means for holding educators accountable for accomplishing those goals.

Senge (1990) authored *The Fifth Discipline* in which he describes five disciplines of an organization made of individuals who must learn in order to create products that they truly desire (Carpenter, 2012). Senge details specifics of what he called "learning organizations" that used "systems thinking" which can best be described as a body of knowledge and tools that help an organization to see underlying patterns and how things can be changed (Thompson, Gregg, & Niska, 2004). He also described learning organizations as being able to "create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together." (p. 3). Senge also spoke of the importance of building shared vision within an organization. He stated:

> Where there is a genuine vision (as opposed to the all-familiar vision statement) people excel and learn, not because they are told to, but because they want to. But many leaders have personal visions that never get translated into shared visions that galvanize an organization. The practice of shared vision involves the skills of unearthing shared 'pictures of the future' that foster genuine commitment and enrollment rather than compliance. In mastering this discipline, leaders learn the counter-productiveness of trying to dictate a vision, no matter how heartfelt (p. 287).

While Senge's initial work focused on the business community, he branched out by publishing a field book, *Schools That Learn*, in which he focused on education and applied

systems thinking and learning organizations to schools (2000). His work in defining schools as learning organizations coalesced with that of Rosenholtz and Little in terms of needed collegiality, collaboration, and a shared vision in order to work together to develop a pedagogical system which would focus on what teachers needed to do and a shared knowledge of the end result.

Oakes (1989) in her studies on school context said that "there is evidence that a professional staff will work toward implementing strategies and programs to improve results" (p. 194). By encouraging staff to become a team of educators willing to work together in a learning organization, a school will become a community of teachers and learners dedicated to improving student achievement. Hord (1997) joined together the definition of schools as learning organizations and professional communities. She focused on the application of the work of Astuto, Clark, Read, McGree, and Fernandez (1993) who proposed three related communities: a professional community of educators, a learning community of educators and their students, and stakeholders in the community.

Hord's (1997) review focused on what Astuto et al. called the *professional community of learners*, where the teachers and administrators of a school continuously seek and share learning through collaboration and act on their learning, with the goal being to enhance their effectiveness as educators for the benefit of the students and community. In her work, Hord (1997) defined principles of effective learning communities by citing several attributes which she found to be common among successful learning communities. The attributes included supportive and shared leadership; collective creativity; shared values and vision; supportive conditions; physical conditions; people capacities; and shared practice. Further, the report described how successful professional learning communities look and act in practice by noting the following

characteristics: the collegial and facilitative participation of the principal who shares leadership – and thus power and authority – through inviting staff input in decision making; a shared vision that is developed from an unwavering commitment on the part of the staff to students' learning which is consistently articulated and referenced for the staff's work; collective learning among the staff and application of learning to solutions that address student needs; the visitation and review of each teacher's classroom behavior by peers as a feedback and assistance activity to support individual and community improvement; and physical conditions and human capacities that support such an operation (p. 24).

By the year 2000 education in America was once again under intense scrutiny. The move towards standards-based education which had begun in 1983 with *A Nation at Risk* was compounded by the 2002 reauthorization of the *Elementary and Secondary Education Act* (ESEA) of 1965. This act, originally passed into law under President Lyndon B. Johnson, was "designed to focus federal funds on poor schools with low-achieving students" (Jorgenson, 2003). The reauthorization which was signed into law by President George W. Bush in 2002 was known as the *No Child Left Behind Act* and moved American education into an era of high-stakes testing and accountability for schools and school districts. The law increased testing requirements by mandating that assessments be conducted annually in grades 3 through 8, and again once in high school. Schools had to demonstrate "adequate yearly progress" on these summative assessments for various groups of students. These groupings were broken down by race, gender, socio-economic status, and special education status. The law was hailed by Senator Edward Kennedy (D-Mass) as "a defining issue about the future of our nation and about the future of democracy, the future of liberty, and the future of the free world." He went on to say "no piece of legislation will have a greater impact or influence on that" (as cited in Rudalevige,

2003, para. 1). However, the law was perceived as a top-down approach by educators which was poorly defined, underfunded, and lacking in clarity (DuFour, DuFour, and Eaker, 2008).

NCLB has been declared a failure by many in the world of education, including the Harvard University Civil Rights Project, which released a review of National Assessment of Educational Progress (NAEP) score trends before and after passage of NCLB and concluded that implementation had no significant effect on improving reading or math achievement, had not helped the nation close the racial and economic achievement gap, and "the attempt to scale up the alleged success of states that already had test-driven accountability programs does not appear to have worked" (Lee, 2006). While No Child Left Behind and its stretch goals has, for the most part, been decoupled from educational accountability it did result in the renewed focus on school and teacher improvement. Educators, researchers, and other stakeholders set out to examine characteristics of academically successful schools and found many of them had implemented characteristics common to professional learning communities. Various studies in the literature (DuFour, 2004a; Wood, 2007; Graham, 2007) found that implementation of professional learning communities could result in higher academic achievement among students, regardless of their gender, race, socio-economic level, or level of disability.

Characteristics Common to Successful Professional Learning Communities

Dewey (1923) envisioned model schools where teachers worked collaboratively in order to give voice to what was working in their classrooms with critical dialogue about pedagogical practice. His approach included systematic study of teaching practices, conducted by the teachers themselves, who then made decisions about their classroom practice based on those conversations. The professional inquiry, he noted, ought to stimulate inquiry and further

innovation. This practice of collegial conversation about pedagogical practice lies at the heart of successful professional learning communities.

Contemporary use of the term *professional learning community* has moved from its origins by Rosenholtz (1985) and Little (1995) to a ubiquitous mix of educational practices. According to DuFour (2004b):

> People use this term to describe every imaginable combination of individuals with an interest in education – a grade level teaching team, a school committee, a high school department, an entire school district, a state department of education, a national professional organization, and so on. In fact, the term has been used so ubiquitously that it is in danger of losing all meaning (p. 1).

There is not a universal definition of a PLC (Stoll et al., 2006). DuFour (2004a) defines the term as "a group of people working interdependently toward the same goal." He later expanded this definition, writing that a PLC should be defined as "educators committed to working collaboratively in the ongoing process of collective inquiry and action research to achieve better results for the students they serve." (DuFour, DuFour, Eaker, and Many, 2010). Research in the field (Hord, 2004; Louis, Kruse, and Associates, 1995) indicates that PLCs appear to share four key characteristics which appear to work together to form an operating framework: shared values and vision, collective responsibility, reflective professional inquiry, and collaboration. Bolam, McMahon, Stoll, Thomas, and Wallace (2005) describe shared values and vision; collective responsibility for pupils' learning; collaboration focused on learning; group as well as individual professional learning; reflective professional inquiry; openness, networks, and partnerships; inclusive membership, and mutual trust, respect, and support as characteristics of a PLC.

Among the characteristics DuFour et al. (2010) recognize as essential characteristics of a successful PLC are a focus on learning**,** a collaborative culture with a focus on learning for all**,** collective inquiry into best practice and current reality, action orientation, a commitment to continuous improvement, and results orientation. Fullan's (2006) list of essential qualities, however, included collaboration focused on student learning, discussion of formative assessments, focusing on results, and data study as characteristics common to successful PLCs. These components will be used in the design of the survey instrument for this study.

In addition to the six characteristics common to successful PLCs, DuFour (2004b) presents three "big ideas" that represent the core principles of successful professional learning communities. These ideas help to guide efforts within the schools to sustain the professional learning community model until it "becomes deeply embedded in the culture of the school" (DuFour, 2004b). Accepting professional learning communities as part of the overall school culture is an important aspect to the success of their implementation. McLaughlin and Talbert (2010) assert that "Professional learning communities that center on students, use data effectively, distribute expertise, and enjoy district level leadership and investment are proving to have a powerful impact on school culture, instructional quality, and student outcomes" (p. 1).

The first big idea from DuFour (2004b) is that educators should ensure that students learn. The assumption that the core mission of formal education is not simply that students are taught but that teachers ensure that students learn as well. This shift in focus, from teaching to learning, has profound implications for schools and teachers. As a school moves toward implementation of this shift all of the educators in the institution must engage with each other in the examination of their responses to these four essential questions of a professional learning community: What do we want each student to learn? How will we know when each student has

learned it? How will we respond when a student has difficulty in learning? How will we respond when a student does not experience difficulty in learning?

It is the answer to the third question which separates professional learning community schools from schools which are more traditional in their approach. The staff of a PLC school will find that students who are having difficulty learning to be a situation which is unacceptable and react by designing strategies which will ensure that students who are struggling receive additional time and support. This attitude towards struggling students must be pervasive and systematic in the school. Additionally, the response of the professional learning community must be timely, based on intervention rather than remediation, and directive in nature. PLCs are timely in that the professional learning community *quickly* identifies students who are in need of assistance. Being based on intervention rather than remediation, the professional learning community provides students with assistance right away rather than relying on such institutions as summer school, retention in grade, or taking remedial courses. PLCs are directive in that students who are struggling are *required* to devote extra time and effort in order to master the necessary concepts. Buffum, Mattos, and Weber (2008) said:

> Students should receive timely interventions at the first indication they need more time and support. This process should be directive rather than invitational, so that the students get the extra help they need, consistently and without interruption, until they are successful. Finally, this extra support should not be dependent upon which teacher the student has, but instead should be implemented systematically, so that every student who faces the same problem is guaranteed the same response (p. 7).

DuFour's (2004b) second big idea is that schools should be collaborative in nature. The collaboration which characterizes a professional learning community is a systematic process,

with teachers working together to improve their classroom pedagogical methods. Teachers engage with each other in a systematic process, exploring an ongoing cycle of questioning which encourages team learning and improved classroom practice. Teachers who are working together in a professional learning community must realize that this process is imperative to the success of the PLC. This process, which focuses on student achievement data and instructional improvement, differs from congeniality, a focus on building group comradery, engaging in a book study, or developing a consensus on building or organizational procedures. None of these examples represent the type of dialogue which focuses solely and explicitly on student achievement, intervention, or enrichment.

In order for this collaboration to be successful, teachers must undergo a shift in their philosophy regarding the use of student data, pedagogical practice, and focus. According to DuFour (2004b):

> Collaborative conversations call on team members to make public what has traditionally been private – goals, strategies, materials, pacing, questions, concerns, and results. These discussions give every teacher someone to turn to and talk to, and they are explicitly structured to improve the classroom practice of teachers – individually and collectively (para. 24).

Finally, DuFour's third big idea is that schools should focus on results. Professional learning communities gauge their effectiveness based on student results on common formative assessments, interim assessments, and other benchmarks (including summative assessments such as federally-mandated testing). Every PLC within a school should work together to understand current levels of academic achievement, establish goals to improve that achievement, and provide evidence to support that improvement, such as common formative assessment results

(DuFour, 2004b). By examining student achievement data as part of a pervasive school practice schools become acutely aware of their progress toward established student achievement goals. This focus on student achievement data is a sea change for many educators; they find they must focus their efforts on student learning rather than previously held beliefs about their effectiveness as teachers. Educators must stop excusing unfavorable data and begin a self-examination of their teaching techniques with the realization that student achievement data must be their prime focus.

Reichstetter (2006) asserts that a PLC is made up of teams which collaborate at regular intervals, and whose efforts are dedicated toward continued improvement in meeting student needs through a shared vision focused on curriculum. Several components which facilitate a PLC are necessary. The components include supportive leadership; classroom and school structural conditions; collective challenges facing teachers and students; questioning and reflecting on instructional practices; team decisions on essential learning outcomes; and interventions from common formative assessments. Feger and Arruda (2008) assert that strong PLCs share an openness to improvement; trust and respect; a foundation in the knowledge and skills of teaching; supportive leadership; and socialization and school structures that extend the school's mission as characteristics imperative to academic improvement. Still others (Nelson, Slavit, Perkins, & Hathorn, 2008; Vescio, et al., 2008) suggest that PLCs are frequently associated with data-driven reform initiatives and can also take the name of inquiry groups or data teams. Marsh, Bertrand, and Huguet (2015) said:

They typically involve collaborative work among peers, guided by a lead teacher or facilitator. In theory, PLCs are effective in influencing teachers' thinking and practice because the discussions occur among trusted peers who may bring to the process diverse expertise and knowledge that enrich the conversations and analysis process (p. 2).

There exists a large theoretical base for the implementation of PLCs, and as is evident there are several threads common to their makeup and implementation. These include shared leadership; collaboration and collegiality; shared mission; shared goals; a focus on improvement and results; shared practice; and shared vision. The defining characteristics of a PLC meet these common threads, although there are several others which fit the definition. PLCs are a "shift in the way we conduct business every day as educators. PLCs are a way of improving education for teachers and students" (Carpenter, 2012).

Changes in Instructional Practice

At its core, the concepts of PLCs rest on the premise of improving student learning by improving teaching practice (Vescio, et al., 2008). A common perception in the literature and among practitioners is that PLCs generally are successful in improving teaching practice and student achievement (Hord, 1997, Stoll & Louis, 2007, Wood, 2007). However, rigorous evaluation studies of PLCs are limited in scope and number, and evaluations which are available are mixed (Lomos, Hoffman, & Bosker, 2011; Vescio, et al., 2008).

Dunne, Nave, & Lewis (2000) conducted a study of 12 schools (five high schools, five elementary schools, and two middle schools) in Chicago under the auspices of the Annenberg Institute for School Reform where they created Critical Friends Groups (CFGs). Critical Friends Groups are similar to PLCs in that teachers in CFGs come together to "identify student learning goals that make sense in their schools, look reflectively at practices intended to achieve those goals, and collaboratively examine teacher and student work in order to meet their objectives" (p. 1). Student populations in these schools ranged from 200 students to 2,100 students, with varying socio-economic and racial backgrounds. The evaluation team observed CFG meetings, observed and interviewed CFG and non-CFG teachers, and collected samples of teacher and student work

over a period of two school years, beginning the spring before each school's coach was trained. These data provided insight into the connections among CFG activities, teacher's thinking about their practice, and changes in their actual practice. Evaluators collected data at the 12 schools during site visits. For eight of the schools they collected data twice a year for one week, and for four of the schools they collected data once a month on the day of the CFG meetings. The researchers then surveyed all teachers in 62 area schools with CFG groups (which included the 12 in the study) to ascertain differences between teachers who participated in CFGs and teachers who did not.

Teacher's answers to the survey indicated that, by a wide margin, CFG teachers collaborate more with each other than do non-CFG teachers. CFG teachers agreed more than did non-CFG teachers that they share ideas about teaching, share samples of their students' work, meet regularly to discuss classroom problems, work together to develop teaching materials or activities, and seek each other's advice about professional issues and problems. They also agreed more than did non CFG teachers that they could count on most staff members to help out anywhere, anytime, and that there was a great amount of cooperative effort among staff members (Dunne, et al., 2000, p.185).

Additionally, teachers indicated there were significant effects on classroom instruction. "Classroom observations and interviews with teachers indicated a shift from teacher-centered to student-centered instruction in classes taught by CFG teachers. Classroom arrangements became more flexible, and the pace allowed students more time to gain mastery of a subject, often through team learning (Dunne, et al., 2000). Berry, Johnson, & Montgomery (2005) found that dramatic increases in student achievement as measured by grade level testing had occurred. In a study conducted in a rural elementary school over a four year period, students improved from

slightly more than 50% scoring at or above grade level to more than 80% of students meeting grade level standards. Phillips (2003) reported that at a middle school in Texas, ratings on a statewide standardized test went from 50% proficiency in reading, writing, and math in 1999-2000 to 90% proficiency in 2001-2002 after the introduction of professional learning communities at the school.

Supovitz (2002) conducted a 4 year study of Cincinnati area schools who were employing a district-wide reform movement called Students First, which revolved around the effect of communities of instructional practice on teacher instruction and student learning. A mixed methods approach was used in the study which collected data from various sources, including interviews, surveys, classroom observations, and student achievement scores. A school culture scale was used to analyze data, which was based on teacher collaboration, collective responsibility, reflective dialogue, faculty influence, and de-privatization of practice. Supovitz (2002) attempted to connect the culture scale to instructional practice and student achievement, based on the belief that if teams of teachers changed instructional practices, the expectations of teachers would lead to higher student performance. Results from the study indicated that effective communities of instructional practice scored well on the school culture scale which also related positively to student achievement data.

Data study by teachers is an important part of the PLC process (DuFour, et al., 2010). Actions taken by teachers in PLCs in response to data was studied by Marsh, et al., (2015) in an attempt to better understand ways in which teachers involved in PLCs were using data to affect classroom practice and student achievement. “In theory, PLCs are effective in influencing teachers’ thinking and practice because the discussions occur among trusted peers who may bring to the process diverse expertise and knowledge that enrich the conversations and analysis

process" (Marsh, et al., 2015, p. 2). This study found that teachers responded to student learning data with "surface-level changes to instruction" (p. 2). However, when teachers who were strong in both vertical expertise (an individual's knowledge and skills) and horizontal expertise (knowledge that is co-created through interactions and movement across contexts) observations found that changes in practice were more meaningful (Marsh, et al., 2015).

The collaborative process of the PLC has the potential to affect teacher data-use skills. Datnow, Park, and Kennedy-Lewis (2012) conducted a multi-school data use study which concluded that social interactions were a major influence in the development of ways in which teachers utilized student data. Symonds (2003) found similar results in a study of schools in the Bay Area of California. Mason (2003) found that teachers who viewed student data as a tool for improvement rather than an accountability measure made significant changes in the manner in which they approached the use of data in PLCs and in shaping the focus of instruction in their classrooms.

McGee (2016) conducted a study of 112 Chicago science and special education teachers using the *School Staff Questionnaire* in an attempt to measure, among other items, changes in science teaching practices. Among the findings in this area, McGee (2016) found that while none of the formal opportunities were statistically significant within the model that included indicators of professional community, conversations were taking place among the teachers about curriculum and student work despite changing district leadership and policy ambiguity. "These conversations about curricula and student work have a significant influence on changes in teaching practice" (p.161).

Elementary teachers were involved in a two-year grant focused on professional development using lesson study processes to increase their understanding of mathematics content

and effective mathematics pedagogy in a study conducted by Gee & Whaley (2016). The primary research questions focused on how 16 elementary teachers described their professional growth after being involved in lesson study in a professional learning community with other teachers and university professors and how they described the impact the program had on their teaching of mathematics. Case study methodology provided the tools for researchers to study complex phenomena within a professional learning community setting. Collected data included interviews of selected teachers focused on the lesson study process, teacher journal reflections, and recordings of individual teacher discussions of video taped segments of their teaching. Data indicated the participants valued collaboration within the community of learners and a change in practice through a focus on student discourse, student thinking, and questioning strategies. The majority of teachers demonstrated the change in practice.

All of the teachers interviewed indicated a change in practice in the way they taught, that involved a deeper understanding of the importance of using problem based instruction to strengthen students' conceptual understanding of mathematics. In addition, all teachers emphasized the effect of teacher reflection and dialogue with other teachers on instruction in changing, and thus improving, their practice (p. 95).

Brucker (2013) conducted a study which investigated teacher perceptions of levels of implementation and effectiveness with regard to student learning in Kanawha County, West Virginia. Her findings indicated that the participants' level of implementation as some or most of the time, and effectiveness of the PLC was somewhat effective to effective. Monterosso (2014) conducted a study centered on professional learning communities which met during common planning time and effects on 8th grade reading scores. School principals were surveyed to ascertain the frequency of common planning time among 8th grade reading teachers. Her findings

concluded that, despite responding administrator's feeling that their PLC implementation was strong, there was little correlation between common planning time and 8th grade reading scores. East (2015) conducted a study based on characteristics of implementation and teacher perceived effectiveness in improvement schools in West Virginia. Teachers reported PLC implementation levels as some of the time and most of the time and they were judged to be somewhat effective to effective in improving student learning. None of these studies examined effects of PLCs on instruction in the classroom in West Virginia.

Summary

The widespread development of PLCs throughout the nation came as a result of many educational improvement initiatives in 1980. While there are no true definitions of a PLC, several commonalities exist among those groups which have been successful in advancing student achievement. Vescio et al. (2008) conducted a review of research concerning the impact professional learning communities have had on teaching practices and student learning; they found that between 1990 and 2005 only 10 empirical studies had been conducted on the subject in the United States. A search of two key sources drove further investigation into the research on the topic. First, a review of various websites, including the Annenberg Institute for School Reform, the Wisconsin Center for Educational Research, and Google Scholar was conducted. Second, an examination of the EBSCO and ERIC databases was completed. These searches (while limited in scope) revealed that since 2006 only 42 studies focused solely on the effects of professional learning communities and instructional practices. The results of these searches, while no means exhaustive, suggest that further research on the topic could prove valuable. The literature in West Virginia on the effects of PLCs on classroom instruction is extremely limited.

This study seeks to add to the body of research available concerning the effects of PLCs on classroom instruction.

Chapter Three: Methods

This non-experimental, descriptive study examined the effect(s), if any, that professional learning communities have had on the professional practices of secondary (grades 9-12) mathematics teachers in Boone, Clay, Putnam, and Kanawha counties in West Virginia. Also investigated were potential differences in instructional-practice change(s) based on selected demographic variables: age, sex, degree level, grade level taught, total years of teaching experience, total number of years in current position, total years of PLC participation, and specific math subject taught. This study also described teacher suggestions to enhance their collaborative efforts and professional practice based on input from individual PLCs.

Problem Statement

Vescio et al. (2008) conducted a review of research concerning the impact professional learning communities have had on teaching practices and student learning, finding that between 1990 and 2005 only 10 empirical studies had been conducted on the subject in the United States. A search of two key sources drove further investigation into the research on the topic. First, a review of various websites, including the Annenberg Institute for School Reform, the Wisconsin Center for Educational Research, and Google Scholar was conducted. Second, an examination of the EBSCO and ERIC databases was completed. These searches (while limited in scope) revealed that since 2006 only 42 studies focused solely on the effects of professional learning communities and professional practices. The results of these searches, while by no means exhaustive, suggest that further research on the topic could prove valuable.

The intent of this study was to survey mathematics instructors who taught in secondary schools in four West Virginia counties (i.e., Boone, Clay, Putnam, and Kanawha) in an examination on the effect(s) professional learning community activities (e.g., improved

collaboration, data study, and formative assessment) have on professional practice in mathematics classes. While three studies have been conducted in the last 10 years on professional learning community practice in our state, none have focused on professional practice. Brucker (2013) focused on teacher perceptions of levels of implementation and effectiveness. Monterosso (2014) conducted a study which centered on professional learning communities, common planning time, and their effects on 8th grade reading scores. East (2015) looked at perceived teacher effectiveness in SIG schools in West Virginia.

Research Questions

The primary question for this study is: To what extent are professional practices affected by interactions and collaboration in PLCs. Five research questions will guide this study. The questions are:

1. To what extent, if any, have PLCs brought about changes in instructional practice?
2. To what extent, if any, have PLCs brought about increased collaboration among teachers?
3. To what extent, if any, have PLCs brought about changes in data study?
4. To what extent, if any, have PLCs brought about changes in assessment practices?
5. To what extent, if any, do selected demographic characteristics affect participant responses to survey items?

Research Design

This study was completed using a one-shot, cross-sectional survey design focused on determining the levels of effective change in professional practice due to collaboration in PLCs in secondary mathematics classrooms in counties which made up Regional Educational Service Agency (RESA) III in West Virginia. A cross-sectional survey was used to collect data from one

group of subjects at one point in time (Fink, 2003) and this survey solicited information from secondary mathematics teachers at one such specific point in time. Secondary mathematics teachers were asked to provide their perceptions regarding the change(s) in their professional practices due to their participation in professional learning communities. Data based on various demographic variables were collected.

Population

The population for this study included secondary mathematics faculty at 16 secondary schools during the fall semester 2018. There were approximately 81 secondary mathematics faculty in the schools targeted for research. Two of the schools in the study were junior/senior high schools with student population ranging from 7th grade to 12th grade. These schools were included in the study.

For the purposes of this study, secondary mathematics faculty were defined as those teachers who teach any mathematics subject, regardless of academic level, in grades 7 through 12 (i.e., 7th grade mathematics, 8th grade mathematics, algebra I, algebra II, geometry, pre-calculus, trigonometry, transitional mathematics, International Baccalaureate (IB) mathematics studies, algebra III, applied math, assisted math, computer science and mathematics, math 1-8, math 1-9, math II, math III (liberal arts focus), math III (science, technology, engineering, math) (STEM) focus, math III (technical readiness) (TR) focus, math IV, math IV (TR) focus, STEM readiness mathematics, advanced mathematical modeling, Advanced Placement calculus (AB), Advanced Placement calculus (BC), and Advanced Placement statistics (West Virginia Educational Information System, 2017).

Instrumentation

An online survey entitled *Mathematics Professional Change Questionnaire* was used in this study. This survey, based on the *School Staff Questionnaire* (Parise & Spillane, 2010) and used with permission, consisted of three sections. Part C of the survey contained demographic information with basic questions pertaining to participants' sex, degree level (bachelors, bachelors + 15, bachelors + 30, masters, masters + 15, masters + 30, masters + 45, advanced degree or certificate), number of years of experience in public education, number of years teaching at the schools where the participants were employed, number of years in their present positions, and the number of years of participation in PLCs. The final question in this section asked participants to identify the composition of the PLCs in which they participated (e.g., departmental, cross-curricular, both, or other).

Part A of the survey contained questions pertaining to changes in professional practice, collaboration, data study, and assessment practices using a Likert-type scale of 1-6. Part B consisted of three open-ended questions requesting that participants identify changes they have made in their classroom as a result of their participation in PLCs, their impressions about the usefulness of PLCs with regard to their instructional practices, and their suggestions for further professional development with regard to PLC practice. The complete instrument is contained in Appendix C.

Data Collection

An introductory email describing the study and requesting permission to conduct the survey with the members of their mathematics faculty was sent to the principals of secondary schools in Boone, Clay, Kanawha, and Putnam counties. After getting administrative permission, emails explaining the study and asking their participation were sent to all mathematics faculty in

secondary schools in the participating counties. A link to the survey was included in the email. Participant responses were collected and the responses analyzed.

Data Analysis

The data collected from all survey questions were analyzed using frequency counts in the form of percentages which will expose majority agreement or disagreement with the statements posed in the questionnaire. The responses from the survey questions were categorized by common themes and demographic responses, allowing emerging trends and potential relationships between demographics and survey items to be analyzed. Emerging categories for specific changes in professional practice and suggestions for further PLC professional development were examined with regard to open-ended questions 1 and 2, while question 3 employed positive, neutral, and negative categories to determine impressions about the usefulness of professional learning communities.

Significance of Study

A paucity of research exists on PLCs' effects on professional practice. Most research from 2011 to 2016 has focused on teacher perceptions of PLCs, administrator perceptions of PLCs, and PLCs' relative effect(s) on student outcomes on standardized assessments. Few studies are found in the research on how PLCs have changed teacher professional practices specifically. This study is important for the potential results it may generate regarding whether PLCs have significant effects on teacher professional practices.

This study involved secondary mathematics teachers in high schools in Boone, Clay, Putnam, and Kanawha counties in West Virginia. These counties made up the former Regional Education Service Agency (RESA) 3 in south-central West Virginia, and represent a mix of rural, suburban, and urban school districts.

Results of this study provide school and district administrators with information that can be used for assessing, improving, and sustaining effective PLCs. This study may also provide information regarding the continuing importance of PLCs in the classroom and whether the ongoing PLC initiative in West Virginia is having a significant effect on classroom instruction.

Limitations

Limitations are potential weaknesses or problems with the study identified by the researcher. Often, these limitations relate to the number of participants in the survey, errors in measurement, and other factors related to data collection and analysis (Creswell, 2005).

The findings of this study were limited to the perceptions of secondary mathematics teachers in Boone, Clay, Putnam, and Kanawha counties in West Virginia. As such, the results are not be generalizable to other academic areas or to other mathematics teachers. Those who responded to the survey may have done so out of a particular bias, either for or against PLCs in general. There may have been differences in the implementation of PLCs in the counties and schools being studied (e.g., the DuFour PLC model mandated by the West Virginia Department of Education in 2009 may not be the model used in the schools in this study). An additional limitation was that all schools surveyed were secondary schools, and as such the results do not represent elementary PLC practices in the counties surveyed.

Chapter Four: Presentation and Analysis of Data

The purpose of this study was to examine the effect(s) professional learning communities (e.g., instructional practices, collaboration, data study, and formative assessment) have on professional practice in secondary mathematics classes in Boone, Clay, Putnam, and Kanawha counties in West Virginia. Findings in this chapter are organized around the following sections: data collection, participant characteristics, major findings for each of the five research questions examined in this study, qualitative analysis, and a summary.

Data Collection

On September 26, 2018 an introductory email describing the study and requesting permission to conduct the survey with the members of their mathematics faculty was sent to the principals of each of the secondary schools in the survey area. Follow-up phone calls were made on October 28, 2018 to administrators who had not responded to the email. The survey was approved for distribution by administrators at all 16 schools. On October 4, 2018 the survey, *Mathematics Professional Change Questionnaire* (Appendix C) was distributed via email to all secondary mathematics faculty in the selected counties ($N = 81$). A reminder email was sent to the potential participants on October 22, 2018. Survey data collection concluded on November 19, 2018. The response rate for the participating schools was 22% ($n = 18$).

Participant Characteristics

Part C of the survey requested demographic information pertaining to the participants' sex, degree level, number of years of experience in public education, number of years teaching at the schools where the participants were employed, number of years in their present position, number of years of PLC participation, and the composition of the PLCs in which they participate (e.g., departmental, cross-curricular, both, or other).

Sex

Five (27.8%) of the participants in the survey were male, while 13 (72.2%) were female. These data are arrayed in Table 1.

Table 1

Demographic Characteristics of Participants

Sex	*n*	%
Male	5	27.8
Female	13	72.2

Degree Level

The degree level choices were categorized as bachelors, bachelors + 15, bachelors + 30, masters, masters + 15, masters + 30, masters + 45, and advanced degree or certificate. The responses indicated 11.1% of the participants held bachelors degrees, 11.1% of the respondents fell into the category of bachelors + 15, 11.1% of the participants held masters degrees, 16.7% held masters degrees + 15 hours, 22.2% held masters degrees + 30 hours, and 27.8% held masters degrees + 45 hours. None of the participants categorized themselves as holding bachelors degrees + 30 hours or as holding an advanced degree or certificate. These data can be seen in Table 2.

Table 2

Degree Level of Participants

Degree Level	*n*	%
Bachelors	2	11.
Bachelors + 15	2	11.1
Bachelors + 30	0	0
Masters	2	11.1
Masters + 15	3	16.7
Masters + 30	4	22.2
Masters + 45	5	27.8

Experience

The majority of participants in the study (55.5%) indicated 16 or more years of experience in public schools. Teachers with 6-10 years of experience comprised 27.8% of the participants, followed by teachers with less than 5 years of experience (11.1%) and 11-16 years of experience (5.6%). These data can be seen in Table 3.

Table 3

Years of Public Education Experience

Years	*n*	%
Less than 5	2	11.1
6-10	5	27.8
11-15	1	5.6
16 or more	10	55.6

Years of Teaching Where Presently Employed

Thirty-eight percent of the participants indicated they had been teaching at the school where they were presently employed for 6-10 years, while 33.3% had been at their present school for less than 5 years, and 27.8% indicated they had been at their present school for 16 years or more. These data can be seen in Table 4.

Table 4

Years of Teaching Where Presently Employed

Number of Years	*n*	%
Less than 5	6	33.3
6-10	7	38.9
11-15	0	0
16 or more	5	27.8

Years of Teaching in Present Positions

Responses to the survey showed that 38.9% of the respondents had been teaching 16 years or more in their present positions. Thirty-nine percent of the respondents had been teaching 6-10 years in their present positions, while 16.7% had been teaching in their present positions less than five years, and 5.6% had been in their present positions 11-15 years. These data can be seen in Table 5.

Table 5

Years of Teaching in Present Position

Number of Years	*n*	%
Less than 5	3	16.7
6-10	7	38.9
11-15	1	5.6
16 or more	7	38.9

Years of PLC Participation

The majority of respondents (44.4%) had been involved in PLCs for 6-10 years. Thirty-three percent had been involved less than 5 years, while 22.2% had been involved in PLCs for 11-15 years. None of the respondents had been participating in PLCs for 16 years or more. These data can be seen in Table 6.

Table 6

Years of PLC Participation

Number of Years	*n*	%
Less than 5	6	33.3
6-10	8	44.4
11-15	4	22.2
16 or more	0	0

Composition of PLCs

Most of the respondents (55.6%) were involved in departmental PLCs, while 44.4% were involved in a hybrid of departmental and cross-curricular PLCs. None of the participants indicated they were involved in strictly cross-curricular PLCs. No other compositions of PLCs were listed by the participants. These data can be seen in Table 7.

Table 7

Composition of PLCs

Composition	*n*	%
Departmental	10	55.6
Cross-curricular	0	0
Both	8	44.4
Other	0	0

Research Question 1: To what extent, if any, have PLCs brought about changes in instructional practice?

This survey contained six questions which focused on changes made by the educators regarding instructional practices due to PLC participation. Question 2 asked the participants, on a scale of 1-6, if their participation in PLCs had any effect on teaching materials used in their classroom. The mean response for this was 4, with 77.8% ranking this as 4, 5, or 6, indicating significant change in professional practice. This was the highest level of change in the instructional practice category. A majority of the respondents agreed with Question 1, that PLCs had affected their teaching methods (66.67%). They also agreed with Question 5, indicating substantial change in the understanding of the academic needs of their students (66.67%), and with Question 6, change in the manner in which they assessed their students (61.12%). The

participants also indicated substantive change on Question 3 regarding whether PLC participation had affected their student grouping practices (50%), and on Question 4, whether the kinds of questions they asked in their classrooms had changed (50.01%). The means for questions 1 (3.89), 3 (3.28), 4 (3.72), 5 (3.83), and 6 (3.83) indicated that there was disagreement (at least to some degree) with the extent to which participation in PLCs had changed their instructional practices in their classrooms.

Table 8

Extent to Which PLCs Have Brought About Changes in Instructional Practice

Question	1	2	3	4	5	6	Mean
Teaching Methods	2	2	2	5	4	3	3.89
Teaching Materials	2	1	1	6	7	1	4.00
Student Grouping Practices	4	0	5	5	4	0	3.28
Kinds of Questions Asked	3	1	5	1	5	3	3.72
Understanding Academic Needs	3	1	2	5	4	3	3.83
Student Assessments	2	1	4	3	7	1	3.83

Research Question 2: To what extent, if any, have PLCs brought about increased collaboration among teachers?

Participants were asked to provide their input on four questions relating to increased collaboration among colleagues due to PLC participation. The mean ratings of the responses in this area ranged from a high of 4.22 to a low of 3.00. Question 1 asked about collaboration with regard to subject area content. This question generated the highest mean (4.22) and an overall substantive change percentage of 66.67%. None of the other questions in this area had means higher than 4.00. Question 3 – collaboration about classroom instruction – had a mean of 3.83

and an overall rate of change percentage of 66.67%. Question 2 – collaboration about how to help students learn – had a mean of 3.72 and a rate of substantial change percentage of 61.1%. The question with the lowest mean response asked respondents about collaboration with colleagues about classroom management. This question generated a mean of 3.00 and a rate of change percentage of only 38.9% (*n = 7*).

Table 9

Extent to Which PLCs Have Brought About Changes in Collaboration

Question	1	2	3	4	5	6	Mean
Content Being Taught	2	1	3	2	5	5	4.22
How to Help Students Learn	3	3	1	3	5	3	3.72
Classroom Instruction Practices	3	2	1	4	5	3	3.83
Classroom Management Practices	5	3	3	3	2	2	3.00

Research Question 3: To what extent, if any, have PLCs brought about changes in data study?

The survey instrument contained five questions related to changes in data study behaviors as a result of PLC participation. The mean ratings for this set of questions ranged from 3.67 to 3.28. The question with the highest mean response was Question 1 – examination of student assessment data. This question had a mean response of 3.67 and a substantive change percentage of 55.5%. The question that had the lowest mean response asked participants to rate their use of assessment data to drive enrichment practice in the classroom. The mean response to this question was 3.28, with a substantive change response of only 44.4%. Question 2, concerning the sharing of assessment data, had a mean response 3.33 and a substantive change percentage of 50%, while Question 4 – use of assessment data to drive remediation practice in the classroom –

had a mean response of 3.44 and a substantive change percentage of 55.5%. Question 3, which dealt with the use of assessment data to drive changes in instructional practice, had a mean of 3.56 (second highest in the group) and a substantive change percentage of 61.1%, the highest among the five questions asked about data study. The responses to all questions in this area are found in Table 10.

Table 10

Extent to Which PLCs Have Brought About Changes in Data Study

Question	1	2	3	4	5	6	Mean
Examination of student assessment data	3	3	2	4	1	5	3.67
Sharing of assessment data	5	3	1	4	0	5	3.33
Use of assessment data to drive changes in instructional practice	4	2	1	6	1	4	3.56
Use of assessment data to drive changes in remediation practice	4	3	1	5	1	4	3.44
Use of assessment data to drive changes in enrichment practices	5	2	3	3	1	4	3.28

Research Question 4: To what extent, if any, have PLC brought about changes in assessment practice?

In Question 4, participants were asked to rate four questions surrounding the premise that PLCs had an effect on their assessment practices. Of the four questions, none rated higher than a mean of 3.44 or a substantive change rate of 50%. The highest rated mean was found for Question 2, which asked participants to assess the extent to which their participation in PLCs has brought about changes to assessments they had given to determine areas of academic weakness among their students (formative assessments). On this question, the mean was 3.44 and the substantive change rate that PLCs had a positive effect was 50%. Question 1 asked if PLCs had

any effect on the frequency of assessments given. This question generated a mean of 3.0 and a change rate of only 38.9%. Question 3 – the use of assessments to determine overall knowledge of a given objective (i.e., summative assessments) – had a mean of 3.06 and a change rate of only 33.3%. The lowest rated of the questions was Question 4, which asked participants to rate the extent to which their participation in PLCs had an effect on assessments developed by collaborative teams (i.e., common formative assessments). The mean for this question was only 2.94, and it generated a substantive change rate of 38.9%. These data can be found in Table 11.

Table 11

Extent to Which PLCs Have Brought About Changes in Assessment Practices

Question	1	2	3	4	5	6	Mean
Frequency of assessments given	5	4	2	3	1	3	3.0
Assessments to determine areas of academic weakness (formative)	4	2	3	3	3	3	3.44
Assessments to determine overall knowledge of a given objective (summative)	4	3	5	2	2	2	3.06
Assessments developed by collaborative teams (common formative assessments)	7	2	2	3	0	4	2.94

Research Question 5: To what extent, if any, do selected demographic characteristics (sex, degree level, years of experience in public education, years of experience teaching mathematics, years of experience at present school, years of experience in present subject area, years of participation in PLCs, and composition of PLC participation) affect participant responses to survey items?

The survey instrument contained 19 specific items within four categories related to possible changes in professional practice (i.e., instructional practice, collaboration, data study,

and assessment) which may have occurred due to participation in PLCs. In analyzing the data, the researcher used bivariate analyses to determine whether any significant relationships existed between the demographic data (i.e., sex, years of experience in public education, years of experience teaching mathematics, years of experience at present school, years of experience in present subject area, years of participation in PLCs, and composition of PLC participation) and participant responses to the questions concerning their professional practice. Each professional practice item in the survey was calculated independently against each demographic characteristic.

Instructional Practice Question 1 asked participants to rate the extent to which their participation in PLCs had affected their teaching methods. This question was found to have a significant relationship at .521 (significant at the $p < 0.05$ level) with the number of years of PLC participation by the participants. These data can be found in Table 12.

Table 12

Bivariate Correlations between Teaching Methods and Years of PLC Participation

		Teaching Methods	PLC Participation
Teaching Methods	Pearson Correlation	---	.521*
	Significance (2-tailed)	---	.027
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Instructional Practice Question 3 asked participants to rate the extent to which their participation in PLCs affected their grouping practices. This question was found to have a significant relationship with the composition of participants' PLCs. The Pearson *r* was .539 ($p < 0.05$ level). These data can be found in Table 13.

Table 13

Bivariate Correlation between Grouping Practices and PLC Composition

		Grouping Practices	PLC Composition
Grouping Practices	Pearson Correlation	---	.539*
	Significance	---	.021
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Instructional Practice Question 4 asked participants to rate the extent to which their participation in PLCs affected their questioning practices. This question was found to have a significant relationship with the composition of participants' PLCs. The Pearson *r* was .477, which was significant at the $p < 0.05$ level. These data can be found in Table 14.

Table 14

Bivariate Correlation between Questioning Practices and PLC Composition

		Questioning Practices	PLC Composition
Questioning Practices	Pearson Correlation	---	.477*
	Significance	---	.045
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Collaboration Question 3 asked participants to rate the extent to which their participation in PLCs had changed how often conversations had taken place with their colleagues about instructional practices. The question was found to have a significant relationship with the participants' subject area (the specific course of mathematics being taught). The Pearson *r* was .479, which was significant at the $p < 0.05$ level. These data can be found in Table 15.

Table 15

Bivariate Correlation between Participant Conversations Concerning Instructional Practices and Years of Experience in Present Subject Area

		Instructional Practice Collaboration	Years of Experience Present Subject Area
Instructional Practice Collaboration	Pearson Correlation	---	.479
	Significance	---	.044
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Data Question 3 asked participants to rate the extent to which their participation in PLCs had affected their use of data to drive changes in their instructional practice. The question was found to have a significant relationship with the composition of the participant's PLCs. The Pearson *r* was found to be .469, which was significant at the $p < 0.05$ level. These data can be found in Table 16.

Table 16

Bivariate Correlation between Use of Data to Drive Changes in Instructional Practice and PLC Composition

		Use of data to drive changes in Instructional Practice	PLC Composition
Use of Data to Drive Changes In Instructional Practice	Pearson Correlation	---	.469*
	Significance	---	.050
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Assessment Question 3 asked participants to rate the extent to which their participation in PLCs had affected their assessments given to determine overall knowledge of a given objective (summative assessment). The question was found to have a significant relationship with the number of years of PLC participation of the participants. The Pearson *r* was.565, which was significant at the $p < 0.05$ level. These data can be found in Table 17.

Table 17

Bivariate Correlation between Summative Assessments and Years of PLC Participation

		Summative Assessment	PLC Participation
Summative Assessment	Pearson Correlation	---	.565*
	Significance	---	.014
	n	18	18

*Correlation is significant at the $p < 0.05$ level (2-tailed)

Qualitative Analysis

The Mathematics Professional Change Questionnaire contained three open ended questions requesting that participants identify changes they have made in their classrooms as a result of their participation in PLCs, impressions about the usefulness of PLCs with regard to their professional practice, and suggestions for further professional development relating to PLC practice at their schools. Open ended questions offer insight into why individuals maintain specific belief (Fink, 2006). Fink continued by asserting that the resulting data provide descriptions of feelings and perceptions, values, habits, and personal backgrounds or demographic characteristics (p. 4). Creswell (2009) wrote that the analysis of qualitative research consists of "analyzing the data for significant phrases, developing meanings and clustering them into themes, and presenting the description of the phenomenon" (p. 160). Liu (2012) wrote that

sentiment analysis is "the field of study that analyzes people's opinions, sentiments, evaluation, appraisals, attitudes, and emotions" (p. 7). Sentiment analysis was used to analyze positive, neutral, and negative responses to determine impressions about specific changes in professional practice, usefulness of professional learning communities, and suggestions for further PLC professional development.

In Part B, Question 1 of the survey, participants were asked to respond to this open-ended question: Is there anything else you wish to report concerning the effect of PLCs on your instructional practice, your collaborative practice, your data study practice, or your assessment practice? A total of eight responses were recorded to this question.

Sentiment analysis (Liu, 2012) was used to analyze and categorize these responses. Four negative responses (50%) to the question were recorded as were three positive responses (37.5%), and one neutral response (12.5%). Negative responses included these:

- "PLCs actually take time away from helping our students."
- "My colleagues share materials, assessments, data, etc. all the time without being forced to participate in unnecessary meetings and creating more paperwork."
- "USELESS!!"

Positive responses to the question included the following:

- "PLCs are especially beneficial for newer teachers."
- "The PLCs let us see that we all are encountering the same types of strengths and weaknesses of the students in our classes. We have focused on CFAs and sharing data to improve our instruction. We also are completing a book study on our own to help improve instructional practices."

The neutral response to the question was "PLCs have really affected my teaching if they are effective. Many times we have had PLCs that do not help or are conducted by people that are not qualified in our content." The results of these data can be seen in Table 18.

Table 18

Effects of PLCs on Instructional, Collaborative, and Data Study Practices

Sentiment	*n*	*%*
Positive	3	37.5
Neutral	1	12.5
Negative	4	50

In Part B, Question 2 of the survey, participants were asked to describe their impressions about the usefulness of PLCs as they may have affected their professional practice. There were a total of nine responses to the request. Sentiment analysis (Liu, 2012) was used to analyze and categorize the responses. Five negative responses (55.6%) were recorded to the request, as were three positive responses (33.3%), and one neutral response (11.1%). Negative responses included the following:

- "Not useful at all. This is just a device that the board offices can use to get free labor from the teachers. Since we are to stay on the topic dictated by the board office we can't discuss actual issues that we need addressed in the classroom. We are not able to share ideas because that would be considered off topic."
- "I have not found PLCs useful as I take offense to the methods of teaching me new skills. As an older teacher I do not like having to make me actually perform a new strategy, technique or method, as opposed to knowing I am experienced enough to be able to perform these techniques with simple instructions. It is rather demeaning to be

treated like young students instead of as scholars who take pride in our continuing education."

- "The PLCs are forced on us at our school. We have them weekly during our lunch time (15 mins). They are USELESS!!! PLCs should be given more time if taken seriously and we should be able to talk about projects, concepts and anything else that goes with our curriculum."

Positive responses included the following statements:

- "It has given me the chance to collaborate with fellow teachers a great deal and I have been able to change some instructional techniques and share success and ideas with other teachers. Also gives us a chance to co-plan, evaluate standardized test scores, and implement good teaching practices."
- "PLCs give an opportunity for sharing new and improved methods."
- "I have found the PLC time to be very useful in all of the areas that you addressed, especially assessment. I'd wish we had more time to focus on best practices and we may be able to do that this year. All of the teachers in the math department have been made to feel that our opinion is important and we all try to look at issues with an open mind. Our state test scores in math improved significantly and I attribute that to our time in PLC planning for improvement".

The lone neutral response to the request was "No effect." These data are presented in Table 19.

Table 19

Impressions about usefulness of PLCs Concerning Professional Practice

Sentiment	*n*	*%*
Positive	3	33.3
Neutral	1	11.1
Negative	6	55.6

In Part B, Question 3 of the survey asked respondents to please list suggestions for further professional development regarding PLC practice at their school. Six responses were recorded to this request.

Emergent category analysis (Salkind, 2008) was used to analyze and categorize these responses as the question asked for suggestions rather than participant impressions. The most frequently reported suggestions were related to logistics (50%, $n = 3$). Suggestions related to content had two responses (33.3%), and one response (16.7%) was devoted to training. Those responses related to logistics included suggestions about lack of time and focus, principal involvement, and central office involvement. Those responses related to content included suggestions for classroom activities, classroom management, time management, and data analysis. The lone suggestion for training requested that the professional development should be aimed at the people who require participation in PLCs. I believe this comment to be aimed at either central office staff or school administrators, although there is nothing in the comment to confirm this assumption. These data are presented in Table 20.

Table 20

Suggestions for Further Professional Development Regarding PLCs

Suggestions related to:	*n*	*%*
Logistics	3	50
Content	2	33.3
Training	1	16.7

Summary

The purpose of this chapter was to present data gathered to examine the effect(s) professional learning communities (i.e., instructional practices, collaboration, data study, and formative assessment) have had on secondary mathematics classrooms in Boone, Clay, Kanawha, and Putnam counties in West Virginia. Respondents were asked to rate the extent to which their professional practice had changed (i.e., instructional practice, collaboration, data analysis, and formative assessment) on 19 items and to provide information about other types of changes in professional practice, the usefulness of PLCs, and suggestions for further professional development regarding PLC practice at their schools.

Analysis of the data provided from the *Mathematics Professional Change Questionnaire* yielded insight into the effectiveness of PLCs of mathematics teachers in four West Virginia counties. Data were collected using Likert-type responses on a scale of 1 (never) to 6 (a great deal) and open ended questions. Mean ratings ranged from a low of 2.94 on Research Question 4, Item 4, which asked participants to rate the extent to which their participation in PLCs had an effect on assessments developed by collaborative teams (i.e., common formative assessments), to 4.22 on Research Question 2, Item 1, which asked participants to rate the extent their collaborative practice had changed concerning the content being taught in their classrooms.

Chapter Five: Summary of Findings, Conclusions, and Recommendations

This chapter reviews the purpose of the study, research questions, demographic data, methods, and summarizes the findings. The chapter ends with a presentation of conclusions based on the responses to the five research questions and recommendations for further research.

Purpose of the Study

The purpose of this study was to examine the effect(s) professional learning communities had on professional practice (e.g., instructional practices, collaboration, data study, and formative assessment) in secondary mathematics classrooms in Boone, Clay, Kanawha, and Putnam counties in West Virginia. The study additionally examined the findings in relationship to selected demographics (i.e., sex, degree level, years of teaching experience in public education, years of experience teaching mathematics, years of experience at the present school, years of experience in the specific subject area(s), number of years of PLC participation, and composition of the PLCs in which the respondents participated. The study also sought to collect additional information offered by the respondents concerning their participation in PLCs which had not been addressed in the survey items, their impressions about the usefulness of PLCs as they may have affected their professional practice, and to solicit any suggestions for further professional development in the area of PLCs. The study focused on five research questions:

Research Question 1: To what extent, if any, have PLCs brought about changes in instructional practice?

Research Question 2: To what extent, if any, have PLCs brought about increased collaboration among teachers?

Research Question 3: To what extent, if any, have PLCs brought about changes in data study?

Research Question 4: To what extent, if any, have PLCs brought about changes in assessment practice?

Research Question 5: To what extent, if any, do selected demographic characteristics (i.e., sex, degree level, years of experience in public education, years of experience teaching mathematics, years of experience at present school, years of experience in present subject area, years of participation in PLCs, and composition of PLC participation) affect participant responses to survey items?

Respondent Data

The sample for this study included 18 secondary mathematics teachers of a total of 81 in Boone, Clay, Kanawha, and Putnam counties representing 16 secondary schools, two of which were configured grades 7-12. All others were configured grades 9-12. Respondent data indicated 13 females and five males chose to participate in the study. Of the 18 respondents, two held bachelors degrees, two held bachelors degrees plus 15 hours, two held masters degrees, three held masters degrees plus 15 hours, four held masters degrees plus 30 hours, and five held masters degrees plus 45 hours. None of the respondents indicated they held a terminal degree or certificate. Ten respondents indicated they had been teaching in public education for 16 or more years, one had been teaching for 11-15 years, five had been teaching for 6-10 years. Only two had been teaching for less than five years. The numbers of years teaching mathematics mirrored exactly the number of years in public education. Six of the respondents had been teaching at their present school for fewer than five years, while seven had been at their present school for 6-10 years. Five had been at their present school for 16 years or more. None had been at their present school for 11-15 years.

The respondents were asked to indicate how long they had been teaching in their specific subject area(s). Three indicated they had been teaching their specific subject area(s) for less than five years, seven had been teaching in their specific subject area(s) for 6-10 years. Only one had been in their subject area 11-15 years, while seven of the respondents indicated they had been teaching their specific subject area(s) for 16 or more years. Six respondents indicated they had been participating in PLCs fewer than five years, eight had been participating in PLCs 6-10 years, and four had been participating in PLCs for 11-15 years. None of the respondents indicated they had been involved with PLCs for 16 years or more. Ten of the respondents indicated they participated in departmental PLCs and eight indicated they participated in both departmental and cross-curricular PLCs. None of the respondents indicated they participated only in cross-curricular groups.

Methods

This non-experimental, descriptive study was completed using a one-shot, cross-sectional survey design which focused on determining the levels of effective change in professional practice due to participation in PLCs in secondary mathematics classrooms in counties which made up the former Regional Educational Service Agency (RESA) III in West Virginia. Quantitative data were gathered using a researcher developed survey.

The survey instrument was a three-page, three-part researcher developed questionnaire named *Mathematics Professional Change Questionnaire,* which was based on the *School Staff Questionnaire* (Parise & Spillane, 2010) and modified with permission. Part A asked participants to use a six-point Likert-type scale to indicate levels of change in professional practice (i.e., instructional practice, collaboration, data study, and formative assessment) on 19 professional practice items. Responses of 1-3 on the 6-point scale were viewed as evidence of little change in

practice, while responses of 4-6 were viewed as evidence of more substantial change. Part B consisted of three open-ended questions requesting that respondents report any other effect(s) on practice they felt were attributable to the PLC, to describe their impressions about the usefulness of PLCs, and to suggest further professional development regarding PLC practice at their schools. Part C contained demographic items. The survey was administered using the Qualtrics.com website. Invitations to participate were sent via email to the 81 identified potential participants. Qualtrics and SPSS software were used to analyze all quantitative data, while sentiment analysis and emergent category analysis were used to analyze the open ended questions in Part B.

Summary of Findings

Research Question 1: To what extent, if any, have PLCs brought about changes in instructional practice?

This survey contained six questions which focused on extent of changes in instructional practice made by educators as a result of PLC participation. A majority of the respondents agreed that PLCs had an effect on their teaching materials with 77.8% ranking this item as a 4, 5, or 6 on a 6-point scale, thus indicating a substantial change. The mean response for this item was 4.0, the highest among the six questions in this section of the survey. The respondents also reported that PLCs brought about changes in their teaching methods (66.67%, mean of 3.89), had helped them gain an improved understanding of the academic needs of their students (66.67% level of change in practice, with a mean of 3.83), and had affected the manner in which they assessed their students (61.12% level of change in practice, with a mean of 3.83). Participants reported substantial effects on student grouping practices (50% change in practice, with a mean of 3.28),

and on whether participation in PLCs had affected the kinds of questions they asked in their classrooms (50.01% change in practice, with a mean of 3.72).

Research Question 2: To what extent, if any, have PLCs brought about increased collaboration among teachers?

There were four questions relating to increased collaboration as a result of participation in PLCs. Respondents indicated on three of the four questions in this section that PLC participation had generated substantial change in collaboration. Question 1 asked about collaboration with regard to subject area content and generated the highest mean in the section (4.22, 66.67% level of change). Question 3 asked participants to rate their collaboration on classroom instruction and had a mean of 3.83 and 66.67% level of change. Question 2 asked participants to rate collaboration levels on how their students learn and generated a mean of 3.72 and of 61.1% change in practice. Only Question 4, which asked participants about their collaboration concerning classroom management failed to indicate a substantial level of change as only 38.9% rated this a 4, 5, or 6 on the 6-point scale and generated a mean of only 3.00.

Research Question 3: To what extent, if any, have PLCs brought about changes in data study?

The survey instrument contained five questions related to changes in data study behaviors as a result of PLC participation. Four of the five questions – examination of student assessment data (mean of 3.67, 55.5% level of change), use of student assessment data to drive remediation (mean of 3.44, change level of 55.5%), use of assessment data to drive changes in instructional practice (mean of 3.56, change level of 61.1%), and sharing of assessment data (mean of 3.3, change level of 50%) – showed that PLC participation had substantially changed their practices. The participants indicated little change in practice relating to the use of data to drive enrichment practice (mean of 3.28, level of change of 44.4%).

Research Question 4: To what extent, if any, have PLCs brought about changes to assessment practice?

The survey instrument contained four questions concerning possible changes to frequency of assessments given, to types of assessments (i.e., formative and summative), and assessments developed by collaborative teams (i.e., common formative assessments). Of the four questions, none scored a mean higher than 3.44 or generated a rate of change in excess of 50%. Question 2 concerning changes to formative assessments scored a mean of 3.44 and a rate of change of 50%. Question 1 asked if PLCs had an effect on the frequency of assessments. This question generated a mean of 3.0 and a rate of change of 38.9%. Question 3 – which centered on changes to summative assessments – generated a mean of 3.06 and a rate of change of only 33.3%, while Question 4, which asked participants to rate the extent to which their participation in PLCs had an effect on assessments developed by collaborative teams generated a mean of only 2.94, with a rate of change of 38.9%.

Research Question 5: To what extent, if any, do selected demographic characteristics (sex, degree level, years of experience in public education, years of experience teaching mathematics, years of experience at present school, years of experience in present subject area, years of participation in PLCs, and composition of PLC participation) affect participant responses to survey items?

The survey instrument contained 19 specific items within four categories related to possible changes in professional practice (i.e., instructional practice, collaboration, data study, and assessment) which may have occurred due to participation in PLCs. In analyzing the data, the researcher used Pearson *r* correlations to determine whether significant relationships existed between any of the independent demographic variables and dependent variables of participant

responses to the questions concerning their professional practice. Each professional practice item in the survey was calculated against each demographic variable.

The first set of six questions centered on instructional practices. Results of the Pearson correlation indicated that there was a significant positive association between number of years of PLC participation and participants' teaching methods (r (.521) = .05, p = .027). Significant positive associations were also found between the composition of participants' PLCs and their grouping practices (r (.539) = .05, p = .021), as well as PLC composition and questioning practices (r (.477) = .05, p = .045).

The second set of four questions asked participants whether their collaborative practices had changed as a result of PLC participation. Results of the Pearson correlation indicated that there was a significant positive association between the participants' specific areas of instruction and the frequency of conversations between colleagues (r (.479) = .05, p = .044).

Five questions about data practices were included in the survey instrument. Results of the Pearson correlation indicated that there was a significant positive association between the respondents' PLC composition and the use of data to drive changes in their instructional practice (r (.469) = .05, p = .050).

Finally, four questions about assessment practices were included in the survey instrument. Results of the Pearson correlation indicated that there was a significant positive association between the number of years of PLC participation and changes in summative assessment practices (r (.565) = .05, p = .014).

Qualitative Findings

The survey contained three open-ended items which were related to varying PLC topics which included:

- identification of changes in professional practice participants had made in their classrooms which had not been covered by the survey instrument
- impressions about the usefulness of PLCs with regard to professional practices
- suggestions for further professional development concerning PLCs

A total of 23 responses (42.6%) were received for the open-ended questions. Full responses to all open-ended questions are in Appendix D. Responses to the first two open-ended questions were analyzed using sentiment analysis (Liu, 2012). The researcher reviewed the data from the responses to these questions and constructed three categories (i.e., positive, neutral, and negative) to record the responses, while the third question was analyzed using emergent category analysis (Salkind, 2008).

The first open-ended question dealt with identification of changes participants had made concerning their professional practice (i.e., instructional practice, collaborative practice, data study practice, and assessment practice) which had not been covered by the survey instrument. Fifty percent of the responses to the questions were recorded as negative, while 37.5% of the responses were recorded as positive and 12.5% were found to be neutral. Negative responses tended to focus on time taken away from instruction for PLCs, and the lack of need for PLC meetings to share new instruction methods, new classroom strategies, and to collaborate.

The second open-ended question asked participants for the impressions about the usefulness of PLCs with regard to their professional practice. Fifty-six percent of the responses to the question were categorized as negative, 33.3% of the responses to the question were

positive, and 11.1% of the responses were neutral. The negative responses to this question involved primarily a lack of usefulness for PLCs, scheduling issues, and narrow focus of discussions.

The third open-ended question asked participants for suggestions for further professional development regarding PLC practice at their schools. The researcher reviewed the data from the responses and constructed three categories based upon key words within the reported replies. The categorized items included logistics, content, and training. Fifty percent of the responses concerned the manner in which PLCs were conducted at their schools (e.g., scheduling problems, attendance of school administration), while 33.3% of the responses centered on content of what should be discussed in meetings (e.g., discussion of ways to improve lessons, classroom management, data analysis, and time management), and 16.7% of the responses concerned themselves with training for proper implementation of PLCs.

Discussion: Quantitative Findings

The data collected from the survey instrument demonstrated that a majority of the mathematics faculty who participated in the study perceived there to be some value in PLC participation with regard to their professional practice (i.e., instructional practice, collaboration, data study, and assessment practice). Responses to the survey revealed fairly substantial changes within the areas of PLC practice studied in this survey. The replies to the qualitative portion of the study were, however, to a certain degree, contradictory to the quantitative responses in that a majority of the participants expressed some negativity about their PLC experiences.

Changes in Instructional Practice

The majority of the mathematics teachers who participated in the study agreed that their participation in PLC activities had some effect on a majority of the areas of their instructional

practice listed in the survey. They reported that PLC participation had a positive influence on the manner in which they either selected or used teaching materials and that PLCs had a positive effect on the methods they used to instruct in their classrooms, on the assessment of their students, and on gaining an improved understanding of the academic needs of their students, areas that are integral for the successful implementation of PLCs (Vescio, et al., 2008).

The extent of change reported for these areas, however, showed that there should be some concern amongst those who have advocated for PLCs in West Virginia. While 63% of the respondents felt their instructional practice(s) (i.e., teaching methods, teaching materials, student grouping practices, kinds of questions asked, understanding of the academic needs of students, and student assessment) had been changed by their participation in PLCs, only 50% reported any substantial effect that PLC participation had on their grouping practices. Research shows that flexible grouping practices are important to differentiated instruction (Huberman, Navo, & Parrish, 2012; Hewitt and Wickstein, 2012; Kennedy and Smith, 2013), and while it is possible that survey participants were already using flexible grouping prior to responding to the survey this is an area that should perhaps be further explored. Finally, while improved questioning techniques are integral to improved student achievement (Barnette, Walsh, Orletsky, & Sattes, 1995; Edwards and Bowman, 1996), only 50% of the study participants indicated that PLC participation had any effect on the kinds of questions they asked in their classrooms. Bearing in mind the limitations of this study (i.e., a small sample representing a single state and involving only secondary mathematics teachers), it is nonetheless important to consider what we can learn from these PLC participants in relationship to their teaching practices, particularly on the issues of flexible grouping and questioning techniques. It may be that mathematics does not lend itself to the sorts of grouping or questioning practices that the research stipulates are best for

differentiated instruction, or that there is something unique about the location of the study sample – but the schools within the scope of the study represent both rural and urban, small and large, less and more affluent schools, as well as teachers with a range of experience levels (both in public education and at their individual schools), and academic degree levels.

Changes in Collaboration

According to DuFour (2004b) the importance of collaboration in the PLC process cannot be overstated. It is integral to most aspects of the process:

> When teachers work together to develop curriculum that delineates the essential knowledge and skills each student is to acquire, when they create frequent common assessments to monitor each student's learning on a timely basis, when they collectively analyze results from those assessments to identify strengths and weaknesses, and when they help each other develop and implement strategies to improve current levels of student learning, they are engaged in the kind of professional development that builds teacher capacity and sustains school improvement (p. 63).

The mathematics teachers who participated in the survey reported that PLC participation has brought about increased collaboration in their professional practice, and based upon their responses, they have engaged in collaboration which supports subject area content. DuFour et al., (2010) assert that this collaboration works to help answer the first question which drives the work of a PLC: what do we want our children to learn?

DuFour (2004b) further observes that "the powerful collaboration that characterizes professional learning communities is a systematic process in which teachers work together to analyze and improve their classroom practice" (p. 7). According to their responses the teachers who completed the survey have used increased collaboration to share ideas, to improve their

teaching methods, and to change instructional techniques to better implement sound teaching practices.

Changes in Data Study

The second of the four critical PLC questions focuses on the need to assess whether students have learned the objects of the lesson. Renfro (2007) asserts that "during collaborative team meetings, teachers share their concerns, reflect on their teaching strategies, and make decisions based on data" (p. 1).

In PLCs, teams view data as an essential component of their process of continuous improvement (DuFour et al., 2010). The mathematics teachers who participated in the survey somewhat reported that their participation in PLCs had brought about changes in their instructional practice with regard to the examination of assessment data (mean of 3.67, change in practice rate of 55.5%), the use of assessment data to drive remediation (mean of 3.44, change in practice rate of 55.5%) and the use of data to drive changes in instructional practice (mean of 3.56, change in practice rate of 61.1%). These mean levels do not indicate that PLC participation had a strong influence on the use of data by the survey participants. Of particular interest is the rather weak mean level concerning the use of data to drive remediation. This item was tied directly to the third critical question which drives the work of the PLC which asks how, based on data, a teacher should respond when a student fails to learn the object of a lesson.

Of further concern are the mean and change levels reported for the other two items in this section. Both the sharing of assessment data (mean of 3.33) and the use of data to drive enrichment practices (mean of 3.28) in the classroom failed to show any substantive change with the participants. Each of these items addresses a critical question which helps to drive the work

of a PLC, and the lackluster mean for either item should be concerning for those who are charged with development and implementation of PLCs in the counties represented in the study.

Changes in Assessment Practice

The use of assessments is a necessary step in helping teachers to understand a student's achievement level. Formative assessments, according to Jackicic (2017) are "team-designed, intentional measures used for the purpose of monitoring student attainment of essential learning targets throughout the instructional process" (p. 1). The goal of a formative assessment is to monitor student learning and to enable teachers to address shortcomings in understanding, while a summative assessment is used as an evaluative tool to assess student learning at the end of an instructional unit.

Data centered on the use of assessments was collected across four items on the *Professional Mathematics Change Questionnaire.* Mean ratings and change levels reported from those four items were weak and indicated that participants in the survey had not substantially changed the manner in which the participants used assessments in the classroom as a result of PLC participation, as the highest change level was only 50% and the highest mean was only 3.44. A significant positive relationship, however, was found between the number of years of PLC participation and changes in summative assessment practices, which suggests that the longer teachers participate in PLCs, the more likely they are to have changed the manner in which summative assessments are used.

Demographic Characteristics

Statistical analysis of the demographic variables found significant relationships with six of the 19 Likert-type items in the survey. Of those six, three items were found to have been associated with the composition of participants' PLCs (i.e., either departmental or a hybrid of

departmental and cross-curricular). Those were grouping practices (r (.539) = .05, p = .021, questioning practices (r (.477) = .05, p = .477, and the use of data to drive changes in instructional practice (r (.469) = .05, p = .050. The p values of .05 or less in each instance indicates that the pattern of findings found in this study is potentially applicable to a larger population.

Two items were found to have significant relationships with the number of years of PLC participation. Those were teaching methods (r (.521) = .05, p = .027, and changes in summative assessment practice (r (.565) = .05, p = .014. Vescio et al., (2008) asserted that "at its core, the concept of a PLC rests on the premise of improving student learning by improving teaching practice" (p. 83). With this statement, Vescio concluded that teachers who are part of a PLC are more likely to change their teaching methods and thus become more effective educators. The significant relationship between years of PLC participation and the change in teaching methods in this study would suggest that Vescio was correct in his belief. As a component of PLCs, formative assessment practice is vital to the success of the student. According to DuFour et al. (2010), "formative assessments, or assessments *for* learning, are part of an ongoing process to monitor each student's learning on a continuous basis" (p. 75). Summative assessments, on the other hand, are "assessments *of* learning" (DuFour et al., 2010, p.75), which measure a number of objectives much less frequently than formative assessments.

Stiggens and DuFour (2009) state that "the infrequency of these end-of-process measurements limits their effectiveness in providing the timely feedback that guides teacher practice and student learning" (p. 642). These statements would indicate that it is formative, not summative, assessments which are paramount to student achievement. This study's results

indicated that participation in PLCs had a significant effect on participants' formative practice with 50% of the respondents reported substantial change in this area.

One item was found to have a significant relationship with the specific area of instruction, and that was the frequency of collaboration (r (.479) = .05, p = .044. Collaboration is looked upon as a key concept where successful PLCs have been implemented. According to DuFour et al. (2010), "The purpose of collaboration – to help more students achieve at higher levels – can only be accomplished if the professionals engaged in collaboration are focused on the right work" (p. 119). An increase in the frequency of collaboration in the demographic of specific area of instruction would suggest that participants are using collaboration to influence classroom practice in ways that will lead to improved academic performance for their students.

Discussion: Qualitative Findings

The *Mathematics Professional Change Questionnaire* contained three open-ended questions which provided interesting insights related to the changes in professional practice due to PLC participation among the survey sample. In most instances the responses to the open-ended questions supported the response data received from the quantitative section of the study. Appendix D contains a full transcription of the open-ended responses provided by the survey participants.

Sentiment analysis was used to analyze positive, neutral, and negative responses to determine impressions about specific changes in professional practice and usefulness of professional learning communities. Emergent category analysis was used to analyze suggestions for further professional development regarding PLC practice at their school.

Question 1 asked respondents to provide any additional information they wished to report concerning the effect of PLCs on their instructional practice, their collaborative practice, their

data study practice, or their assessment practice which had not been asked about in the survey. Analysis of the limited quantity of responses given reveals that the participants were divided nearly equally in their reports of other strengths or weaknesses of their own PLCs (e.g., taking time away from instruction, creation of more paperwork). The responses were divided into four negative descriptions, three positive descriptions, and one neutral description. These responses mirror the quantitative data found in Part A of the survey.

Question 2 dealt with participants' impressions about the usefulness of PLCs as they may have affected their professional practice. Again, responses were categorized into positive, negative, or neutral responses using sentiment analysis with the negative dominating. Responses were divided into six negative comments (e.g., demeaning to be treated like young students, PLCs forced upon the staff) and three positive responses (e.g., opportunity to share new methods, increased collaboration).

It is important to note that the demographic characteristics of the survey population indicated that 89% of teachers who participated in the survey had been teaching for six years or more, with 61% teaching mathematics for 11 or more years. According to Zimmerman (2006), experienced teachers who do not recognize and appreciate the need for change will maintain an interest in maintaining the status quo. Fullan and Hargreaves (1996) indicated that many efforts at educational reform actually alienate teachers from changing their instructional practices. The negative responses to this question came from respondents who were more experienced in public education – two negative comments from participants with 6-10 years of experience and four from participants with 16 or more years of experience – which would suggest that Zimmerman is correct in his assertion.

The replies to Question 2 also reveal a negative impression about the usefulness of PLCs as they have affected the survey sample's instructional practice. Six of the 10 responses were negative, indicating that the participants had little use for the systematic changes their participation in PLCs was asking. Only three responses to the item were positive, with one neutral response.

Question 3 centered on suggestions for further professional development regarding PLC practices at the participants' schools. Unlike the first two questions, emergent category analysis was used to evaluate responses to Question 3 as the question asked for suggestions rather than participant impressions.

The categorization of responses yielded the following groupings: logistics (e.g., not adequate time to conduct meetings), content (e.g., discussion about improving lessons), and training (e.g., training for PLCs was inadequate to improve instruction). The responses, in general, did not address specific suggestions for professional development but rather the question unintentionally served to allow participants to vent their frustrations with the process and its implementation. Only one of the responses suggested topics for professional development.

Conclusions

Examination of the data from the Likert-type portion of the *Mathematics Professional Change Questionnaire* and the open-ended questions showed that some of the respondents in the survey have changed their professional practice due to participation in PLCs to a certain degree, although a top mean of 4.22 is not indicative of a substantial level of change. Further, the responses to the open-ended questions of the survey indicated that many of the participants feel negatively toward PLCs, consistent with the rather weak mean ratings and overall change percentages.

The demographic information given by the participants in the study showed that the majority of the participants were experienced teachers. Their years of service in the education field, as well as their years of teaching mathematics, may, as Zimmerman (2006) and Fullan and Hargreaves (1996) suggest, reflect a reluctance to change their professional practice. The small sample notwithstanding, the study's findings can provide a foundation for those who design and present professional development to teachers in Boone, Clay, Kanawha, and Putnam counties, as well as those teachers who participate in PLCs.

Recommendations for Further Study

The purpose of this study was to examine the effect(s) professional learning communities (e.g., instructional practices, collaboration, data study, and formative assessment) had on professional practice in secondary mathematics classrooms in Boone, Clay, Kanawha, and Putnam counties in West Virginia. The study examined the data based on sex, degree level, years of teaching experience in public education, years of experience teaching mathematics, years of experience at participants' present schools, years of experience in their specific subject areas, number of years of PLC participation, and composition of the PLCs in which participants practiced. The study also sought to identify other information offered by the participants concerning their participation in PLCs which had not been addressed in the survey items, their impressions about the usefulness of PLCs as they may have affected their professional practice, and to collect any suggestions for further professional development in the area of PLCs. Based on findings from both the literature review and analysis of study data, several avenues of future research can be explored.

1. The study focused on teachers from Boone, Clay, Kanawha, and Putnam counties. Expanding this study to include a larger population such as the entire state of West

Virginia may provide data which would help support conclusions and implications regarding changes in professional practice due to participation in PLCs.

2. The study focused on only mathematics teachers in selected counties. Expanding this study to include all core subjects (i.e., English, social studies, and science, as well as mathematics) may provide data which would show differences in changes in professional practice based on academic area.
3. The study included three open-ended questions which (1) asked respondents to identify additional information regarding professional changes due to PLC participation; (2) asked respondents to describe their impressions about the usefulness of PLCs as they affected their professional practice; and (3) asked respondents for suggestions for further professional development regarding PLC practice at their school. A study that made use of more qualitative research methods (e.g., field observations, interviews, focus groups) or a mixed-methods study may provide a clearer picture of teacher's efforts to make changes to their professional practice.
4. The study focused on changes to professional practice as a result of PLC participation. A study could be conducted centering on potential relationships between change in practices due to PLC participation and indicators used by the West Virginia Department of Education to measure accountability. A study of this type would provide data for those who develop professional development activities which help guide schools and counties to improve performance on statewide accountability measures.
5. The study was limited to mathematics teachers in secondary schools in four West Virginia counties. Expanding this study to include elementary and middle school teachers

would provide comparative data on changes in professional practice made in differing scholastic levels.

6. The study focused on changes to professional practice due to PLC participation without focusing on who provided the training (e.g., central office based, West Virginia Department of Education based, or outsourced training) and how the training was provided. A study based on who provided the training and how it was offered would benefit school administration officials who are responsible for professional development.
7. The study was conducted using a one-shot survey instrument. A longitudinal study beginning with a pre-survey administered to first-year teachers would provide baseline data of professional practices. The survey could be re-administered after the teacher had been participating in PLCs for five years, and then again for 10 years to measure changes in professional practice due to PLC participation.

References http://edglossary.org/hidden-curriculum

Abbott, S. (2014). The glossary of education reform. *Hidden Curriculum.* Retrieved from http://edglossary.org/hidden-curriculum.

Astuto, T., Clark, D., Read, A., McGree, K., & Fernandez, L. (1993). *Challenges to dominant assumptions controlling educational reform.* Andover, MA: Regional Laboratory for the Educational Improvement of the Northeast and Islands.

Atkin, J., & Black, P. (2003). *Inside science education reform: A history of curricular and policy change.* New York: Teachers College Press, Columbia University.

Barnette, J., Walsh, J., Orletsky, S., & Sattes, B. (1995). Staff development for improved classroom questioning and learning. *Research in the Schools, 2*(1), 1-10.

Berry, B., Johnson, D., & Montgomery, D. (2005). The power of teacher leadership**.** *Educational Leadership*, 62 (5), p. 56.

Blintz, C., & Schulman, R. (2016). Measurement instruments for assessing the performance of professional learning communities. *Regional Educational Laboratory Mid-Atlantic.* Retrieved from http://files.eric.ed.gov/fulltext/ED568594.pdf

Bolam, R., McMahon, A., Stoll, L., Thomas, S., Wallace, M., with Greenwood, A., Hawkey, K., Ingram, M., Atkinson, A., & Smith, M. (2005). *Creating and sustaining professional* learning *communities.* University of Bristol.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 1-49.

Brucker, E. (2013). *Implementation and perceived effectiveness of professional learning communities in the Kanawha County school district in West Virginia.* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (355812).

Buffum, A., Mattos, M., and Malone, J. (2018). *Taking action: A handbook for RTI at work.* Bloomington, IN: Solution Tree.

Buffum, A., Mattos, M., and Weber, C. (2008). *Pyramid response to intervention: RTI, professional learning communities, and how to respond when kids don't learn.* Bloomington, IN: Solution Tree.

Campbell, M., & Lee, H. (2017). Examining secondary teachers' opportunities to develop mathematically in professional learning communities. *School Science and Mathematics, 117*(3), 115-126.

Carpenter, D. (2012). *Professional learning communities' impact on science teacher classroom practice in a Midwestern urban school district.* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (3546015).

Coleman, J. (1966). *Equality of educational opportunity study.* Ann Arbor, MI: Inter-University Consortium for Political and Social Research.

Corcoran, T., Fuhrman, S. H., & Belcher, C. L. (2001). The district role in instructional improvement. *Phi Delta Kappan, 83*, 78 – 84.

Corcoran, T. & McDiarmid, W. (2000). Promoting professional development of teachers. In R. Pankratz & J. Petrosko (Eds.), *All children can learn: Lessons from the Kentucky reform experience.* (pp. 141-158). San Francisco: Jossey-Bass.

Creswell, J. (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Upper Saddle River, NJ: Pearson Education.

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

Darling-Hammond, L., & McLaughlin, M. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan, 76*, 597-604.

Darling-Hammond, L., & Richardson, N. (2009). Research review/teacher learning: What matters. *Educational Leadership,* 66(5), 46-53.

Datnow, A. (2011). Collaboration and contrived congeniality: Revisiting Hargreaves in the age of accountability. *Journal of Educational Change, 12*(2), 147-158.

Datnow, A., Park, V., & Kennedy-Lewis, B. (2012). High school teachers' use of data to inform instruction. *Journal of Education for Students Placed at Risk, 17*(4), 247-265.

DeBoer, G. (1999). Scientific literacy: Another look at its historical and contemporary meaning and its relationship to science education. *Journal of Research in Science Teaching, 37*(6), 582-601.

Deneve, D., & Devos, G. (2017). How do professional learning communities aid and hamper professional learning of beginning teachers related to differentiated instruction? *Teachers and Teaching: Theory and Practice, 23*(3), 262-283.

Dewey, J. (1923). *Democracy and education: An introduction to the philosophy of education.* New York: Macmillan.

Dougherty-Stahl, K. (2015). Using professional learning communities to bolster comprehensive instruction. *Reading Teacher, 68*(5), 327-333.

DuFour, R. (2002). The learning centered principal. *Educational Leadership, 59*(8), 12-15.

DuFour, R. (2004a). What is a professional learning community? *Educational Leadership, 61*(8), 6.

DuFour, R. (2004b). Leading edge: The best staff development is in the workplace, not in a workshop. *Journal of Staff Development, 25*(2). Retrieved from http://www.nsdc.org/library/publications/jsd/dufour252.cfm.

DuFour, R. (2015a). How PLCs do data right. *Educational Leadership 73*(3), 23-26.

DuFour, R. (2015b). *In praise of American educators and how they can become even better.* Bloomington, IN: Solution Tree.

DuFour, R., DuFour, R., & Eaker, R. (2008). *Revisiting professional learning communities: New insights for improving schools.* Bloomington, IN: Solution Tree.

DuFour, R., DuFour, R. Eaker, R., & Many, T. (2010). *Learning by doing* (2nd ed.). Bloomington, IN: Solution Tree.

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

DuFour, R., Eaker, R., & DuFour, R. (2005). *On common ground: The power of professional learning communities.* Bloomington, IN: Solution Tree.

Dunne, F., Nave, B., & Lewis, A. (2000). Critical friends groups: Teachers helping teachers to improve student learning. [electronic version]. *Phi Delta Kappan*, 28.

Eaker, R., DuFour, R., & DuFour, R. (2002). *Getting Started: Reculturing schools to become professional learning communities.* Bloomington IN: Solution Tree.

East, K. (2015). *A study of professional learning communities: Characteristics of implementation and perceived effectiveness in improvement schools in West Virginia.* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (3707615).

Edwards, S., & Bowman, M. (1996). Promoting student learning through questioning: A study of classroom questions. *Journal on Excellence in College Teaching, 7*(2), 3-24.

Englert, C. S., & Tarrant, K. L. (1995). Creating collaborative cultures for educational change. *Remedial and Special Education*, 16(6), 325–336, 353.

Feger, S., & Arruda, E. (2008). *Professional learning communities: Key themes from the literature.* Providence, RI: The Education Alliance at Brown University.

Fink, A. (2003). *How to design survey studies.* Thousand Oaks, CA: Sage Publications, Inc.

Fink, A. (2006). *How to conduct surveys: A step-by-step guide.* Thousand Oaks, CA: Sage Publications, Inc.

Fullan, M. (1995). Change processes and strategies at the local level. *Elementary School Journal, 85*(3), 391-421.

Fullan, M. (2006). Leading professional learning. *School Administrator, 63*(10), 10-14.

Fullan, M., & Hargreaves, A. (1996). *What's worth fighting for in your school?* New York: Teachers College Press.

Gee, D., & Whaley, J. (2016). Learning together: Practice centered professional development to enhance mathematics instruction. *Mathematics Teacher Education and Development, 18*(1), 87-99.

Graham, P. (2007). The role of conversation, contention, and commitment in a professional learning community. *Connexions.* Retrieved from https://cnx.org/contents/5WaSb59o@1/The-Role-of-Conversation-Contention-and-Commitment-in-a-Professional-Learning-Community

Guskey, T.R. (1986). Staff development and the process of teacher change. *Educational Researcher 15*(5), 5-12.

Guskey, T.R. (1995). Results-oriented professional development: In search of an optimal mix of effective practices. Retrieved from http://www.ncrel.org/sdrs/areas/rpl_esys/pdlitrev.htm

Guskey, T.R. (1997). Research needs to link professional development and student learning. *Journal of Staff Development, 18*(2). Retrieved from http://www.nsdc.org/library/publications/jsd/jsdgusk.cfm

Guskey, T.R. (2000). Evaluating professional development. Thousand Oaks, CA: Corwin Press.

Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. London: Routledge Press.

Heise, M. (1994). Goals 2000: Educate America Act: The federalization and legalization of educational policy. *Fordham Law Review, 63*(2), 345. Retrieved from http://ir.lawnet.fordham.edu/flr/vol63/iss2/2.

Hewitt, K., & Wickstein, D. (2012). Programs in practice: differentiated instruction: begin with teachers. *Kappa Delta Pi Record, 48*(1), 35-46.

Hord, S. (1997). *Professional learning communities: Communities of continuous inquiry and improvement.* Austin, TX: Southwest Educational Development Laboratory.

Hord, S. (2004). Professional learning communities: An overview. In S. Hord (ed.), *Learning together, leading together: Changing schools through professional learning communities.* New York: Teachers College Press.

Huberman, M., Navo, M., & Parrish, T. (2012). Effective practices in high performing districts serving students special education. *Journal of Special Education Leadership, 25*(2), 59-71.

Hurd, C. (2010). *The effect of professional learning community principles on English language learner instructional practices and reading achievement.* (Doctoral Dissertation). Retrieved from https://theses.lib.vt.edu/theses/available/etd-04082010-121516/unrestricted/Hurd_CC_D_2010.pdf.

Jackicic, C. (2017, October 31). What are common formative assessments anyway? [web log comment]. Retrieved from http://allthingsassessment.info/2017/10/31/what-are-common-formative-assessments/

Jorgenson, M. (2003). History of the No Child Left Behind Act of 2001 (NCLB). *Harcourt Educational Measurement.* Retrieved from http://images.pearsonclinical.com/images/PDF/assessmentReports/History_of_NCLB.pdf

Joyce, B., & Showers, B. (1995). *Student Achievement through Staff Development*, (2nd ed.). New York: Longman.

Kahle, J. (1997). *Teacher professional development: Does it make a difference in student learning?* Paper presented at the meeting of the U.S. House of Representatives Committee on Science. Retrieved from http://www.house.gov/science/kahle.

Kennedy, S., & Smith, J. (2013). The relationship between school collective reflective practice and teacher physiological efficacy sources. *Teaching and Teacher Education, 29,* 132-143.

Killion, J. (2002). *Assessing impact: Evaluating staff development*. Oxford, OH: National Staff Development Council.

Lee, J. (2006). *Tracking achievement gaps and assessing the impact on the gaps: An in-depth look at national and state reading and math outcome trends.* Civil Rights Project at Harvard University, pp. 22-23.

Little, J. W. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis, 15*(2), 129-151.

Little, J. W. (1995). "Professional Development Training." Professional Development Newsletter. (Spring): 4-7.

Little, J. W. (2002). Professional community and the problem of high school reform. *International Journal of Educational Research, 37,* 693-714.

Liu, B. (2012). Sentiment Analysis and Opinion Mining. *Synthesis Lectures on Human Language Technologies.* San Rafael, CA: Morgan & Claypool.

Lomos, C., Hoffman, R., & Bosker, R. (2011). Professional communities and student achievement—a meta-analysis. *School Effectiveness and School Improvement*, *22*, 121–148.

Louis, K., Kruse, S., & Associates. (1995). *Professionalism and community: Perspectives on reforming urban schools.* Thousand Oaks, CA: Corwin Press.

Marsh, J., Bertrand, M., & Huguet, A. (2015). Using data to alter instructional practice: The mediating role of coaches and professional learning communities. *Teachers College Record, 117*(4), 1-40.

Marzano, R. (2003). *What works in schools: Translating research into action.* Alexandria, VA: ASCD.

Mason, S. (2003, April). *Learning from data: The role of professional learning communities.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

McClusky, N., & Colsun, A. (2007). End it, don't mend it: What to do with no child left behind. *Policy Analysis,* 599. Retrieved from https://object.cato.org/sites/cato.org/files/pubs/pdf/Pa599.pdf

McGee, S. (2016). The relative influence of formal learning opportunities versus indicators of professional community on changes in science teaching in urban schools. *Journal of Urban Learning, Teaching, and Research, 12,* 150-162.

McLaughlin, M., & Talbert, J. (2010). Professional learning communities: Building blocks for school culture and student learning. *V'U'E,* Spring 2010, 35-45

Monterosso, A. (2014). *The relationship between teacher planning time and eighth grade reading achievement in West Virginia schools.* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (3667954).

Morgan, J. (2010). *An evaluation of the process and outcomes of teacher collaboration in vocabulary instruction.* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (349826).

Murphy-Latta, T. (2008). *A comparative study of professional development utilizing the Missouri commissioner's Award of Excellence and indicators of student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (3297825).

National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform.* Washington, DC:

Nelson, T., Slavit, D., Perkins, M., & Hathorn, T. (2008). A culture of collaborative inquiry: Learning to develop and support professional learning communities. *Teachers College Record, 110*(6), 1269-1303.

Neuzil, L. (2010). Professional development activities and professional learning community in the mid-American region of Association of Christian Schools International. *International Christian Community for Teacher Education.* Retrieved from https://icctejournal.org/issues/v5i2/v5i2-neuzil/

Newmann, F., King, M., & Yongs, P. (2001, January). *Professional development that addresses school capacity: Lessons from urban elementary schools*. Retrieved June 1, 2005 from http://www.wcer.wisc.edu/archive/pdbo/grand-aje411.html

Nicholson, B., Harris-John, M., & Schimmel, C. (2005). Professional development for principals in the accountability era. *Appalachian Educational Laboratory at Edvantia.* Retrieved from http://files.eric.ed.gov/fulltext/ED489141.pdf

Oakes, J. (1989). What educational indicators? The case for assessing the school context. *Educational Evaluation and Policy Analysis, 11*(2), 181-199.

Owen, S. (2014). Teacher professional learning communities: Going beyond contrived congeniality toward challenging debate and collegial learning and professional growth. *Australian Journal of Adult Learning, 54*(2), 54-77.

Parise, L., & Spillane, J. (2010). Teacher learning and instructional change: How formal and on-the-job learning opportunities predict change in elementary school teachers' practice. *The Elementary School Journal, 110*(3), 323-344.

Phillips, J. (2003). Powerful learning: Creating learning communities in urban school reform. *Journal of Curriculum and Supervision, 18*(3), 240-258.

Philpott, C., & Oates, C. (2017). Professional learning communities as drivers of educational change: The case of learning rounds. *Journal of Educational Change, 18*(2), 209-234.

Pirtle, S., & Tobia, E. (2014). Implementing effective professional learning communities. *SEDL Insights 2*(3), 1-8.

Popham, W. (2008). *Transformative assessment.* Alexandria, VA: ASCD.

Prater, E. (2010). *Professional learning communities in schools to watch* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses (3395318).

Provini, C. (2012). Best practices for professional learning communities. *Education World.* Retrieved from http://www.educationworld.com/a_admin/best-practices-for-professional-learning-communities.shtml

Rasberry, M. & Mahajan, G. (2008). From isolation to collaboration: Promoting teacher leadership through PLCs. *Center for Teaching Quality.* Retrieved from http://files.eric.ed.gov/fulltext/ED503637.pdf

Rebora, A. (2011). No Child Left Behind. *Education Week.* Retrieved from http://www.edweek.org/ew/issues/no-child-left-behind/index.html

Reichstetter, R. (2006). *Defining a professional learning community* (Report No. 06.05). Raleigh, NC: E & R Research Alert.

Renfro, E. (2007). Professional learning communities impact student success. *Leadership Compass, 5*(2). Retrieved from https://www.naesp.org/sites/default/files/resources/2/Leadership_Compass/2007/LC2007v5n2a3.pdf

Rentschler, T. (2006). No child left behind: Admirable goals, disastrous outcomes. *Widener Law Review, 12*(637), 637-663.

Rosenholtz, S. J. (1985). Effective schools: Interpreting the evidence. *American Journal of Education, 93*(3), 352-388.

Rudalevige, A. (2003). The politics of no child left behind. *Education Next, 3*(4).

Salkind, N. (2008). *Statistics for people who (think they) hate statistics* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Schmoker, M. (2004). Tipping point: from feckless reform to substantive instructional improvement. *Phi Delta Kappan, 85* (6), 424–432.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Currency Doubleday.

Senge, P. (2000). *Schools that learn: A fieldbook for teachers, administrators, parents, and everyone who cares about education.* New York: Doubleday.

Sparks, D., & Hirsch, S. (2000). *A national plan for improving professional development*. National Staff Development Council. Oxford, Ohio. p. 9.

Stiggens, R., and DuFour, R. (2009). Maximizing the power of formative assessments. *Phi Delta Kappan, 90*(9), 640-644.

Stoll, L., Bolam, R., McMahon, A., Thomas, S., Wallace, M., Greenwood, A., & Hawkey, K. (2006). *Professional Learning Communities: Source material for school leaders and other leaders of professional learning.* Bristol, England: DfES.

Stoll, L., & Louis, K. (2007). *Professional learning communities: Divergence, depth, and dilemmas.* Maidenhead, England: Open University Press.

Strahan, D. (2003). Promoting a collaborative professional culture in three elementary schools that have beaten the odds. *Elementary School Journal, 104*(2), 127-146.

Supovitz, J. (2002) Developing communities of instructional practice. *Teachers College Record, 104*(8), 1591-1626.

Symonds, K. (2003). *After the test: How schools are using data to close the achievement gap.* San Francisco, CA: Bay Area School Reform Collaborative.

Thompson, J. (1994). Systemic education reform. *ERIC Digest 90,* 1-7.

Thompson, S., Gregg, L., & Niska, J. (2004). Professional learning communities, leadership and student learning. *Research in Middle Level Education, 28*(1).

Tienken, C. (2003). *The effect of staff development in the use of scoring rubrics and reflective questioning strategies on fourth-grade students' narrative writing performance*. Unpublished doctoral dissertation, Seton Hall University, South Orange, NJ.

Turchi, L. (2002). *The Impact of Accountability on the Professional Development Teachers: Preliminary Evidence from Case Studies in Six Southern States.* A paper prepared for presentation at the Annual Meeting of the American Educational Research Association. New Orleans, LA.

Tye, K. A., & Tye, B. B. (1984). Teacher isolation and school reform. *Phi Delta Kappan, 65*(5), 319-322.

U.S. Department of Education. (2001). *No child left behind.* Washington, D.C.: Author.

Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education, 24*(1), 80-91.

Walstrom, K., & Louis, K. (2008). How teachers experience principal leadership: The roles of professional community, trust, efficacy, and shared responsibility. *Educational Administration Quarterly, 44*(4), 458-495.

West Virginia Educational Information System (2017).

Wood, D. (2007). Teachers learning communities: Catalyst for change or a new infrastructure for the status quo. *Teachers College Record 109*(3), 699-739.

Zimmerman, J. (2006). Why some teachers resist change and what principals can do about it. *NASSP Bulletin, 90*(3), 238-249.

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

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Office of Research Integrity
Institutional Review Board
One John Marshall Drive
Huntington, WV 25755

FWA
00002704

IRB1
#00002205
IRB2
#00003206

September 20, 2018

Barbara Nicholson, PhD
Leadership Studies, MUGC

RE: IRBNet ID# 1317673-1
At: Marshall University Institutional Review Board #2 (Social/Behavioral)

Dear Dr. Nicholson:

Protocol Title:	[1317673-1] Effect of Professional Learning Communities on Instructional Revisions in Secondary Mathematics Classrooms
Site Location:	MUGC
Submission Type:	New Project APPROVED
Review Type:	Exempt Review

In accordance with 45CFR46.101(b)(2), the above study was granted Exempted approval today by the Marshall University Institutional Review Board #2 (Social/Behavioral) Designee. No further submission

(or closure) is required for an Exempt study **unless** there is an amendment to the study. All amendments (including the addition of research staff) must be submitted and approved by the IRB Chair/Designee.

This study is for student John Bond.

If you have any questions, please contact the Marshall University Institutional Review Board #2 (Social/ Behavioral) Coordinator Bruce Day, ThD, CIP at 304-696-4303 or day50@marshall.edu. Please include your study title and reference number in all correspondence with this office.

APPENDIX B: CONSENT TO PARTICIPATE IN STUDY

Anonymous Online Survey Invitation and Informed Consent

September 25, 2018

Dear Colleague:

You are being invited to participate in a regional research project entitled Effects of Professional Learning Communities on Instructional Revisions in Secondary School Mathematics Classrooms. This research project is being conducted to better understand what effects, if any, participation in professional learning communities has had on various professional practices in mathematics classrooms and will provide West Virginia secondary school administrators some insight into instructional revisions which have taken place as a result of participation in professional learning communities. The study is being conducted by Kenny Bond, EdD candidate, and his faculty advisor, Dr. Barbara Nicholson, from the College of Education and Professional Development at Marshall University (University). The study is being conducted in partial fulfillment of the requirements for the degree of Doctor of Education in Leadership Studies at Marshall University.

Participation in this study is completely anonymous and voluntary. The survey is comprised of a series of Likert-type scale questions and open-ended questions and should take approximately 10-15 minutes to complete. Do not enter your name or other identifying information anywhere on the survey. Your IP address will not be collected, and once you complete the survey, you can delete your browsing history for added security. Results will be reported only in aggregate form. There will be no reporting of individual responses.

There are no known risks involved in participating in this study. Participation is completely voluntary, and there will be no penalty or loss of benefits if you choose not to participate or to withdraw from the research study. If you choose not to participate, you may leave the survey site. You may also choose to not answer any question by simply leaving it blank. Once you begin the survey, you may end your participation at any time by simply closing your browser. Completion of the online survey indicates your consent to use your responses as part of this study. If you have questions about the study, you may contact Dr. Barbara Nicholson at 304-746-2094 or at bnicholson@marshall.edu, or Kenny Bond at bond4@marshall.edu.

If you have questions concerning your rights as a research participant you may contact the Marshall University Office of Research Integrity at 304-696-4303.

By completing this survey, you are confirming that you are 18 years of age or older.

Please print this page for your records.

APPENDIX C: SURVEY INSTRUMENT

Mathematics Professional Change Questionnaire

With 1 being never and 6 being a great deal, to what extent (if any) has participation in professional learning communities affected the following aspects of your teaching?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)
Teaching methods (1)	○	○	○	○	○	○
Teaching materials (2)	○	○	○	○	○	○
Student grouping practices (3)	○	○	○	○	○	○
Kinds of questions asked (4)	○	○	○	○	○	○
Understanding the academic needs of students (5)	○	○	○	○	○	○
Student assessment (6)	○	○	○	○	○	○

With 1 being never and 6 being frequently, to what extent (if any) has participation in professional learning communities changed how often you have had conversations with colleagues about the following topics?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)
Content being taught (1)	○	○	○	○	○	○
How to help students learn the best (2)	○	○	○	○	○	○
Classroom instruction practices (3)	○	○	○	○	○	○
Classroom management practices (4)	○	○	○	○	○	○

With 1 being never and 6 being a great deal, please indicate how much (if any) your participation in PLCs affected the following data study practices?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)
Examination of student assessment data (1)	○	○	○	○	○	○
Sharing of assessment data with colleagues (2)	○	○	○	○	○	○
Use of assessment data to drive changes in instructional practice (3)	○	○	○	○	○	○
Use of assessment data to drive remediation practice (4)	○	○	○	○	○	○
Use of assessment data to drive enrichment practice (5)	○	○	○	○	○	○

With 1 being never and 6 being a great deal, please indicate how much (if any) your participation in PLCs affected the following assessment practices?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)
Frequency of assessments given (1)	○	○	○	○	○	○
Assessments given to determine areas of academic weakness (formative) (2)	○	○	○	○	○	○
Assessments given to determine overall knowledge of a given objective (summative) (3)	○	○	○	○	○	○
Assessments developed by collaborative teams (4)	○	○	○	○	○	○

End of Block: Part A

Start of Block: Part B

*

Is there anything else you wish to report concerning the effect of PLCs on your instructional practice, your collaborative practice, your data study practice, or your assessment practice?

_____

_____

_____

_____

_____

Please describe your impressions about the usefulness of PLCs as they may have affected your professional practice.

_____

_____

_____

_____

_____

Please list suggestions for further professional development regarding PLC practice at your school.

_____

_____

_____

_____

_____

What is your sex?

- ○ Male (1)
- ○ Female (2)

What is your degree level?

- ○ Bachelor's (1)
- ○ Bachelor's +15 (2)
- ○ Bachelor's +30 (3)
- ○ Master's (4)
- ○ Master's +15 (5)
- ○ Master's +30 (6)
- ○ Master's +45 (7)
- ○ Advanced Degree or Certificate (8)

How many years of public education teaching experience do you have?

- ○ Less than 5 (1)
- ○ 6-10 (2)
- ○ 11-15 (3)
- ○ 16 or more (4)

How many years of experience do you have teaching mathematics?

- ○ Less than 5 (1)
- ○ 6-10 (2)
- ○ 11-15 (3)
- ○ 16 or more (4)

How many years have you been teaching at your present school?

- ○ Less than 5 (1)
- ○ 6-10 (2)
- ○ 11-15 (3)
- ○ 16 or more (4)

How many years have you been teaching in your present specific subject area?

- ○ Less than 5 (1)
- ○ 6-10 (2)
- ○ 11-15 (3)
- ○ 16 or more (4)

How many years have you participated in PLCs?

- ○ Less than 5 (1)
- ○ 6-10 (2)
- ○ 11-15 (3)
- ○ 16 or more (4)

What is the composition of the PLC in which you participate?

- ○ Departmental (1)
- ○ Cross-curricular (2)
- ○ Both (3)
- ○ Other (4)

Other If you chose "Other" in the question above, please specify the type of PLC in which you participate in the space below.

_____

APPENDIX D: RESPONSES TO OPEN ENDED SURVEY QUESTIONS

Question 1: Is there anything else you wish to report concerning the effect of PLCs on your instructional practice, your collaborative practice, your data study practice, or your assessment practice?

Response 1: PLCs actually take time away from helping our students.

Response 2: PLCs really have affected my teaching if they are effective. Many times we have had PLCs that do not help or are conducted by people that are not qualified in our content.

Response 3: In a small school, it is easier to communicate with my peers than in a larger school. If teachers want or need to collaborate, they will. My colleagues and I share materials, assessments, data, etc. all the time without being forced to participate in unnecessary meetings and creating more paperwork.

Response 4: USELESS!!

Response 5: The PLCs let us see that we all are encountering the same types of strengths and weaknesses of the students in our classes. We have focused on CFAs and sharing data to improve our instruction. We also are completing a book study on our own to help improve instructional practices.

Response 6: PLCs are especially beneficial for newer teachers.

Response 7: Simply interacting with other educators has been a great way to learn new techniques of instruction and ways to drive students forward. It doesn't have to be a professional setting. I find talking school over a cup of coffee is useful.

Response 8: In mathematics it is often the case where PLC shared information is not applicable to the content or specialized needs of math classes. I have many times been on my own to

discover new ways of instruction, new learning strategies and new areas that my students struggle with. PLC has had little effects on my classroom decisions.

Question 2: Please describe your impressions about the usefulness of PLCs as they may have affected your professional practice.

Response 1: Not useful at all. This is just a device that the board offices can use to get free labor from the teachers. Since we are to stay on the topic dictated by the board office, we can't discuss actual issues that we need addressed in the classroom. We are not able to share ideas because that would be considered off topic.

Response 2: It has given me the chance to collaborate with fellow teachers a great deal and I have been able to change some instructional techniques and share success and ideas with other teachers. Also give us a chance to co-plan, evaluate standardized test scores, and implement good teaching practices.

Response 3: No effect.

Response 4: I have not personally found that the PLC process in my community to be helpful. For example, we spent an entire year discussing formative and summative assessment. As an educated professional, I felt that after the 2nd month we were beating a dead horse.

Response 5: The PLCs are forced on us at our school. We have them weekly during our lunch time (15 mins). They are USELESS!!! PLCs should be given more time if taken seriously and we should be able to talk about projects, concepts and anything else that goes with our curriculum.

Response 6: PLC when attended voluntarily and with an open mind produce incredible results. However, when attendees don't want to be there I find they grumble more than discuss or don't really reflect and share well.

Response 7: I have found the PLC time to be very useful in all of the areas you addressed, especially assessment. I'd wish we had more time to focus on best practices and we may be able to do that this year. All of the teachers in the math department have been made to feel that our opinion is important and we all try to look at issues with an open mind. Our state test scores in math improved significantly and I attribute that to our time in PLC planning for the improvement.

Response 8: PLCs give an opportunity for sharing new and improved methods.

Response 9: I have not found PLCs useful as I take offense to the methods of teaching me new skills. As an older teacher I do not like having to make me actually perform a new strategy, technique or method, as opposed knowing I am experienced enough to be able to perform these techniques with simple instructions. It is rather demeaning to be treated like young students, instead of as scholars who take pride in our continuing education.

Question 3: Please list suggestions for further professional development regarding PLC practice at your school.

Response 1: I believe the PD should be directed at the people who require us to do the PLCs.

Response 2: As a PLC facilitator, I often feel frustrated. I attend training, there is not adequate time at the school level given to share the knowledge I have gained with peers other than in my department. Often weeks go by before we have school wide PLCs and then it is a rushed affair with most people not willing to buy in to what we are trying to do. Sometimes I am forced to share concepts that I may not yet be comfortable with myself. At county PLC trainings, sometime too much information is shared without adequate practice time, or no one seems to be able to relate the information being shared to the content that I teach.

Response 3: If PLCs are intended to improve teacher effectiveness, then the principal should not be involved. These things will happen organically if they are to happen.

Response 4: Each week a teacher should volunteer to share a class project, discovery activity or lesson. We should discuss how we can improve on the lesson, what the problems were, or what went well. We should also be discussing changes made state-wide or county-wide that affect our classrooms.

Response 5: Our math department PLCs ran very efficiently and the county level personnel have attended. They have been very complimentary of our efforts and asked us to film some of our sessions. We were lucky to start out with help from RESA 3 Angela Walker who was very knowledgeable of PLCs and CFAs. It gave us a jump start the year before the county mandated the PLC program.

Response 6: Classroom management, time management, data analysis.

APPENDIX E: CURRICULUM VITAE

JOHN K. BOND

EDUCATION

ABD Doctor of Education, Leadership Studies, Marshall University
Major: Public Education
Emphasis: K-12 Education
Dissertation: Effect of Professional Learning Communities on Instructional Revisions in Secondary School Mathematics Classrooms

2008 Master of Arts, Educational Leadership, Marshall University
Major: Leadership Studies

1990 Bachelor of Arts, Music Education, Marshall University
Major: Music Education (Percussion Emphasis)
Minor: Piano Education

WORK EXPERIENCE

2008 - Present	Principal, Wahama Junior Senior High School Mason County (WV) Schools Mason, WV
2003 - 2008	Director of Bands, Gallia Academy High School Gallipolis City (OH) Schools Gallipolis, OH
2001 - 2003	Director of Junior High Bands, Meigs Junior High School Meigs (OH) Local Schools Pomeroy, OH
1990 - 2001	Director of Bands, Wahama Junior Senior High School Mason County (WV) Schools Mason, WV
1982 – 1986	Sergeant, United States Air Force Wright-Patterson AFB, Fairborn, OH

PRESENTATIONS

2016	Qualitative Bibliometrics Presenters: John Bond, Jessica Hannah, and Gregg McAllister 56th Annual Southern Regional Council on Educational Administration (SRCEA) Conference, Charleston, WV