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Math Teachers' Experiences with Math Staff Development Training

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This is to certify that the doctoral study by

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Walden University
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Abstract

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MEd, Prairie View A& M University, 1998

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

As a result of low student scores on math assessments and teachers' seeming

inability to raise those scores, professional development (PD) interventions were

developed to address teachers' knowledge and understanding of math instruction.

The purpose of this case study was to gain a deeper understanding of teachers'

experiences with the math staff development training and how those experiences

influence their teaching and students' learning. Guided by constructivist theory,

the key research questions addressed the math teachers' experiences with the

math PD and what teachers perceive to be their needs for effective math PD. Data

for this case study were collected through interviews and observations of 25

secondary math teachers at 3 high schools. The data were coded using an analytic

method to discern themes and patterns. The findings indicated that PD should

have a focus on strategies that are relevant, include team collaboration and time to

observe demonstration lessons. As a result, a 3-day PD was designed to focus on

specific course content taught by teachers, opportunities to observe lessons, and

team collaboration to design lessons. This project study affects positive social

change via a PD training program with consistent, pertinent and content-specific

support for math teachers in the classroom. Teachers will be more engaged in the

process, students will be more engaged in their learning, and the community will

benefit from increased student success. Effective PD has the potential to improve

teacher practice, thus student learning, enabling student success in school and

beyond. Successful students make successful adults who live independent,

constructive and fulfilled lives.

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Dedication

This page is dedicated to my beloved parents, Horace and Annie Grady and grandparents, Brady and Rosie Hampton, may they rest in peace. They were my greatest financial and moral supporters throughout my pre-doctoral studies. I could not imagine my achievements without their support for me.

Acknowledgments

Faith is being sure of what we hope for and certain of what we do not see.

Hebrews 11:1. I would like to thank my God for allowing me to have continues faith and

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Section 1: The Problem

It is commonly recognized that quality of instruction is the significant component necessary to guarantee quality education in the United States (United States Department of Education, 2012). Guidance on fiscal year 2010 school improvement grants under section 1003(g) of the Elementary and Secondary Education Act of 1965 (Washington, DC: U. S. Department of Education, 27). Jackson, Gibbons, and Sharpe (2017) studied research that relates to teacher quality to student achievement. Skilled teachers produce better student results. Many researchers agree that assigning qualified trained teachers to low-performing schools and students is likely to pay off in better performance and narrowing the achievement gaps (The Center for Public Education, 2015). Certainly, one of the main objectives of No Child Left Behind (NCLB) regulation is to secure "highly qualified teachers" in each classroom (US Department of Education, 2015).

In spite of years of study, there is no unanimity as to what specific elements improve instructional excellence (What Works Clearinghouse [WWC], 2015). Our local problem was the low scores of students on math assessments and teachers' seeming inability to raise those scores. As the District provided professional development (PD) designed to improve instruction, I focused on the math instructional strategies presented in a range of PDs, including formal in-service, and informal staff training developed through district instructional math coaches, math mentors and professional development trainers. Preceding studies on professional development have produced varying outcomes and have generated a varied collection of strategy recommendations (What Works Clearinghouse [WWC], 2015). In the WWC review (2014),

thirty-two studies assessed the effectiveness of math professional development approaches (only five of those met WWC standards for scientific research) and two of the five were found to have positive effects on learners' math proficiency.   One reason why there were so few WWC findings in which professional development was significantly associated with student growth is that previous researchers were not able to document the effects of PD training on instructional efficiency through experimental designs, a pre-requisite for meeting WWC standards (What Works Clearinghouse [WWC], 2015). While my study was not an experimental design, I explored teacher perceptions of the perceived relationship between math professional development training and the instructional strategies of math teachers.

Definition of the Problem

One potential contributing factor to student math struggles may be the shortage of staff development for teachers in mathematics to aid teachers with engagement and fostering student learning experiences. The problem is that some question if the PD that participating teachers receive is effective in enhancing their knowledge and skills such that they can transform by improving their teaching practices and strategies. At present, various studies (De Monte, 2013;What Works Clearinghouse, 2015; Killion & Roy, 2009; Holmstrom, 2010) have shown current PD provided to teachers has several short comings including: 1) the content is disconnected to the everyday practice of teachers; 2) the training sessions are too generic and not related to the curriculum of the students; 3) the training does not address the problems that teachers face inside their classrooms, and; 4) the training occurs very infrequently. PD is usually

a one-time event or led by a consultant who simply conducts a one-time workshop without follow-up (De Monte, 2013).

As these are the most commonly reported issues with professional development, further research is needed on the professional development of math teachers (De Monte, 2013). It is important to know whether sample math teachers have the same issues with professional development as commonly reported in the literature. Moreover, there is a need to know whether math staff development enhances math teachers' knowledge and skills and how they learn instructional strategies to improve their teaching practices. Thus, the overarching question for my research study is: What are the math teachers' perceptions of their experiences with math staff development trainings?

Texas student assessments are intended to measure student mastery of academic content for each tested grade and course level (Texas Education Agency, 2013).   Struggling students are expected to enroll in Saturday school, before, and after-school tutorials for intervention and many do, attend, however, their state assessment scores continue to decline in mathematics which, in turn, has a negative impact on their ability to advance in their secondary educational career (Texas Education Agency, 2013).   Although many teachers tend to blame their student and family shortcomings for math failure (Jackson et al, 2017), researchers question the quality of instruction received at school, whether it is during regular hours or after school hours as supplement to their regular instruction (Boston &Wilhite, 2015).

Rationale

Evidence of the Problem at the Local Level

The Texas Education Agency 2013 Accountability Summary resulted in a 'required improvement' rating. The campus did not meet Index 2 (student progress). The target score was 17 and the campus scored a 15. Based on these data, we needed to develop a targeted intervention in the area of Math. Furthermore, ninth grade math scores were 44% passing at Level II and tenth grade math scores were at 30% pass rate for Level II. These data indicated that we were in need of math instructional intervention strategies (Local ISD, 2014). According to student achievement on STAAR/EOC (2014) data, there was a strong need to support campus staff in the development of an aligned and rigorous curriculum with the level of rigor that is needed to teach the state standards Texas Essential Knowledge and Skills/ Student Expectation (TEKS/SE) while allowing teachers to amend their instruction based on student needs (Texas Education Agency, 2013).

In response to these low scores, and need for additional teacher support, the district implemented an innovative approach to PD on the school campuses with math instructional faculty and staff. This PD was intended to provide math teachers with additional instructional strategies and support for math instruction in the classroom (Local ISD, 2014). While the district has implemented an approach to mathematics content-PD to meet the instructional need of teachers, there is still a gap between what was presented in that PD and what was implemented in the classroom resulting in continued poor student achievement in math (Local ISD, 2014). As a result of this gap, my study evolved. The purpose of my study was to gain a deeper understanding of teacher's perspectives of an effective PD and what they need to improve student success in the local school district.

At the time of my study, year-around PD included: Learning Academies, online learning, workshops, customized professional learning events, and Lunch & Learns (Local ISD, 2014). Summer PD was most often one-day-long workshops focusing on district-level issues and were usually content based. I collected data from teachers who attended either the summer, year-around, or both PDs. I asked the teachers for their perspectives on the type of strategies that were taught during the summer or year-around PD and its effectiveness with instructional practices.

The summer PDs were offered during the months of June and July and were content based. These PDs are often facilitated by central staff Program Directors and staff with specific training and or background in the content being presented. Oftentimes, the facilitators were not employed on a campus and, therefore, the participants were not familiar with their teaching pedagogy or style. The summer PDs also varies by grade level but is open to the entire district, for example; a math PD may have participants from 10 different campuses who all teach Algebra I. The summer PD is more District specific.

The year-around PDs were offered on the campus monthly, bi-weekly or on the weekends. These PDs involved reviewing data related to campus goals and objectives. The year-around PDs were facilitated by campus instructional coaches more frequently opposed to central staff personnel. Participants were able to discuss specific issues and resolve campus specific concerns. This PD was specific to grade and content level, for example: Algebra I teachers met with all campus Algebra I teachers.

Evidence of the Problem from the Professional Literature

Holmstrom, Wong, and Krumm (2015) discussed the effect of instruction and assessments in reference to teacher's collaboration in public school districts. They suggested that math is a common problem in most U.S. school districts, and education leaders are well aware that U.S. math achievement lags far behind many other countries in the world. Holmstrom (2010) described creating a successful partnership among math, professional development, and district leaders in a Washington district to improve math instruction while highlighting the roles that leaders play in the district's math reform efforts. Brendefur, Strother, Thiede, Lane, and Surges-Prokop (2013) examined the effects of professional development and center-based mathematics activities around four mathematical domains with educators' teaching in Head Start programs and found that PK-4 learners in the treatment group were more fluent and flexible with number concepts, than were peer children in the control group. Their study illustrated the need to provide necessary mathematical experiences to young children to enhance their early understanding and skills to provide the foundation for future success in mathematics.

Desimone, Smith and Philips (2013) wrote that math PD and the application of similar conceptual and theoretical frameworks has an overall effect on improving the quality of professional development. It also influences the general view of the perception of shaping and application of opportunity for learning by teachers for overall benefit to students. Accordingly, she based this statement on current research knowledge that the advancements in our concepts, actions, and practice are essential in studying students' and teachers' professional development. Furthermore, Desimone et.al (2013) argued that the use of a standard conceptual framework in professional development with teachers has to reflect a positive impact on instructional

strategies. Desimone et. al's current research includes studying the effects of state, local, and campus policy influence on the promotion of changes in instruction that links to improved student achievement. Desimone et.al focused on three critical areas in the study: the effect of policy on teaching and learning, implementation of a system, and methods of improvement for impact and implementation for composing a successful PD training (Desimone, Smith &Philips, 2013).

According to Wlodkowski and Ginsberg (2017), the motivation towards learning involves is a basic survival that appears naturally among humans. They further identified a natural tendency among humans to direct all their energy towards the accomplishment of goals set. The two authors cited people's behavior as a contributing factor towards their capacity to learn and also emphasized the impact of culture (Wlodkowski & Ginsberg, 2017). In a classroom setting, there are learners from different origins and cultural perspectives with deeply entrenched and acquired beliefs, behaviors, language and values. All the aspects of culture are present in learning and should be considered by the teachers to ensure effective learning. Therefore, apart from considering the mathematical strategies brought by students into class environments, teachers have to also think about their identities, broader knowledge, and experiences about the content (Goldsmith &Lewis, 2014).

Research conducted in the United States as to the effectiveness of professional development demonstrates varied results (Stewart, 2014). Among the five studies that met the WWC standards, three showed positive outcomes arising from professional development; one explained the limited nature of effects while two did not indicate any identifiable results

(Gersten,Taylor, Key, Rolfhus& Newman-Gonchar, 2014). Of the two WWW-cited studies that suggested positive outcomes, the PD approach included rigorous content of math content with supplement workshops and lessons.

Definition of Key Terms

Professional Development (PD): In teaching, PD refers to the in-service training, formal in approach, and to upgrade the pedagogical skills and content knowledge of teachers. Additionally, PD has been widely considered as an essential approach in reaching improvements on learning and teaching. Professional developments in education are conducted to achieve the following results:

- For updating the knowledge of an individual on a particular subject about the key advancements

- For updating the attitudes, skills, and approaches applied to the progress of new objectives and teaching techniques

- To ensure that people are well placed to implement the curricula changes to the practice of teaching effectively.

- For purposes of assisting schools in the development and application of new methods relating to the curriculum and aspects of teaching.

- For purposes of exchanging information and expertise among teachers, industrialists, and academicians.

For this study, PD is therefore defined above with the set of expected objectives (Patti, Holzer, Brackett, & Stern, 2015).

Constructivism: Constructivism is one of the learning theories that posits that students are ultimately responsible for the construction of their knowledge. The students' active participation in learning, such as by testing new ideas, enables them to construct their understanding (Dollarhide, Gibson, & Moss, 2013).

Guided inquiry: The guided inquiry entails the presence of instructional personnel that provides students with a personal approach and a more in-depth understanding through the use of a vast source of knowledge, (Kuhlthau, Maniotes&Caspari, 2015).

The below terms and definitions will be used throughout the discussion of study findings:

Individual conferencing: These are brief conferences held with students individually to provide their strengths and weaknesses while reviewing the lesson objectives.

Private think time: Allows the students to know what they think themselves before they share with others. It also gives each student the chance to review the material and check for understanding or have questions.

Public data: This is a general report card that is generated by the state department of education that provides an annual summary of performance data of each campus within the state.

Structured Math Talk: This strategy is used in the district to allow students to make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures.

Team lesson planning: The tool that is used to identify and planning implementation for what you intend to teach as a team.

Think Through Math: This is an electronic program of lessons that teachers use as a resource to measure students' performance by assessments that allow them to access and track progress.

Turn and talk: This strategy permits all students to participate in discussion, rather than only a few students participating in a class-wide discussion (National Council of Teachers of Mathematics Commission on Standards for School Mathematics, 1989).

Significance

I explored teachers' perceptions of: the math PD they receive; and the effect of that PD had on student classroom outcomes and will be important to our local district stakeholders because it provides insight as to why PD often fails. These insights were based on the perceptions of the teacher participants themselves, who also provided feedback that could contribute to improving student outcome and eliminating the educational gap in the local district. Although there may be positive and effective PD for math teachers, there is still the problem of students not progressing as indicated by their math achievement scores on state assessments (Ballou &Springer, 2015).

I investigated teacher perceptions about their PD training and asks whether sample teachers thought PD had a direct influence on their implementation of effective instructional strategies and in increasing their growth in knowledge and skills in the classroom. Garmston and Wellman (2016) noted that creating a successful PD plan involves evaluation and monitoring focused on meeting school goals. Assessment and monitoring are essential elements in designing

and implementing PD activities for math teachers and are useful in ensuring that instructional strategies improve. But what other items should an effective PD plan have?

This is a fundamental question that this study aimed to answer. In implementing PD in mathematics, studies not sanctioned by WWW have shown that adequate PD should foster a community engaged in professional learning to develop the math knowledge of teachers and be used as a way to support local goals and interests in the district. The need for promotion of students' intellectual autonomy can be achieved through changes in practice that facilitate their own learning (Goldsmith & Lewis, 2014). Therefore, support of community goals would be enhanced through adopting strategies that enhance their own understanding, hence learning.

Guiding Research Questions

I explored the perceptions of teachers regarding math PD they received and the effect of that PD on student outcomes (as measured by their classroom work). I investigated current strategies taught in math teachers' PD and the impact of that PD on changing teachers' instructional strategies, by interviewing, observing, and receiving feedback from teachers who participated with the math PD provided by my school district. I studied two types of PD: summer PD presented on a lecture format focused on content versus on-going year-round PD that meet weekly year-round in which content is shown in a coaching, hands-on modeling form. I investigated perspectives from teachers regarding their constructing meaning by using strategies they learned in the summer or year-round PD. The objective of my study was to understand which teachers viewed as the most effective district PD (summer or year-round). I was particularly interested in how teachers constructed knowledge and applied that new knowledge.

The guiding questions were based on the constructivist theory that stresses the importance of formulating and implementing new knowledge and a learner-centered focus on the needs and interests of the participants. The following guided research questions were used to achieve my objective:

RQ1:How do math teachers' perspectives on PD strategies vary by type of PD provided? This includes interviewing district math teachers who complete the summer or year-round math PD. The interviews were based on constructivist theory as it related to participants' making meaning of content received in the math PD and how they applied it. According to previous researchers, Adom and Anack, (2016), one variable that may impact teachers' understanding of content is the lack of continual and recurrent support accessible to teachers. Without active and consistent support, the application of knowledge learned will not be effective without the opportunity to apply what is learned in the classroom.

RQ2: What are the math teachers' experiences with staff development training in mathematics?

This involves observing teachers implement the strategies taught in the math PD as well as asking them about their experiences. This question relates to constructivist theory which posits that people construct their understanding and knowledge through experience and by reflecting on the lessons to become creators of their understanding.

RQ3: How does students' depth of understanding (as measured by performance on classroom assignments) differ by the type of PD provided? This question is based on

constructivist theory that stresses the importance of analyzing learner needs, and the formulation of learning objectives and instructional strategies based on those needs.

Review of the Literature

In the following section I will present the conceptual framework that structured my study and data collection and analysis. I will also provide a description of constructivist theory that informed my research of math teachers' perspectives with math PD. I will also provide a review of current literature in regard to math teachers' perspectives with math PD.

Conceptual Framework

In this section, I describe approaches based on the constructivism theory which stresses the importance of joint planning, analysis of learner needs, and formulation of learning objectives based on the needs and interests of the participants (Richards & Rodgers, 2014). In my study, I reviewed teacher's experiences about math, their participation with the math PD and their understanding of the PD.

Weimer (2013) applied constructivist theory in a comprehensive overview of learner-centered teaching by providing examples of educators providing instruction across content area in college and university settings. Weimer advocated learner-centered methods, and provided a detailed discussion of the way students' developmental comprehension concerns could influence the success of learner-centered teaching. She demonstrated how instruction and curriculum are connected to the process of comprehension for participants. For example, Weimer observed several classrooms in which the teacher's primary mode of delivery of instruction was lecture even though that teacher had had previously attended PD that focused on learner-centered

strategies. Weimer concluded that teachers prefer to demonstrate what they are acquainted with, as opposed to using different methods with which they are uncomfortable. According to Weimer, "learner-centered teachers opt for those instructional strategies that promote deep and lasting learning" (p. 123). It is more important for students to remember more and apply more than to cover the content. My study was based on a conceptual framework built from Weimer's learner-centered teaching using a constructivist approach through an adult learning lens.

Constructivist theory, developed and refined by Piaget, Bruner, and Vygotsky (Adom & Anack, 2016) addresses how people acquire knowledge. Its principal foundation is that people construct their understanding and knowledge through experience and by reflecting on the lessons to become creators of their understanding (Dollarhide, Gibson, & Moss, 2013). In this study, I also drew from the framework of constructivism. Constructivism encompasses sharing several perspectives with the thought that authenticity is constructed and yields various understandings (Lodico et al., 2010). During the production of information from a diversity of perspectives, learners create meaning from their environment and experiences to develop their point of view. Fosnot (2013) wrote that even though constructivism is not a theory of lessons, it suggests taking a fundamentally diverse approach to teaching from that utilized in most public-school districts. A constructivist vision of learning suggests an approach to training that give learners the opportunity for tangible, contextually significant experience throughout which they may look for patterns, elevate questions, model, infer, and support their strategies and thoughts (Fosnot, 2013). While using the constructivist approach, I examined how math teachers reconcile the new strategies they learned through PD with previous experiences to improve their practice. To do

this, I asked questions to explore and assess teacher's perspectives on the effectiveness of two types of math PDs (summer and year- round).

Researchers (Ulrich, Tillema, Hackenberg, & Norton, 2014, Ozuah, 2005, Wlodkowski & Ginsberg, 2017) have noted that constructivist theory should be applied when educating adult learners. Klingner, Vaughn and Boardman (2015) suggested that adult learners' cognitive needs differ from those of children and adolescents. For example, they can shift instructional strategies learned through PD into their classroom methodology. Wlodkowski and Ginsberg (2017) wrote that adults possess diverse ways of perceiving to create knowledge and the significance of learning in qualitatively special ways. This enables teachers' orientation toward knowledge and construction of knowledge to become consistent with their approach to teach. They further explained, "when adults learn, they build on or modify networks that have been created through previous learning and experience" (Wlodkowski & Ginsberg, 2016, p. 11).

Ulrich et al. (2014) examined how applying constructivist theory may lead to a specific methodological practice, and increase higher-order thinking skills for students, thus enabling math educators to become highly effective teachers for their learners. They discussed how the constructivism approach can be used to clarify and stimulate teaching and learning in a more practical adaptation to the complexity of instructional strategies. Ulrich et al. showed how the process of higher-order thinking skills is created through constructivism, and, as it progresses, teachers become more effective in providing instruction to learners. In this study, I used the relationship between adult learning and the constructivism approach to examine the impact of the math PD effectiveness on the teachers' instructional strategies. Math teachers in my district were

introduced to instructional strategies throughout the two types of PD. The conceptual framework was applied to understanding what teachers thought about the PD and how they applied what they learned.

Another framework guiding my study was Knowles' (2012) andragogy theory. Knowles theory was established as an effort to describe how adults comprehend knowledge. Knowles emphasized six assumptions that relate to adult learning. These assumptions were (a) independence with thinking and self-directed learning, meaning that motivation to learn is generated from prior knowledge and the capability of building on their current information; (b)a necessity to recognize the worth of why they are learning a concept; (c) make logic of innovative information by linking it to their personal practices; (d) taking responsibility for occasions to obtain new knowledge; (e) identify if the knowledge is pertinent and can be implemented; and (f) inspired more by inner than exterior actions (Knowles, Holton, & Swanson, 2012).

Sandlin, Wright and Clark (2013) examined adult learning by focusing on current writing with an emphasis on instruction and argued that a substantial amount of learning occurs outside of educational institution. According to Ozuah (2005), adults learn best:

- When they want or need to learn something

- When the learning occurs in a non-threatening environment

- When their individual learning style needs are met

- When their previous experience is valued and utilized

- When there are opportunities for them to have control over the learning process

- When there is active cognitive and psychomotor participation in the process

- When sufficient time is provided for assimilation of new information

- When there is an opportunity to practice and apply what they have learned

- When there is a focus on relevant problems and practical applications of concepts

- When there is feedback to assess progress towards their goals (p. 86).

I drew from the above theoretical literature to arrive at my conceptual framework that focuses on: meaningful content (constructivism); active learning (constructivism); coherence (constructivism); duration (andragogy); and collective participation (andragogy). Both constructivism and andragogy are the frameworks that contributed to the formation of key aspects of my study and research questions: (1) How do math teachers' perspectives on PD strategies vary by type of PD provided? (2) What are the math teachers' experiences with staff development training in mathematics? and (3) How does students' depth of understanding (as measured by performance on classroom assignments) differ by the type of PD provided?

In conducting my research, the review of literature search terms was obtained by reviewing teacher perceptions of PD effectiveness and strategies taught at the high school level. I reviewed sources based on the Teacher Performance Rubric utilized by the local school district as it relates to PD and teacher collaboration. I studied literature that related to PD and its effectiveness to ensure that high school teachers can relate new knowledge to their specific content. I retrieved various books by authors who had effectively implemented PDs in their school as administrators. I read a variety of scholarly journals from Walden University Library and various sources. In conducting my research, I used the following search terms: effective professional development, PD and I retrieved information from the subsequent databases for this

literature review via Walden's library: Education Research Complete, ProQuest, Education Research Starters, Sage, EBSC and ERIC were all retrieved. The following topics were discussed in my review of literature: Understanding Professional Development; Theoretical Underpinning of Professional Development; Social Learning Theory; The Relationship between PD and Student Outcomes; and Effective Professional Development.

Understanding Professional Development

Effective PD has been defined as a professional learning that is well structured and leads to changes in the practices of teachers and useful improvements in the outcomes of student learning. The definition of the features of an active PD needs a review of studies carried out concerning methodologies in the past decades' research (Gregory, Allen, Mikami, Hafen & Pianta, 2014). For PD to be considered effective, different elements have to be taken into consideration. First, it has to be focused on content. In other words, there is much emphasis on the teaching strategies that are connected to the particular content of curriculum supporting teacher learning in the context of a classroom. This element is inclusive of the international focus on the development of curriculum that is centered on discipline and pedagogies in areas such as literacy, science or mathematics (Bayer, 2014). Secondly, an excellent PD takes into consideration active learning that involves direct engagement of teachers in the designing and attempts at the application of strategies used in teaching. Additionally, it offers them an opportunity of engaging in a similar teaching style in learning that is many benefits to students (Stein& Silver, 2016). This type of PD makes use of interactive activities, authentic artifacts and other relevant strategies for developing an understanding of the embedded and highly

contextualized professional learning. Therefore, this type of approach does not employ the same aspects of traditional methods of learning and learning environments that are based on lectures. These lecture-based learning environments are devoid of a direct connection between the students and the classroom environment of teachers.

Thirdly, an active program development for teachers provides collaboration. This means that high-quality development of a program results in the creation of room for teachers to efficiently and freely share ideas and work together in their learning activities. Through collaborative working activities, teachers can create communities that have a positive reaction to changes in the instruction and culture of students. This is about the departmental, grade, school and district level (Lang, 2017). The fourth necessary element is that a valid profession development program takes into consideration of the models of efficient practice. The curricular modeling and instruction models serve in the capacity of providing teachers with enhanced and clear vision of the most appropriate type of training to adopt. Through the element of models ineffective practice, teachers are given room to view the whole unit and lesson plans, a sample of the work of a student, video or written teaching cases and observing peer teachers. The fifth essential element rests in the provision of expert and coaching support.

The expert and coaching support is critical to the sharing of knowledge on the evidence and content-based practices that lay much emphasis on the individual needs of teachers. Additionally, an active program development has room for the provision of reflection and feedback. Often, professional learning of high quality offers inbuilt time for teachers to reflect on their teaching and make the necessary changes by soliciting for feedback. Accordingly,

indicating and feedback is essential in providing teachers to carefully move towards the vision and overall goals of the teaching practice. Finally, a practical program development has sustainability in its direction given that it offers teachers ample learning, practicing, implementation and reflection time on the new adoptable strategies (DiPaola & Hoy, 2013).

Theoretical Underpinning of Professional Development

The theories relating to PD included social and cognitive aspects of learning, with an emphasis on perspectives. Cognitive perspectives focus on the idea of changes in the knowledge or belief of teachers, while the social perspectives focus on human interactions (Syafii &Yasin, 2014). Different theories, including social learning theory, have provided theoretical strategies for the integration of social and cognitive effects of learning. Self-efficacy is a vital sub-construct of social learning theory has been utilized in the placing of teacher education in a theoretical framework. Just like the constructivism theory, the social learning theory has been used in the exploration of the application of the learning theory in the program of PD for supporting teachers in the use of Student-Centered Problem-Solving approaches (SCPS). The SCPS approach involves teaching characterized by the collaboration of students and discussion for purposes of arriving at solutions to open-ended activities and tasks (Syafii &Yasin, 2014), and it is entirely different from the traditional centered teaching approach focused on teaching of mathematical routines and methods. The essence of SCPS rests in the fostering of a detailed understanding of mathematics and the improvement of the engagement and motivation. The different criteria used in the assessment of a theory or model used in the provision of guidance towards the evaluation of how viable the already mentioned theories are in the PD context. The

power of explanation refers to the extent to which a method offers different descriptions on the manner in which something works.

Social Learning Theory

Often, when teachers start their careers, they observe and model the other teachers' practices, efficiently adapt them and finally reproduce them in the classroom setting (Watson, 2013). There are different responses, feedback, and self-assessments that can be used in the development of teaching behaviors. These practices may grow into routines over time (Watson, 2013). This teacher-to-teacher direct contact approach is often based on conservative and traditional approaches to teaching.

There is a need for a constant reminder of the contextual and social effects which challenge innovation efforts, often mediated through self-efficacy (Watson, 2013). When one's behaviors are challenged, s/he can begin having doubts about the chances of final success, and for teachers, this applies to pedagogy. Alternatively, one can influence a positive change teaching via improved teacher self-efficacy and positive cognitive effects. As mentioned, it has been recognized that the effects of the environmental (job demands, working conditions, and the learning institution where PD occurs) can impact the teaching offered (Jones, Swan & Pollitt, 2015).

Social learning theory (Bhatia, 2014), constructivism (Adom & Anack, 2016), and other relevant theories have been used in conceiving knowledge as the potential behaviors that are modeled in a mental perspective. If the theories offer reasonable explanatory and descriptive capability, then there are chances of observatory learning (Laurillard, 2002) The self-efficacy

beliefs of a teacher have a direct reflection on his/her motivation, confidence and innovative willingness in the process of teaching. Conversely, there are negative effects connected with self-efficacy directly related to the expectations of a parent, a student or a colleague that might have an effect of preventing the transmission of knowledge in a classroom environment (Tseng & Kuo, 2014).

The Relationship between PD and Student Outcomes

Studies other than those mentioned in the introduction (Mayotte& Doyle, 2013) also have supported the conclusion that math teachers' perceptions of PD strategies used in the classroom may affect student outcomes (Jones, Swan & Pollitt, 2015). These researchers have encouraged educators to apply the lessons they have learned through practice and theory for purposes of increasing the intensity of evaluation of professional development. This could be achieved through the incorporation of reliable and valid PD methods and practices and knowledge of teachers. Mayotte and Doyle's research demonstrated positive outcomes across five dimensions of elementary education in the professional development. These include the reaction of participants, organizational change and support, learning and the application of skills and new knowledge to influence the outcomes of students.

The National Math and Science Initiative Standards (2015) were created to increase the performance of students in Science, Technology, Engineering, and Math (STEM) fields by teaching and transforming education (Watkins & Mazur, 2013). To do this, researchers drew upon the most effective programs to create quantifiable results. The underlying rationale is that once an idea works, it can be utilized on a national scale closely monitored for effectiveness.

NMSI's 'Laying the Foundation Program' is meant to strengthen the existing teaching corps through professional training resources aligned with Common Core State Standards (Graham & Harris, 2013). A group of six articles reviewed by Milner (2014) supported effective STEM educator PD and preparation, discussing targeted efforts to prepare and retain new teachers to know the pedagogical content produced by the STEM to allow them to have adequate learning.

Anhalt and Cortez (2015) focused on a variety of approaches to support teachers including the application of a math curriculum based on standards. Additionally, Anhalt and Cortez focused presented a detailed PD program for administrators and teachers (Anhalt & Cortez, 2015). They agreed that math content area is a concern and efforts aimed at increasing achievement in math for students of low-income is a top priority for narrowing the achievement gap (Anhalt & Cortez, 2015).

Effective Professional Development

Birk (2013) investigated the contributions of the gaps in incomes towards the scores in math, and she identified an even distribution in her studies. All students were needed to pass a state test to achieve a diploma in her school district (2013). In 2008, only 23% of low-income learners passed the state test. The findings from Birk's research indicated a need for increased attention to the various challenges of high school math teaching, such as: student motivation, the organization of the school, and the implementation of math instructional practices effective for student achievement. She also specified a need to increase consideration on meeting the academic needs of high-achievers, as well as low-achieving learners, to reduce the achievement gap that exists between them.

According to Nugent et al. (2016), mathematics teachers need to include more cooperative and active experiences in the classroom environment. The outcomes of a study carried out by Nugent et al. comparing teachers who received PD through a summer institute combined with coaching with teachers who received no intervention. Teachers who received coaching had significant gains compared to the control teachers. Results indicated that interacting with math instructional coaches was a positive experience for teachers because the coaches offered lessons for development to teachers. Additionally, the coaches provided support for teacher ideas, observed and gave feedback, and helped teachers with understanding the concepts presented in the PD. This approach of PD required teachers to formulate lessons and teach mathematical concepts through guided inquiry as a method of instruction (Aschermann & Klenzan, 2015).

Implications

PD facilitators must consider the experience that teachers bring to their interaction. Facilitators need to be aware of the participants' level of experience with mathematics and distinguish how these various experiences offer knowledge to the world of mathematics instruction for future analysis (O'Dwyer & Atlı, 2015). Over the course of the PD investigated by O'Dwyer and Atlı (2015), teachers who participated in the training developed a stronger identity as impartial mathematics educator than they had previously exhibited. They recognized precise changes that influenced their instructional strategies and reflected on the relationship between mathematics and equity. Despite this success, the PD facilitators may have been more

capable of advancing teachers if they had taken into account the participants' previous experience.

PD goals may be attained when teachers' previous experiences in the content area influence their comprehension of knowledge gained in PD (O'Dwyer & Atlı, 2015). O'Dwyer and Atli further suggested that PD facilitators take into consideration the methods by which teachers construe goals for meeting their instructional needs. Based on the findings presented in the following section, my study explored the District programs' effectiveness in helping teachers improve their instructional methods and provided awareness of new teaching strategies made possible with the math curriculum. The findings will assist facilitators with content for possible future PD strategies that may be implemented by math teachers in the classroom.

The results of this study will enable math departments to produce more efficient instructional strategies in math classrooms, resulting in higher academic achievement for all math learners.   The insights from my research should empower math teachers to utilize plans presented at the PD learning, thus contributing to the support of future project development with math scholars in our society. Adult learners require actual experiences that they may relate their knowledge into the classroom (Creswell, 2014).

Summary

I offered a description of the program of PD aimed at helping teachers of math to integrate mathematical strategies into their lesson efficiently and provided an insight into the influence of PD on the instructional methods. Desimone, Smith and Philips (2013) described the application of a globally recognized framework and the ensuing effect of elevating PD values

and an enhanced view of the formation and employment of opportunity for teacher learning. This combined with the premises of constructivist and adult learning theories is the basis of the conceptual framework: a) content focus, b) active learning, c) coherence, d) duration, and e) collective participation. I utilized the conceptual framework to answer the research question that asks teachers for their perspectives of the math PD's effectiveness with instructional strategies that can be used in the classroom.

To create an effective PD program, facilitators must understand the needs of their audience by establishing multiple goals and implementing activities consistent with the PD goals. This has been the plan with our District. The National Math and Science Initiative indicated that researchers should investigate ideas and programs with proven effectiveness and quantifiable results while monitoring results for efficiency with educators in the classroom (U.S. Department of Commerce, Economics and Statistics Administration,2015). This was the motivating reason for my study. In the next section, I will be present an introduction to the methodology that was used for my research study. The Methodology contains the following sub-sections: The Problem Statement and Research Question; Research Design and Approach; Participants; Data Collection Methods; Data Analysis Method; Data Presentation Strategy; and Conclusion.

Section 2: The Methodology

Problem statement and research question

Although many students attend tutorials on Saturday, before, and after-school for intervention strategies, their scores on assessments continue to decrease in mathematics. Students in the sample school district are not progressing in math, in part, due to the lack of effective math staff development. Further investigation is needed to examine the influences of math PD on math teachers' instructional strategies (Royster, Gross, & Hochbein, 2015). The guiding research question for my study was: What are math teachers' experiences with the math staff development training and how do those experiences influence their teaching and their students' learning?

Research design and approach

Methodology refers to theoretical and professional procedures for designing and conducting an investigation, and the practices to be used (Robson, 2011). I utilized qualitative research methodology. This method originated from human and social sciences as well as the evaluative research studies (Creswell, 2014). It is known as the 'science of the outstanding' (O'Dwyer&Atlı,2015). In other words, qualitative research aims to recognize the uniqueness about a phenomenon as it is lived and interpreted (Peixoto, Sanches & Monteiro, 2017), whether it be by an individual, in a classroom, or in an institution. A rich assortment of information was collected to assist with a deeper understanding for this qualitative research study. This process included interviews and observations

This methodology is appropriate for this research because qualitative research is focused on descriptive narrative data (Warren-Kring and Warren 2013). There is greater emphasis on the words as spoken or answered by the participants. In explaining a phenomenon, inductive reasoning is used in making sense of the data gathered from the interviews (Warren-Kring and Warren 2013). Interview data were analyzed to explain the perceptions of teachers about PD and its relationship with current student outcomes. Instead of using a quantitative research method which quantifies or ranks data (Warren-Kring & Warren 2013), this approach was more appropriate as it provided a clearer and deeper picture of teachers' perceptions as compared to them ranking certain aspects of professional development.

For this study, a case study method was used to investigate the teacher's perspectives regarding the effectiveness of mathematics staff development on their instructional strategies. I used interviews to gather qualitative data to obtain the perceptions and beliefs of teachers participating in two types of PD (Creswell, 2012; Lodico, Spaulding, & Voegtle, 2010). The case study approach was chosen as the most appropriate method to answer my research questions. This design enabled the use of multiple data collection and analysis. The primary sources were interviews, and observations. Each of the data sources provided specific information for my study. Case studies can also comprise an examination of a system of multiple cases over time through specific data collection that involves several sources of information (Creswell, 2012).

For this study, case study was more appropriate than phenomenology, ethnography or grounded theory. Phenomenology is a philosophical approach to qualitative methodology

(Creswell, 2012). It holds an emphasis on the person's subjective interpretations and experiences of their lived experiences. The researcher aims to understand how the world looks to others while searching for commonalities with individuals. Phenomenology was not used in this study since I am focused on the individual teachers' perspectives of the effectiveness of the math PD and not their lived experiences. Ethnography is a study of a culture that focuses on the characteristics of a specific group of people living within their culture (Creswell, 2012). The researcher becomes an active participant of the culture while completing the study. Ethnography does not have a set ending point or limits of what will be observed by the researcher. Since I was not studying one specific culture, ethnography was not appropriate for my study of math teachers' perspectives with math PD. The purpose of grounded theory is to create a theory concerning specific phenomena of significance and becomes grounded in the observation (Creswell, 2012). Core theoretical concepts are identified and developed as the researcher gathers the data. In grounded theory, the researcher's efforts progress toward one central category. Therefore, grounded theory was not used in my study because I did not create a theory while collecting data on the teachers' perspectives of the effectiveness of the math PD (Royster, Gross, & Hochbein, 2015).

Participants

The twenty-five participants of the study were teachers from three of our District's Secondary Public High Schools comprising the research sites. In selecting the sample, non-probability sampling was used (Herek, 2012). Non-probability sampling is when the population is selected based on their availability or selected based on the professional judgment of the researchers. The purposive type of sampling is common to exploratory qualitative researches

(Herek, 2012). It is also important to note that the non-probability sampling was more appropriate for this study because the study was specifically designed for math teachers in our district and math teachers who have undergone the same professional development. Creswell (2012) recommended a structure of purposeful sampling of individuals or sites to confirm or disconfirm preliminary findings. This strategy was utilized throughout the study to follow-up on precise cases to examine or explore additional definite findings. This sampling served to verify that math staff training supports the development of teachers by providing instructional strategies.

In order to avoid bias in the selection of participants, my study used a sampling frame (OECD, 2012). The sampling frame is the master list of the population intended for the study. From this master list, the participants were chosen. Using the sampling frame, researchers are able to avoid bias because the participants will be identified from the sample frame and not from personal selection of the researchers (OECD, 2012). Thus, although non-probability sampling relies on the judgment of the researcher, the use of a sampling frame enables the researcher to remain objective and not use her own personal judgment in the selection of the sample. For this study, the sampling frame used was the master list of the math teachers in the secondary public-school district who had attended the specified professional development which was the summer or year-around PD.

In the selection of participants, one of the most important issues that researchers must address is the ethical and legal responsibilities in the selection of participants. Ethical and legal responsibilities are important considerations for researchers because researchers need to

collaborate with others which require them to adhere to the standards of practice and standards of effective collaboration (Ruthven, 2016). Many researchers are funded by various entities and succeed with the support of the public, various entities and institutions (Ruthven, 2016). Lastly it is important to be concerned with the legal and ethical issues of research because if the research is illegal and unethical, it can lead to negative publicity and even legal liabilities (Ruthven, 2016). This defeats the purpose of the study which is to provide more knowledge about the subject(Jones, Swan & Pollitt, 2015).

In conducting the research, voluntary participation was emphasized to ensure that the research remained ethical. Participants were not forced or coerced into taking part of the study. As such, I went through the right channels and procedures to select and gather participants. These procedures taken to acquire permission to study participants consisted of authorization from local school district board of trustees, creating a detailed explanation of the study, developing a well-versed consent document and review of the study (Creswell, 2012).I applied to receive permission to approach the participants in my qualitative study through the approval procedure of the districts' institutional review board. As a district Vocational Compliance Coordinator, I had access and the right to enter the three sites that were used to conduct my research study. While obtaining consent from the participants, I exercised caution by considering possible interfering factors that may occur.

According to Creswell (2012), qualitative researchers choose one or more sampling strategies based on the intention of the sampling. Disconfirming and confirming sampling is a purposeful strategy utilized throughout a study to follow up on exact cases that examine or

explore additional precise findings. This sampling was used to verify the accurateness of the findings during the study and represented a sampling method used throughout the study. This sampling served to verify that math staff training supports the development of teachers by providing instructional strategies. The participants and research sites that I studied were twenty-five math teachers located at three secondary Public High Schools. The compilation of participants and sites for my study was deliberate and purposeful to recognize the central phenomenon examined.

In protecting human subjects, I was sensitive to the potential invasive character of my study. I used care in relating to participants and sites, diffused the perception of the possible power imbalance, and gave support or reciprocate when I could. The participants were teachers in our secondary public schools, and I did not have a direct relationship with the participants since I do not work in the math department.

Data Collection Methods

According to Creswell (2012), qualitative data collection includes five interconnected steps in the method of data collection. The five steps are primarily to classify participants and sites to be examined and to employ in sampling approach that will help one comprehend one's central phenomenon and the investigative question that one asks. Second, the subsequent segment expands the right to use to talk to these participants and research sites by securing permission. Third, when permission is in position, the researcher will consider what type of information will answer the research question. During the fourth phrase, the researcher design

protocols or instruments for collecting and recording the data. In the final phrase, the researcher administers the data collection with particular attention to possible ethical issues that may arise.

Interviews are utilized widely in qualitative research studies as a technique of data collection. The interviews might be structured, semi-structured or unstructured (Robson, 2011). My data collection description for the qualitative method included collecting data by utilizing open ended interview questions that allow the participant to create comments by describing data verbally, and collecting information from a small number of educators (p. 205).

Creswell (2012) described constructive theory research designs as methodical, qualitative actions that researchers utilize to explore a procedure, action, or interface amongst people. The constructive approach was used to explore math teachers' experiences with math staff development training. As a qualitative researcher, I accumulated qualitative data from the following instruments and sources: observations, and interviews. In determining the type of data to gather, I collected information that answered the guiding research question. For example, I looked at data that was specific to the math instruction and PD (Creswell, 2012). My data collection included: one sixty- minute interview that was held after school hours at the participant's campus, one sixty-minute observation that took place during the school day for which I was on a personal leave.

Data collection took place during the fall of 2016. All data collected from participants were obtained with informed consent from the participants and in total compliance with the Institutional Review Board (IRB) procedures. Researchers need to be aware of all ethical issues that might occur throughout the qualitative research procedure (Miles & Huberman, 1994). My

research involved collecting data from teachers about their perspectives as it related to the math

PD. Data were physically secured and stored with the usage of the computer software program

called the Coding Analysis Toolkit and a locked file for notes. All individual, classified

information not proposed for protected archiving was destroyed. Protocols in Appendix B, C

and D were developed to reduce the need to accumulate identifiable information by determining

if there is a valid reason to gather teachers' identification. Data was gathered anonymously

without personal identifiers from the participants. If it became necessary to collect and retain

individual data, a data protection process was developed to include the proper stage of privacy

protections based on the possible magnitude of the danger of harm as a result of disclosure. I

protected the participants by developing their trust, and promoting integrity. First, I had a

commitment to respect the rights, values, desires and needs of each participant. Confidentiality

issues were acknowledged and considered at each phase of the research study. These phases

included the initial research design; classification, recruitment, and permission process for the

study participants; safety measures, investigation, and final disposition of information; and

publication or dissemination of data and results. The following procedures were used in the study

to protect the participants:

- Written notice was given to teachers of their voluntary basis to participate in the study and their ability to withdraw at any time with no consequence. They were also given notice that they may decline to answer any question during the interview.

- Teachers were given the study objectives in a written format.

- Each participant provided written consent to participate with the study,

- A written notice was provided to each teacher that explained the methods and PD

  activities to be collected data.

- Provisions were prepared for monitoring the information gathered to make sure that

  teachers' confidentiality was a priority.

- Teachers received written transcripts that include interpretations of the collected

  information to confirm validity.

When reporting the findings, teachers' interest, wishes, and rights were considered prior to

finalizing the results

of the study (Aldridge, 2002).

Conclusion

This section described the qualitative methods of data collection process based on the

data studied that included: data coding system; and linking codes or units of data to form

concepts. I methodically identified patterns in an order that provided an enlightening description

of the teacher's perspective of the math PD. This section outlined the methods of data collection

and analysis used in this research project.

Data collection was undertaken in the school setting because I sought to describe the

math PD effectiveness from the teacher's perspective. The individual interview and observation

methods were used to collect data, and analyze with codes to identify key points in the study.

The criteria to determine the trustworthiness of my study was briefly discussed and explored.

The previous two sections gave details that related to the fundamental assumptions, methods and

procedures of qualitative research to improve perceptions by math teachers. My hope is that

more math teachers will adopt strategies taught in improved and relevant math PD training to enhance instructional strategies in the classroom.

Data Analysis Method

According to Wake and Burkhardt (2013), the qualitative method of data analysis involves coding data (such as interview transcripts) by allocating labels to events, actions and approaches. As data analysis continued, I abstracted these codes into broader more conceptual concepts and categories to capture the complexities of the social process. The data analysis process was facilitated by constantly comparing similarities and differences within and between the data set; a process referred to as the constant comparative method of analysis. I made notes about my thoughts and hypotheses as hypothetical memos that help to construct relationships among codes and assist me with identifying conditions, actions and consequences of the investigation.

According to Creswell (2012), the object of the coding is the process to make sense out of text data by dividing it into text or image segments. Coding is the process of segmenting and labeling text to form descriptions and broad themes in the data. Codes are grouped together to form broader themes that are used in the study as key findings. I utilized the Coding Analysis Toolkit to code the interview responses. CAT or Coding Analysis Toolkit is a web-based suite of Computer Assisted/ Aided Qualitative Data Analysis Software (CAQDAS) tools (Texifter, LLC, 2018).

Creswell (2012) identified six interconnected steps in qualitative data examination and understanding. I planned and organized my information for analysis using the six steps. The

first step was storing the hand-written data that was provided by participants into the computer for analyzing. The subsequent step was to review the information and organize by coding it. This step included interpretation of the data and implementing the coding steps. I classified parts of text and dispersed code labels to the parts based on the significance of content segment. The codes were then utilized to form clarification of the important segments for my study. Following these steps, my codes were divided into three sections that fit into the categories of teachers' experience with math staff development. The three sections that were used for my coding was: setting and context, math teachers' perspectives, and observed strategies. Explanations of how the findings were produced are included with a report of how the themes and concepts were derived from the data. The analysis was not only restricted to issues that I consider important, projected themes, but also issues that were evolving themes emerging from the data (Laureate, 2012).

The discrepant cases were used to enable an objective perspective of gaining the truth about the math teacher's perspectives with the math PD. For example, the question was raised as to whether teachers who received PD failed to implement some of the mandated strategies due to: the type of PD received on campus, the type of PD received during the summer, the level of support received at the school, or a combination of all factors. The participants explained their difficulty in implementing the strategy due to the limited level of training and comfort level with introducing the strategy into their lesson. Their responses were added to the findings in Appendix H: Participant Confidence Results.

Data Presentation Strategy

According to Creswell (2012), qualitative researchers often display their findings visually using figures or pictures that enhance the dialogue. A strategy that was used to present my data is through a comparison table that illustrates and compares the two types of PD with a sample of math teachers who attended one of the PDs. Teachers were able to attend any PD (summer or year-around) that was available in their content area. I categorized the teachers according to the type of PD they attended whether summer or year-around. If the teacher attended both, I asked them to select one of the PDs to focus on for the purpose of my study. The interviews were based on their perspectives of only one of the PDs and the observations were based on strategies taught in the same PD as the interview. I created a visual image using charts and tables in Appendix F that illustrated the groups of teachers who believed that math staff development strategies were effective. Creswell explained that the primary form for reporting findings in a qualitative research is a narrative discussion. A narrative discussion is a written passage in a qualitative study where the author summarizes in detail the findings from their data analysis (2012).

The consistency of an investigation refers to the production of the findings. I substantiated validity by various techniques that include triangulation: the use of opposing confirmation, respondent corroboration, and steady comparison study (Creswell, 2012). Respondents' validation allowed the participants to interpret and analyze data while providing feedback as an interpretation of their response. This provided me with a technique of examining for inconsistency, assumption challenges, and another chance to analyze the data again. When using steady comparison data, I was able to analyze data oppose to fragmenting it. The use of

continuous comparison enabled me to recognize rising themes in my research study (Creswell, 2012). My dialogue between the accessible literature and research findings contributed to the study (Watson, 2013).

Creswell (2012) wrote that validating findings means that the researcher determines the accuracy or creditability of the findings through strategies known as triangulation. I showed my validity of finding through the process of triangulation. Limitations may occur if all elements are not considered that go into the narrative report of findings (Watson, 2013). To ensure that the study was useful to educators and the public, it was necessary to ensure the validity of the study. Validity makes the study credible and defensible (Guimaraes, 2015). To ensure the validity of my study, first I utilized a qualified editor who checked for biases. The editor was able to point out some inconsistencies in the data presentation and helped me explain my more clearly. Second, I ensured that I had a good sample, which included several content areas of math and on several campuses in the district. For the sample framework, my study involved all the secondary math teachers in the district. By including all the math teachers, I was able to receive perspectives from each one of the content areas of math: Algebra I, Geometry, Algebra II, Math Models and Trigonometry. Third, I utilized triangulation. For triangulation, my study utilized several methods in the collection of data. This included collecting evidence from administrators and teachers, field notes and interviews. Fourth, respondent validation was used. Respondent validation was obtained by asking the participants to confirm the data that was collected to ensure that the content was authentic. Saturation was fifth. In the case of saturation, I compared the results of the study with other studies that addressed the same question and I continued

collecting data until no different answers were provided when I asked the interview questions. And finally, my sixth step was when I provided for alternative explanations (Guimaraes, 2015).

Conclusion

This section described the qualitative methods of data collection process based on the data studied that included: data coding system; and linking codes or units of data to form concepts. I methodically identified patterns in an order that provided an enlightening description of the teacher's perspective of the math PD. This section outlined the methods of data collection and analysis used in this research project.

Data collection was undertaken in the school setting because I sought to describe the math PD effectiveness from the teacher's perspective. The individual interview and observation methods were used to collect data and analyze with codes to identify key points in the study. The criteria to determine the trustworthiness of my study was briefly discussed and explored. The previous two sections gave details that related to the fundamental assumptions, methods and procedures of qualitative research to improve perceptions by math teachers. My hope is that more math teachers will adopt strategies taught in improved and relevant math PD training to enhance instructional strategies in the classroom.

Data Analysis Results

Data Gathered and Recorded Procedures

The data collected during the study was stored in a file electronically by using a USB drive and folder on my laptop with password protection as a safety. I transcribed the interview comments into a Google document from the field notes, afterwards I shared the transcript with the interviewees to verify that there was no distortion to the information that they had shared. Each participant was given an opportunity to review their transcript as an effective approach to reduce bias, and ensure reliability (Lodico et al., 2010). Each participant who chose to review their transcript confirmed the information as transcribed accurately. No participant asked for any changes in the transcripts.

Findings

This chapter presents findings from the participant interviews and observations related to the three guiding research questions poised for this study. There are several sections in this chapter. First, I introduced the participants who shared their experiences with this study. A summary of their interview comments was included. The next section described themes that arose from my interviews with participants about the research study; the last section compared the effectiveness of PD that occurs during the summer and throughout the school year via classroom observations.

Due to my communication with participants, I felt it necessary to present a narrative that enabled readers to experience a relationship with the participants. The story of these participants

contributed greatly to a deeper understanding of the most effective PD for math teachers that enabled effective implementation of instructional strategies in the classroom.

Access to Participants and Role of Researcher

The target participants of the study were 25 math teachers from three of our District's High Schools. In selecting the sample, purposive sampling was utilized. Purposive sampling is common to exploratory qualitative research(Herek, 2012) and was most appropriate for this study because the study was specifically designed for math teachers in our district and math teachers who have undergone the same PD training on campus and during the summer(Fink, 2000).

Thanks to the interviews, the following participant profiles emerged. The profiles included the following contents: Algebra I, Algebra II, Geometry, Math Models and Trigonometry. The names selected for the participant reflects the number sequence of interview and math subject that they taught.

Participant Profiles Interviews

There were seven Algebra I teachers who participated with the study. The teachers had a variety of years of experience and, as a group, believed that there is a great need for this type of study because they had concerns about the overall contribution to instructional strategies that emerged from the PD. For example, Participant 1 said that the on-campus PD strategies were not as effective with all students. The strategies needed to be modified for the special needs students in the inclusion classes. Most participants talked about PD strategies that were taught in other districts in comparison to the target district's PDs, and felt that the campus PD throughout the

year was more beneficial since teachers could collaborate with their colleagues and discuss strategies that are successful, as well as those that were not successful in Algebra I. Furthermore, Participant 14 would like to attend a PD that is not in her district to identify research-proven effective strategies implemented with other secondary schools in other states. Participant 15 provided examples of some of the strategies that were demonstrated and implemented in his/her classroom. For example: the strategies were judged effective because there was a direct rapport with the facilitator and the participant could receive assistance and modeling of strategy from the campus math instructional coach. Overall, the Algebra I participants believed that the campus year-around PD is most effective because of the ability to link the strategies and data specifically to their students. Studying the on-campus data enabled the teachers to apply intervention strategies specific for the individual student.

Algebra II was represented by five participants for the study. There was a consensus among the teachers that the campus PD was helpful because they can discuss data and intervention strategies with their specific team. Participant 13 believed that the strategies learned in on-campus PDs are more effective with the students because they were usually facilitated by the Instructional Coaches on the campus and are more relevant to their students. Another example of the campus PD was provided by Participant 17who believed that campus PDs are most effective due to campus support and opportunities for the team to discuss strategies about what is successful or not, and then to make modifications.

The participants also included five Geometry teachers with various years of teaching experience. This team of teachers believed that the most effective PD is campus year-around.

For example, Participant 18 said that he is very pleased with the campus year-around PD and felt that meeting with the teams is very effective because of the dialogue that relates specifically to strategies that work with teaching geometry. This participant felt that the summer PD is not very personalized since it includes all secondary geometry teachers with close to fifty teachers at the PD as opposed to their small team on campus. On the other hand, Participant 21 said s/he has learned many useful strategies during the summer PD from other teachers. She acknowledged that the campus PD does offer the additional support for implementing the strategies and for reviewing specific data beneficial to ensuring that "you are reaching your students' needs."

Math Models content area was represented by five teachers in the study. Their overall experiences were positive for the campus-based year-around PD. The teachers believed that the strategies learned in the campus year-found PD are most effective due to the accessibility of the teacher mentor and instructional coach, as well as the ability to structure the instructional strategies to fit their campus student population. In addition, Participant 22 felt that the campus year-around PLCs are most effective because of the data driven instruction. The team could develop a plan of action and identify strategies specific to the students' weak areas. This enables the teachers to create strategies tailored for the success of their own students opposed to the district.

Trigonometry was represented by two participants who said that the district is providing adequate campus and summer PD. However, they said that they would like to see more specific content strategies related to their math subject with the summer PDs. They felt that this will enable them to learn more from other campuses about strategies that are successful with other

populations. But, overall, both believed the campus year-around PDs are more effective since it provided strategies specific to their school population.

Emergent Themes

The following section will describe the themes that emerged from the interviews and observations for my study.

Theme 1: On-Campus Strategies

There were several on-campus PD strategies found to be beneficial, such as: Structured Math Talk and Public Data, Team Lesson Planning, Turn and Talk and Private Think Time.

Beneficial on-campus strategies. Participant 3 stated: "I was able to expand my question with students by utilizing strategies of Turn and Talk. This strategy was beneficial allowing students to explain their answers opposed to just writing it down."

Participant 7 discussed the Team Lesson Planning as an effective strategy since it is held during PLC time on campus and the Instructional Coaches are available for support with implementation. For example, this participant said some of the other effective strategies that are used inside the classroom include Turn and Talk because students are advanced and they can explain the answers and solve the problem as a team. Participant 7 stated, "Collaborating is very important for students to learn in secondary, since it is a reality for most higher education institutions and careers."

Participant 24 commented that the on-campus PD has proven to be most effective since the support is easily accessible. This participant is a veteran math teacher who also mentors the new math teachers to their campus and confirms "It is very important to have a support system

that you can go to throughout the day and even to observe them teaching using the strategies taught in PD." One of the most effective strategies for this participant is the Structured Math Talk because the students explain their problem-solving strategy while defending their answer. According to Participant 24, this strategy is very effective with maintaining student engagement in the classroom.

Least beneficial campus strategies. The least beneficial strategies/PD included pulling students out to complete small group conferencing, and Team Lesson Planning. The negative attitude or perceptions about lesson planning puts into question the long-standing beliefs on some of the old teaching strategies teachers use and their benefits about them. Formerly, lesson planning was completed on an individual basis as opposed to a team basis. Team lesson planning is completed with a team of teachers who teach the same content. For example, all Algebra I teachers meet on Tuesdays afterschool for one hour to complete their lesson plans for the following week. Teachers are supposed to collaborate and develop lessons that are relevant to the scope and sequence of the current content objective. Some of the teachers who did not like team lesson planning felt that the team lesson planning was dictating their lesson presentation and what they teach in their classroom.

Participant 10 expanded on why she thought the least effective strategy was to be pulling students out of the classroom. This participant believed that the students are receiving dual instruction from different teachers and it usually results in the students' poor performance on state assessments. "I would rather keep my students in the classroom to ensure that they are receiving the same instruction as the entire class, Participant 1 commented:

The pulling out of students is least beneficial since they lose some instruction with the general education teacher when they are pulled from the classroom. Even though students are pulled out by their inclusion teachers, the instruction can differ which can be confusing for students at times.

Theme 2: Implementation Issues

Using Public Data, Think Through Math and Individual Conferencing are strategies that teachers are expected to implement on a regular basis at their schools. The emergence of this theme now raises the question as to whether teachers who received PD failed to implement some of the mandated strategies due to: the type of PD received on campus, the type of PD received during the summer, the level of support received at the school, or a combination of all factors. There is also the question as to whether the benefits of these strategies far outweigh their difficulty in implementation. In other words, would the teachers still implement them if they did not provide significant benefits to the students? Participant 21 stated: "The campus PD does offer the additional support for implementing the strategies, and also helps you review specific data which is beneficial to ensuring that you are reaching your student's needs."

Participant 24 commented: "The summer PD is great with implementing general strategies for teaching geometry. However, the campus year-around is more specific with individual students since you are using the data to guide your strategies with instruction. Participant 20 was very passionate about the PD and implementing relevant strategies: "The most effective PD to this teacher is year-around because of the collaboration with campus Algebra team members and, also with the math special education (SPED) teachers."

Theme 3: Benefit to Students

The third theme that emerged is the benefits to math students in improving their confidence, enhancing mental toughness, and competence for sense making useful for tackling tough problems on the state assessment which can have a direct influence on a student's socio-emotional growth by increasing her competence and self-esteem when it involves solving math equations. Even small group discussions were perceived to have their own benefits as it assisted students in thinking mathematically.

Participant 11stated:"The most effective PDs are the PLCs that are held on campus because of the collaboration and the ability to structure the strategies to fit their campus student population." This participant further commented that using the Turn and Talk, and Structured Math Talk strategies help build the students' confidence with answering questions verbally and solving equations on the board. Participant 5 said that one of the benefits she saw in her class is the increased level of competence that her student demonstrated when developing team strategies to solve word problems and formulas. The students work in pairs or groups of fours to calculate a strategy and present the problem and solution to the class.

Participant 7 thought that Structured Math Talk strategy learned in a summer PD was beneficial to her students because it helped her to create more extensive questions which generated class discussion on the equations. The Word Problems strategy helped students rule out answer choices that did not apply and only focus on the remaining answer choices that were relevant to the problem. As a result of implementing this strategy, the teacher said s/he did see an increase in student math scores on the districts' common assessment.

Participant 9 felt that the campus PD meetings throughout the year were more beneficial since teachers collaborated with their colleagues and discussed strategies that are successful as well as, those that were not successful in Algebra I. She believed that one of the most effective strategies beneficial to her students was Think Through Math which allowed her students to take time and solve the problem by analyzing various scenarios. By analyzing the different possibilities, the students used more critical thinking skills and built their confidence levels at the same time.

Observations

The following section describes the observations and documentation of the strategies used in math classes across the sample. Table 1 indicates the strategies that were observed and the extent to which each was observed. The most commonly observed strategy was Team Lesson Plan Posted. Team lesson plans were available in all participants' classes on the front wall or bulletin board that indicated student goals and the objective for the day. I could observe the objectives and lesson to identify the strategies to be taught during the lesson.

Private Think Time and Turn and Talk were each observed in 14 classrooms. For example, Participant 23 was observed demonstrating the strategy of Turn and Talk. Students were given a problem to discuss for two minutes with the person seated behind them. A timer was set and when the time was up, one of the partners had to provide the answer by sharing the formula used to obtain the answer.

For Private Think Time, students were given a math problem to work out. The teacher would ask them to circle all the numbers, box the math terms, underline the objective, and put a

question next to anything they don't know. Afterwards, the students were given5 minutes of quiet time to think, and then collaborate. Most of the students had not solved the problem within the 5 minutes, but they had started to work on a strategy to solve the problem.

The use of Public Data, Think Through Math and Structured Math Talk strategies were observed in 13, 11 and 10 classrooms respectively. Interestingly, while participants indicated that 'Structured Math Talk' was the most beneficial instructional strategy learned in their PD for improving student understanding of content, it was observed in less than half of the sample classrooms. I think that I did not see this strategy in more classrooms because of the time restrictions and the flow of their lesson may not have permitted the additional time for the strategy on the day of my observation. During my observation, I observed several participants use this strategy with their students by presenting the equation on the board and providing two options for the process of solving the problem. Students were given five minutes to think of a defense for their choice of methodology to solve the equation and afterwards presented an explanation to the class.

Individual Conferencing was only observed in five classrooms. Due to the bell-to-bell instruction, many teachers did not have time to conduct Individual Conferencing on the day of my observation. This strategy was used as an exit ticket in the five classes that I observed using Individual Conferencing. Participant 12 used this strategy as an exit ticket for students to the leave. Each student had to check out with the teacher prior to leaving by presenting his/her completed assignment and explaining the process used to solve the independent equation.

As illustrated in Table 1, I was not able to observe the demonstration of using the math strategies in every classroom during my observation. Two of the twenty-five participants did not use any of the strategies and 1 of the participants used only 1 strategy. For example, In participant's 8 and 10 classroom, the students were taking an assessment on the day of my observation and I was not able to see the teacher complete a lesson. Participant five was observed using individual conferencing only with students because of the participant's previous absences and need to review students' completion of work individually. For example, students were allowed an opportunity to present their in-class assignments to receive credit for completion. The conference also informed students of missing assignments that should have been completed while any participant was absent. The remainders of participants were observed using two or more strategies during my observation in their classrooms.

Table1

Strategies observed during classroom observations

Participant	Private Think Time	Individual Conferencing	Public Data	Structured Math talk	Team Lesson Plan Posted	Think through Math	Turn and Talk.	TOTAL
1.			1		1		1	3
2.				1	1	1		3
3.		1			1		1	3
4.	1		1		1		1	4
5.		1			1			2
6.	1			1	1	1		4
7.	1		1		1		1	4
8.					1			1
9.	1		1		1	1		4
10.					1			1
11.	1	1		1	1		1	5
12.	1				1	1	1	4
13.			1		1	1		3
14.		1		1	1		1	4
15.	1		1		1		1	4
16.	1		1	1	1	1		5
17.	1		1	1	1		1	5
18.		1	1		1	1	1	5
19.	1			1	1		1	4
20.			1	1	1		1	4
21.	1			1	1	1		4
22.			1		1	1		3
23.	1		1		1		1	4
24.	1			1	1	1		4
25.	1		1		1	1	1	5
TOTAL	14	5	13	10	25	11	14	92

This table illustrates the observed strategies in each participant's classroom.

Coding Procedures and Software

For the study, the data were coded from the teacher's interviews, observations and student work samples. Even though I observed students using the strategies, I was not physically able to take samples of the work. I documented the strategies that I observed and coded them.

The a priori categories are listed below:

- *Interview prior to Observation:*

Category: Teacher's Perception of PD

Subcategory 1: Positive Perception. Structured Math Talk and Public Data were perceived as the most beneficial instructional strategies in improving student understanding of content. Even though the above two strategies were perceived by teachers prior to my observation as the most beneficial, I only observed ten teachers using Structured Math Talk and thirteen teachers using Public Data as strategies in the classroom. This could have possibly been a result of timing and the day of my observation in relation to the discrepancy of number of teacher perceptions and observations. Or, possibly, the teachers are saying that, 'in theory' Structured Math Talk and Public Data were the most beneficial. Team Lesson Planning, Turn and Talk and Private Think Time were also perceived to be beneficial. Team Lesson Planning was used in each teacher's classroom since it is a district requirement. Team Lesson Plans were created to outline the goals and objectives as well as guided practice and Independent practice for each day. Teachers reviewed the objectives daily with students at the very beginning of the class. This enabled students to understand the teacher's expectations and goal for the class period. Turn and Talk and Private Think Time were both observed fourteen times in classrooms.

However, this was not perceived as the most important strategy. This could possibly be due to the inability to ensure that students are remaining on task with the class topic of discussion. For example; when I observed Turn and Talk and Private Think Time in some of the classes, the teacher had to remain very attentive while walking around the class to ensure that students were not engaging in irrelevant discussions.

Subcategory 2: Negative Perception. The instructional strategy that was perceived as least beneficial was pulling students out to complete small group conferencing. Team and Lesson Planning were also perceived as least beneficial to some participants.

- *Observation*

Category: Implementation

In determining what was and was not implemented, I spoke with the participant in the pre-observation interview to identify the strategies that were taught in the PD whether on campus or during the summer. The observation enabled me to identify the strategies that had previously been discussed with the pre-observation interview.

In terms of difficulty of implementation, Individual Conferencing is the most difficult to implement for the teachers while Structured Math Talk is the second most difficult to implement. Think Through Math was also difficult to implement. Structured Math Talk and Think Through Math are sometimes difficult to implement if one is new to the program and does not have experience with implementation. However, because these are common strategies that are used district wide, teachers are expected to utilize this strategy when exploring conjecture on the basis of evidence and using reasoning and proof techniques to confirm or disprove those conjectures.

Furthermore, the checklist does not document how well the teachers implemented the strategies, only whether or not they did implement the strategies.

- *Interview after Observation*

Participant 7 felt that small group discussions assisted students in thinking mathematically and the strategies-built student confidence, mental toughness, and enhanced competence for rationalization for tackling and solving tough problems on the state assessment. However, more than half of the participants indicated that extended time spent on small group discussions was not the best practice in preparing students to find a right answer on the multiple-choice style assessment. More than half of the participants also felt that more time is needed by the teachers to be spent on teaching test taking strategies for the current multiple-choice format and word problems assessments. For example: this will allow teachers to help students develop a test strategy for solving difficult problems on assessments that requires a particular formula/ equation to find the solution.

Regarding the software, CAT of the Qualitative Data Analysis Program (QDAP) was used for the text-based section or the transcripts for the interview, for reliability and accuracy for text data (Qualitative Research - Software & Support Services , 2013).For the observation notes, the Compendium was used because of its flexibility and for visual representation of the organization and connection of texts with the use of the texts (Compendium Institute, 2015).

Even with the use of these tools however, it should be noted that my understanding and familiarity with the setting was sometimes needed (Computing in the Humanities and Social Sciences, 2016).In this study, I presented the positive perception held by teachers regarding the

type of PD that teachers viewed as most effective. There are several items/codes for the teachers' negative perception as well as positive perceptions of the effective strategies learned in the PD. Lesson planning was the one unanimous agreement that I observed in every teachers' classroom, because of the campus wide procedure that each class must have lesson plans posted daily for students and others who come into their classroom.

In analyzing the data, it is the researcher who creates the code and makes the connections between the codes for the greatest coherence and meaning (Fink, 2000). In this research, I have created the codes and the connection using the guided questions to guard against any bias and ensure general ability, reliability and validity of the findings. The observation is coded by the types of PD strategies that were observed during the classroom observation.

Indexing of Codes

According to Strauss & Corbin (1990), indexing content is the result of process of creating category, while 'dimensional zing' allows the researcher to locate a category in the results. It is, therefore, extracting codes from the contents. Indexing texts allows the researcher to further analyze the content. The result is the coded text and the structural index (Strauss & Corbin, 1990, p. 69). Miles &Huberman (1994) wrote that "coded data segments have to be located in the transcribed field notes; they have to be extracted, condensed, and summarized. Some further data transformation and selection may also be involved: doing ratings, making judgments, picking representative quotes (1994, p. 98).As a result of the interviews and observations, several themes emerged. I used these to further analyze the results of the study.

Process for Dealing with Potential Discrepant Cases

Creswell (2009) stated that presenting discrepant data adds validity to research. Discrepant data counter the themes that surface in a study, and may validate the outcomes by given a different, more practical perspective to the researcher's conclusion (Creswell, 2009). I did not have any discrepant cases in my study. However, I estimated different perspectives of the information to sustain my results. In the possibility of an occurrence of discrepancies, I allocated time and resources to gather more information and continue the triangulation process of data with interviews and observations. For example, I invited the participants to contact me if they wanted to add any information to their interview. I also allocated additional days to observe/ interview participants as a proactive strategy to allow for emergencies that could alter the scheduling for the observation/ interviews.

Findings from Research Questions

As the purpose of this study was to answer three research questions that explore teachers' perceptions about the math PD they receive, and the effect of that PD on Instructional strategies taught in the classroom as measured by student's classwork and state assessments, the following responses were collected from participants as answers to the three research questions.

What are the math teachers' experiences with staff development training in mathematics? The PD objectives were to; (a) engage teachers in the planning process of the first 6 weeks of instruction for secondary math;(b) experience strategies and debrief the strategies to determine if these will benefit student learning and;(c) analyze student work samples and discuss how this strategy/ practice can lead to an effective social climate and instruction in the classroom.

In terms of perception of social change because of the professional development, 75% of the participants felt that PD improved the social climate in the classroom. One hundred percent of the participants indicated that, because of the professional development, the students earned the trust of classmates, had improved student confidence, and trust within the mathematics department improved.

The information was obtained from the teacher interviews held after the classroom observations. Seventy-five percent of the teachers interviewed believed that teachers' morale had a positive effect on the climate based on the perception of the PD effectiveness. These teachers also expressed the importance of a high morale in a school culture as it relates to the type of support and PD that is provided.

For example: 80% of math teachers expressed that there is an improvement with classroom culture which has a direct influence on parent, student and campus educator's trust. Without the presence of trust between school and community, the school's success rate can be difficult to obtain. The majority of participants noted that an effective math PD that demonstrates several math strategies relevant to their content had a positive effect with the relationship between teacher/parent and teacher/student.

In answering the research question, as it related to experiences with math PD, teachers discussed Structured Math talk as a common strategy used in the district to allow students to make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures (National Council of Teachers of Mathematics Commission on Standards for School Mathematics, 1989).

In the second question: 'How do math teachers' perspectives on PD strategies vary by type of PD provided?' the district math teachers who completed two distinct types of math PD. Summer PD presented on a lecture format versus on-going campus PD were interviewed about their opinion about the PD strategies. For example: Public Data is a general report card that is generated by the state department of education that provides an annual summary of performance data of each campus within the state. Analysis of this data is used as a strategy during the on-going PD on campus. With respect to teacher's perspective of the most difficult strategies to implement, 100% of the participants responded that Public Data is the most difficult to implement while 50% indicated that Group Conferencing is the second most difficult to implement. Think Through Math, and Individual Conferencing were also identified as difficult to implement. Turn and Talk and Private Think Time were identified as neither difficult nor easy to implement.

According to Miles and Huberman (1994), implementation occurswhen teachers are able to fulfill and incorporate new strategies into the lesson effectively. The implementation of strategies is addressed by observations and post-observation interviews of the participants. I found that the majority of the participants felt confident with implementing different instructional strategies learned from the on-campus year-around PD into their lesson as opposed to the summer PD. The teachers felt that the on-campus PD presenters were easily assessable to support implementing the strategies. Fifty percent of the participants who received the on-campus PD said they felt confident implementing questioning techniques and asking probing questions around whole group discussions. Other respondents felt confident sequencing content

and with the standards around planning. Fifty percent of the respondents who completed the summer PD did not feel confident with implementing Structured Math Talk in the classroom; specifically, teachers discussed struggles with time management and student engagement when implementing Structured Math Talk. Seventy-five percent of the participants who completed the campus PD felt confident with the use of Public Data, Wait Time, Turn and Talk, and Private Think Time since these strategies were worked on during their PLCs (Appendix G).

Table2

Comparison Chart of summer and year-around PD
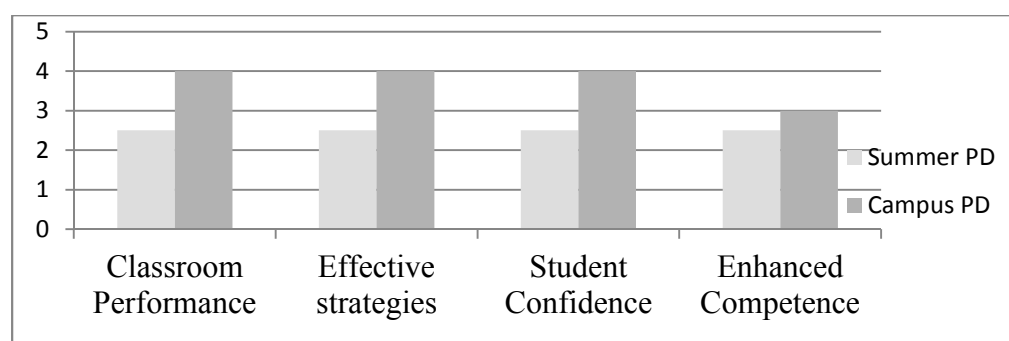
Does students' depth of understanding as measured by performance on classroom assignments differ by the type of PD provided? In the third question, 'Does students' depth of understanding as measured by performance on classroom assignments differ by the type of PD provided?' the teachers were observed while using the math strategies from both campus and summer PD during instruction and documenting students' responses to strategies. Student work was observed during the classroom observations with students demonstrating comprehension of understanding on the smart board and by the work samples that were displayed throughout the classroom. Participants addressed the student's progress by giving example of each student's

proficiency thanks to teacher use of the prospective strategies. For example; Participant 5 indicated that student XX's initial assessment was a grade of 50, but at the end of the 2nd six weeks, the student's grade had increased to 80. Participant 23 presented deidentified examples of five student's work that identified the process and results from the small group discussion report

In addressing the end-of-course state assessment performance, 75% of participants felt the strategies they learned in the PD built student confidence, mental toughness, and enhanced competence for sense making around for tackling tough problems on the test. Small group discussions were said to assist students in thinking mathematically, however 75% of the participants indicated that they believed that extended time spent on small group discussions was not the best practice in preparing students to find a right answer on the multiple-choice style assessment. Small group discussions were said to assist students in thinking mathematically, however 75% of the participants indicated that they believed that extended time spent on small group discussions was not the best practice in preparing students to find a right answer on the multiple-choice style assessment. For example, I was able to observe a small group discussion that included 5 students with an inclusion teacher. This small group remained in the class and had a round table near the rear of the classroom. Students received general instructions and lesson objectives from general education teacher. Afterwards the 5 students were pulled into the small group to receive guided practice and complete independent practice assignments. Twenty-five percent of the participants thought that more time is needed to be spent on test taking strategies for the current multiple-choice format style of assessment on the state assessment (Appendix G). As a result of this analysis, I believe that test prep helps students to develop

strategies to answer questions and problems by using several methods like looking for key words and eliminating irrelevant answers that do not fit the question.

On the other hand, 75% of the participants indicated that the instructional strategy that was least beneficial was 'pulling students out to complete small group conferencing.' This strategy caused students to miss out on the in-class instructions and activities that took place during the class period and sometimes would require the teacher to re-teach the strategy to the students who were pulled-out. Thirty percent of the participants also indicated that Team Lesson Planning, Turn and Talk and Private Think Time were beneficial. On the other hand, 25% of the participants did not agree with Questioning Team and Lesson Planning and instead identified it as least beneficial. Turn and talk and Private Think Time were also identified as beneficial (Appendix G).

Interpretation of Data

Qualitative data was accumulated from the following sources: observations, interviews, and document review. Creswell (2012) described triangulation as the process of corroborating evidence from different individuals, types of data, or methods of data collection in description and themes in qualitative research. I examined information and presented evidence to support the themes. This ensured the accuracy of the study because the information from multiple sources of information, individuals, or processes.

In this study, the triangulation process includes data from participants who are secondary teachers who completed the summer/on-campus PD and who participated in a pre-observation interview, classroom observations, and post-observation interview. After the triangulation of

data, the following themes emerged: (a) teacher perception of ongoing support in PD rather than de-contextualized PD; (b) teachers were most engaged in implementing the following strategies: participating mathematics teachers indicated that Think through Math, Public Data, Team Lesson Planning, Turn and Talk and Private Think Time were the most beneficial instructional strategies in improving student understanding of content; (c) factors that facilitated implementation were the availability of on-campus support from the math coaches contributed to the effective implementation of the above strategies because the math coaches were able to provide demonstration by modeling the strategy with each teacher during a lesson cycle; (d) factors that inhibited implementation were the inability to have receive year-around support with strategies taught in summer PD because the presenters were not available to work with teachers year round; and(e) the perceived role of strategy implementation in improving student self-confidence, and in student math performance.

Conclusion

PD has the potential to affect teacher's instructional strategies that enable the success of students to become college and career ready upon entering the world of work or higher education. According to Onsrud (2015), valuable and successful PD increases the likelihood that recently acquires knowledge will be useful in the classroom, consequently, influencing instructional practice and student attainment. To develop math teachers successfully in our secondary schools, the research literature suggests that PD should be provided on a constant and consistent basis which will ensure that teachers are receiving recurrent knowledge (Soine & Lumpe, 2014). Educational trends and technology are constantly evolving, and instructional

strategies and practice should be a mirror of the evolvement of the new trends (Church, 2012). Veteran and novice teachers' instructional strategies benefit from effective PD whether on campus or during the summer. Educators must have a desire to continue their learning which will enable them the ability to implement current and various strategies into their instruction (Stein, Smith, Henningsen & Silver, 2016).

I intended to demonstrate secondary math teachers' perception of the math on campus and summer PD in the district as well as analyze the instructional strategies learned in PD that were most effective with implementation into instruction. Lastly, I asked teachers to compare the two PDs and their effectiveness with successful student outcomes (Creswell, 2012). According to Yin (2012), a case study can explain a phenomenon in various methods to create an effective outcome. Qualitative data was collected and then analyzed to study how math teachers feel about PD year-around on campus and during the summer at the secondary level.

After selections sample of participants, each teacher was interviewed and observed and interviewed post observation. Notes were taken after the observation and interviews were conducted and the results were reviewed for patterns and themes of similarity.

In any study, it is first important to summarize the data, especially since data can be quite large and complicated to analyze. The results from my data collection indicate that math teachers believe that PD has had an overwhelmingly positive effect on the instructional strategies that they utilize in the classroom. As noted from the participants, the effects are mainly due to the introduction of math-focused PD that takes place in the summer and throughout the school

year. In the following Section 3, I will present a description of the project, rationale, review of

literature and implications.

Section 3: The Project

Introduction

My project is a PD plan that will provide math teachers and math instructional coaches with a tool for the implementation of learning communities school-wide. As a result of my collection of data and emergence of the themes, it became obvious that math teachers desire more time to collaborate with the math instructional coaches. In addition to collaboration, they would also like to have more time to observe demonstration lessons from their math lead teachers and coaches. In order for the local school district to be able to allow additional time for collaboration, schedules must be restructured to ensure that the team of teachers shares the same planning period per school day. Many participants expressed a necessity to examine the math curriculum with math team and to create lesson plans that may be shared with the team. This chapter will provide an explanation of the goals, rational and review of literature for the project. The review of literature will give an explanation of why a PD curriculum and plan was selected for this project. This chapter contains plan to implement the PD, as well as a proposal for the evaluation of the project.

Description and Goals

I examined secondary math teachers' experiences with staff development training in the content of mathematics and their perspectives on PD strategies that varied according to the kind of PD (year-around or summer) provided. The current PD program was developed partly because of the budget constraints within the district, and partly because teachers were required to obtain continuing education hours for their certifications. This project emerged as an alternate method

to deliver PD to secondary math teachers by helping them collaborate with their teams. The results from the participants revealed that there is a need to partake in PD, however PD should have a focus on strategies that are relevant and include team collaboration.

Mizzell (2008) wrote that teachers create effective and valued learning when they can plan and collaborate as a team. The scheduling for the PD project should not be difficult because the district currently has a PLC period that allows the teachers to plan with their team on a weekly basis and this time could be utilized for the PD. This teamwork and collaboration will serve as a main focus of the PD, as well as providing effective strategies needed by math teachers. A 3- day training was created based on the schedule that will provide math teachers with the time to collaborate and learn new strategies for practice with math students. The schedule will permit the PD to be incorporated into the math curriculum calendar for a semester. This will make certain that the present PD progresses successfully into a training that is inclusive with meeting the needs of all math teachers. After the preliminary training, cooperative teacher sessions will occur on a weekly basis. The sessions will afford math teachers with necessary information that help them comprehend the purpose of the PD, which will enable them to practice strategies that are taught in the PD training.

Rationale

As a secondary teacher, I understand the challenging goals of the importance to improve learners' academic achievement as well the association to of performance to the teacher assessment. Many districts hold teachers accountable for their student's performance results on the state assessments. However, many teachers do not receive adequate support and resources to

enable their success with improving student achievement (Tatto et al., 2016). Educators should be constant learners and, to ensure that they continue to gain new knowledge and skills, all districts should offer some type of PD. The project selected for this study is the PD curriculum based on the responses received from the participants during my data collection. I am hopeful that the PD will provide the math teachers with a PD in which they can receive new strategies to improve instruction in the classroom. By using a PD approach with the math teachers, this will enable them to collaborate with their teams and discuss as well as develop new strategies that can be effective with their students.

Burkman (2012) believed that a critical constituent of a PD is the technique by which materials and content is conveyed. Meeting collaboratively is one method used to support math teachers and it can aid in increasing students' achievement by stimulating instructional strategies. When teachers meet to collaborate with their specific teams, the time they spend together can be utilized as a respected strategy to stimulate professional learning (Learning Forward, 2017). Finally, this project will offer a technique to support instruction and learning within the local school district in which the study occurred. Teachers will benefit from the expertise of team members by sharing and collaborating as well as become constituents of their own learning.

Per student achievement on STAAR/EOC data, there is a strong need to support campus staff in the development of an aligned and rigorous curriculum with the level of rigor that is needed to teach the state standards (TEKS/SE) while allowing teachers to amend their instruction based on student needs. Results from Texas Education Agency 2015 Accountability Summary indicated that our campus academic status rating requires improvement. The campus did not

meet Index 2 (student progress). The target score was 17 and the campus scored a 14. Based on these data, we need to develop a targeted intervention in the area of Math. Furthermore, ninth grade math scores were 40% passing at Level II and tenth grade math scores were at 32% pass rate for Level II.

The above data indicated that we need math instructional intervention strategies (Local ISD, 2016). This district is performing below state standards in math – which is a critical area for all students. Teachers can discuss and identify the areas that need to be improved by reviewing the data. Creating and implementing a structured PD that can provide strategies, resources and support to address the weak areas that are a concern may improve the identified areas. In response to these low scores, the district implemented a new approach to PDon the school campuses with the math instructional faculty and staff. The PD I provide is intended to extend and deepen the district sponsored PD.

Review of the Literature

In this literature review, I will discuss the components of an effective PD program that promotes collaboration and cooperation from all stakeholders in the district. This literature review will provide an explanation of the purpose for a secondary PD program with an emphasis on teachers collaborating to implement effective strategies that can be used in the math classrooms. The review of literature will relate to a PD program established to meet the needs of math teachers who are trying to grasp the state curriculum. I focused my review on teacher perceptions of PD effectiveness and strategies taught at the high school level. I also reviewed sources on the Teacher Performance Rubric utilized by the local school district as it relates to PD

and teacher collaboration. Additionally, I studied literature that relates to PD and its effectiveness to ensure that high school teachers can relate new knowledge to their specific content. I retrieved various books by authors who has effectively implemented PDs in their school as administrators, as referenced to Kenney (2012) *Born to Rise*, Winters' (2012) *Teachers Matter* and Muhammad and DuFour's (2009) *Transforming School Culture: How to Overcome Staff Division*. I read a variety of scholarly journals from Walden University Library and various sources. In conducting my research, I used the following search terms: *effective professional development, PD* and I retrieved information from the subsequent databases for this literature review via Walden's library: Education Research Complete, ProQuest, Education Research Starters, Sage, EBSC, and ERIC were all retrieved.

Adult learning theories should be considered when developing an understanding of receiving knowledge while creating an effective PD for teachers. According to Clark and Gokmenoglu (2015), teachers appreciate a PD training that considers their experience and expertise. Because the local district uses the Teachers' Effective Initiative framework to appraise teachers, and one of the components is PD, I used the teacher's performance rubric (2015) as one of the primary inquiries for project information about teacher qualities and training. Gokmenoglu (2015), is noted for describing an effective PD training that researchers have quoted in their studies. Gokmenoglu (2015) offered a framework that advances, evaluates, and retains a valued program. Current researchers (Callahan & Sadeghi, 2015; Holm & Kajander, 2015; Shaha et al., 2015) have illustrated how effective PD may have an extensive and long-lasting influence on teachers, learners, and the local district. I used interviews and observations as the main collection

of data for this study to identify the teachers' perception of PD with their instructional strategies. Additionally, I studied work that is directly connected to PD and the effects of a structured training impact with high school teachers' application of newly acquired knowledge.

Professional Development

Carpenter and Linton (2016) wrote that a valuable PD can sometimes be difficult to develop in every district even though a quality PD is the greatest technique for improving instruction. Effective PD enables teachers to receive the needed support that aids with their growth professionally (Holm & Kajander, 2015), and nurtures academic skills in teachers while developing their knowledge in their specific content area (Carpenter & Linton, 2016). Some PDs have been critiqued for being shallow, unusual, needing more substance, lacking significance, and being too difficult to adapt to the audience (Carpenter & Linton, 2016; Shaha, Glassett, &Ellsworth, 2015). Clark and Gökmenoğlu (2015) illustrated that whether nationwide educational restructuring efforts are successful or not depend on the value and capacity of support given to teachers throughout a viable PD program. A detailed structured PD is an essential element in effectively restructuring education.

Lane and Hayes (2015) agreed that although pre-service and in-service are provided for teachers, teachers don't always learn the process for application of effective research-based strategies that will develop their instructional practices in the classroom. PD still provides teachers with information and knowledge. The Accomplished California Teachers (ACT) is a group of teachers from California (2015) who completed a study on teacher excellence. This group concluded that a successful PD is imperative to improving the type of instruction that a

teacher will exhibit. Additionally, Clark and Gökmenoğlu (2015) documented the association between the effectiveness of PD and highly productive teachers. Their explanation suggests that a valuable PD will expand student and teacher learning. According to Steinberg and Sartain (2015), there is a direct correlation among teacher quality and student achievement progression. Bannister (2015) also proclaimed that a good PD training is an asset in teachers and for students in the achievement of campus, district and state goals.

Jeon, Buettner, and Hur (2015) commented that teachers' inspiration to apply newly acquired knowledge is connected to their gratification with their current job. Clark and Gökmenoğlu (2015) wrote that a successful PD is informed by the necessities of teachers. Callahan and Sadeghi (2015) demonstrated that when educators' input enlightens the preparation of PD activities, the transmission of information was more beneficial than when the PD was disengaged from teachers' essentials. Furthermore, educators are inspired to acquire innovative data when they are assured that there is a relevance to the content in which they are receiving; meaning that this is relevant to my class (Carpenter & Linton, 2016). Holm and Kajander (2015) commented on the popular "one-size fits all" method while referencing PD training and they concluded that this approach is not effective at all. ACT, Callahan & Sadeghi (2015), presented their findings from a study on PD to illustrate that to accomplish its goals and objectives, the PD must be constant and comprehensive (2015).

A comprehensive PD should begin by using a concrete teacher training program. Schramm-Possinger (2016) wrote that teacher training and in-services can have a great impact on educational principles and instructional approaches, especially once the initial in–service has

been implemented for the campus. Several post–secondary colleges and programs have a courses and student teaching opportunities for future teachers who are enrolled in their programs. However, there continues to be a need for more PD training to aid with the novice teachers' effectiveness in the classroom once they become full time teachers (Bryant, Maarouf, Burcham, & Greer, 2016). Student–teaching involves philosophies and approaches that sometimes do not transmit into the actual classroom practice. Tatto et al. (2016) discussed the latest state initiatives to restructure teacher education curricula at the undergraduate and post-graduation levels. They summarized their research with the conclusion that a reorganization of schools is essential to improve learners' academic achievement, and that this is a direct reflection of the type of training that programs provide for those who aspire to become teachers nationwide. This research confirmed that the pre-service training does not provide adequate preparation for teachers who are assigned to work with students who are considered high risk, thus, the training is a disservice for the teachers. Beginner teachers in the high-risk districts are not successful because they may lack adequate knowledge and self- confidence as it relates to cultural differences. This can be a barrier to teaching and effectively relating to their students (Ebersole, Kanahele-Mossman, & Kawakami, 2016).

According to some researchers, PD can address and help many teachers who are not self-confident enough with their preparation to teach the subjects of mathematics (Colwell & Enderson, 2016) or English (Clark, 2016). Students must meet state requirement level in English and mathematics to progress to the next grade level and graduate. Hao& Lee (2016) wrote that, in general, pre-service educators lack self-efficacy when providing instruction to students in this

current generation. Dorel, Kearney, and Garza (2016) argued that pre-service training should expose teachers to real hands-on practicum that interacts with various cultures to enable them to receive a more realistic experience during their student teaching. The above-mentioned researchers concurred that the more time new teachers invest in studying as it relates to real life experiences, the greater their self –effectiveness increases for teaching. Ebersole et al. (2016) recommended incorporating a cultural course to expand pre-service teachers' perception of diversity in the instructional setting.

According to Ronfeldt (2015), when preservice teachers are assigned to a school with strong collaboration between staff, their experiences help them to be more prepared and effective once they are assigned as the classroom teacher of record. A valuable PD for teachers should be structured to be inclusive of all participants with goals and objectives clearly stated for the PD (ACT, 2015). Callahan and Sadeghi (2015) proclaimed that an effective PD is consistent and has follow-up methods to ensure that participants have ongoing learning that has a focus on student achievement (p. 50). The ACT group (2015) research concluded that an effective PD stimulates constant improvement that consists of self-assessment, developing new knowledge, and reflection of their own value of work. Ciullo et al. (2016) considered effective PD as a method that delivers clear modeling while providing a chance to relate newly acquired knowledge to their instructional practices. For example, in one public-school district, over two thousand administrators, teachers, and instructional coaches attended a Reading Academy during the summer and they were able to participate with the follow-up PD that was held throughout the school year (Lane & Hayes, 2015).Korelich and Maxwell (2015) maintained that when preparing

local school district board members to reform or incorporate a new PD policy, it is imperative

that the board is given the essential components that make up an effective PD. These

components should include the districts goals and objectives, budget, location, frequency and

target population for participation.

Collaboration

Collaboration is one of the essential elements that comprise an effective PD along with

structured ongoing support and allocated resources. Researchers write that the above elements

are very effective with a small content team of teachers and it has been concluded that teacher

training and collaboration have a direct effect on student achievement in math (Ronfeldt, Farmer,

McQueen, & Grissom, 2015). Researchers define Professional Learning Communities (PLCs) as

a method of teamwork whereas teachers can come together and meet with their respective

content area to discuss curriculum, as well as goals and objectives, and areas that need specific

attention (Callahan &Sadeghi, 2015; DuFour, 2014; DuFour & Mattos, 2013; DuFour& Reeves,

2016; Onsrud, 2015). The most effective strategy for PDs are when teachers can meet with their

grade and subject area on a regular basis to discuss curriculum and team lesson planning. This

team approach will be useful with engaging dialogue in the training because it will focus on one

content and grade level curriculum (Clark & Gökmenoğlu, 2015; Ronfeldt et al., 2015).

Ermeling and Yarbo (2016) suggested that the collaboration among teachers can have a

positive effect on the type of instruction that is presented in the classroom if there is a connection

with the provided PD. For example, both internal and external trainers and consultants combined

can profit from PD if students and teacher needs are met. Students' growth indicators should be

developed based on their previous outcomes during the collaboration between, teachers, administrators and instructional coaches (ACT, 2015). Quebec Fuentes and Spice (2015) confirmed that active communication should be supported with postsecondary organizations. When referring to the word 'active,' the researchers referred to the partnership that is developed by participants who can constantly reflect and adapt to the clear and pertinent goals that have been established by the PD.

Another element in communication that is critical to the discussion of a valuable PD is the community. The community is viewed as stakeholders in the educating of the learners who reside in the area therefore, obtaining their support is essential to the success of teachers with instruction in the classroom (Quebec Fuentes &Spice, 2015). Epstein and Willhite (2015) documented that educators and parents need the appropriate training to establish meaningful relationships, which can have a positive influence with relating to the students. They also linked the effectiveness of a proficient mentor to aid and support the specialized development of beginner teachers past their initial year. These detailed features of communicating in a collaborative manner stimulate the shared responsibility of the school and community (ACT, 2015).

Cyclical PD (On Campus Year-Round)

Researchers support the role of an instructional coach to shadow first time teachers to prepare and support the teachers who are struggling with the transmission of newly required knowledge (ACT, 2015; Callahan & Sadeghi, 2015; Duncan, Magnuson, &Murnane, 2016; Taylor & Tyler, 2012). Clark and Gökmenoğlu (2015) commented that effective PD contains

demonstrations, time for observation, responses from participants, and classroom implementation. These comments and actions are best delivered by a third party who is does not have input into the teachers' evaluation (Callahan & Sadeghi, 2015). Duncan et al. (2016) remarked that the instructional coach aids teachers and administrators advance their abilities as well as provide acknowledgement of shared responsibility for learners' achievement. Templeton et al. (2016) believed that instructional coaching decreases teacher burnout, but instead maintains educators. They also suggested that instructional coaching diminishes teacher segregation and encourages a setting of trust. Teachers who are recipients of instructional coaching conveyed modifications in their thoughts and with their collaboration with students (Patti et al. 2015). One-on-one instructional coaching can aid with teachers' classroom management abilities, which will decrease the number of classroom incidents and student infringements (Alicea, Flynn, Lissy, McKay & Tazartes, 2016). Jeon et al. (2016) illustrated that an instructional coach can support teachers by utilizing their expressive intellect as it transmits to their self-esteem as an effective teacher and classroom leader.

Finally, in providing an effective PD, it is essential that schools use several approaches to measure the success of teacher performance (ACT, 2015; Evans &Moretti, 2015). For example, in 2013, a public-school district specified that every campus in their district appraise teachers with a novel teacher assessment tool intended to recognize quality teaching and "extremely effective" educators (Callahan & Sadeghi, 2015). Twenty-percent of the teacher assessment is based on student achievement, or learner growth objectives (SGO's), although eighty percent of the teacher appraisal examines educators' practices which also include PD. According to

Steinberg and Sartain (2015), teacher effectiveness is one of the greatest indicators of student achievement, however, current assessment tools have not successfully identified effective educators who essentially increase student knowledge. They also emphasized the difference and unfairness of the current evaluative methods for teachers.

Teachers of assessment content areas receive more pressure from administrators as opposed to teachers who do not teach a core content subject area (Korelich & Maxwell, 2015). Reading and mathematics teachers in some states registered for the President Obama's *Race to the Top (*RTTT), their students' achievement on the state assessments was analyzed, and the teachers received a score that represented an overall score. Teachers who did not teach a core subject (math, science, reading and social studies) were not assessed by the same method. Evans (2015) argued that assessments are not refined enough to document effective teaching. Teacher assessments should not be regarded as punishing, rather an instrument for assessing growth (Callahan & Sadeghi, 2015) and should introduce a combined dialogue on best instructional approaches (Steinberg &Sartain, 2015; Taylor & Tyler, 2012). Additionally, teacher appraisals should advise the preparation of PD training with the essential requirements that are needed for the district teachers to meet the goals and objectives for student achievements (Callahan & Sadeghi, 2015). The appraisers should be experts themselves regarding the approaches on which teachers are assessed and receive training on the appraisal system prior to appraising the teachers (Steinberg &Sartain, 2015)

Project Description

After my data analysis, I identified some key elements to implementing an effective PD program. The findings of my research will produce recommendations on how the local district may to develop a viable, supportive PD at the secondary school level. It will include suggestions of how to mend the gap between summer and year-around training. My intentions are to continue with my study beyond the project to ensure that PD trainers are aware of the elements that comprise an effective PD program for teachers. I hope to partner with local school districts and colleges to develop and implement a comprehensive PD to train teachers effectively as it relates to instructional strategies.

Potential Resources and Existing Supports

The local school district serves numerous students who receive reduced or free lunch, thus, the district meets the qualification for Title I funding. A percentage of the Title I funds are allotted for teacher retention. This includes hiring external trainers and paid expenses for teachers to attend PD relevant to their content. These trainings may be taken in the summer or during the school year. Since the local school district in this study has a "Teacher Center," the 3-day PD plan can be provided at this location as mandatory district training for math teachers to complete collaboratively with their specific content team. Teachers may possibly register as a team to attend courses that are relevant to their content area. This will ensure that they are attending the same training and receiving the information at the same time, which helps with consistency and can promote the collaboration as a team. Attending the training as a team can also promote creative dialogue, which may provide innovative strategies for increasing student

achievement and the participation among team teachers in PD training. The local district issues a calendar annually that include four full PD days that are earmarked for training. In addition to the above four days, teachers are required to attend after school faculty meetings once per month and meet one hour weekly for their team meeting with their specific content. Many times, these meetings become training opportunities since the entire staff is present.

Presently, there are two math instructional coaches at each campus to provide support for math teachers and they are also involved with planning math PD on campus. The instructional coaches plan weekly activities for math teachers to use during PLC meetings, lesson planning, and campus in-services that are vertically aligned with campus goals and objectives. Each campus has an assigned administrator who facilitates and plans the campus PD for the school year in collaboration with the campus instructional coaches. According to Carpenter and Linton, (2016) PD is most effective for teachers if they provide input on a survey prior to finalizing the list of topics to be discussed and presented at the PD. This will enable teachers to have input and a sense of empowerment as it relates to their learning (Alicea et al.,2016). Teachers should provide feedback by evaluating their PD and continued modifications should be implemented based on the feedback given by the participants who attended the PD
(Guskey, 1999; Tatto et al., 2016).

Campus instructional coaches should be available to aid with the new teachers who are struggling with lessons as well as teachers who may need additional support with instruction or the curriculum (Flynn et al., 2016; Patti, Holzer, Brackett, & Stern, 2016; Templeton et al., 2016). Campus support is an essential component for new teachers (Tatto et al., 2016). I agree

with Tattoo's (2016) research, which supports establishing a good working relationship with teachers, mentors, instructional coaches and administrators as it relates to on campus assistance for a minimum of three years to the new teachers. Teachers should continually complete a self–assessment on their growth and participate in constant discussion with administrators and team members about instructional strategies and the influence on student success (Carpenter & Linton, 2016; Patti et al., 2016). PD should be created and implemented based on the teacher needs assessment results or informative evaluation.

Potential Barriers

There may be minimum potential obstacles to employing PD at the local school campus. The first potential barrier is struggling with the change of implementation of something different (Clark & Gökmenoğlu, 2015; Colwell & Enderson, 2016). Resistance may occur due to numerous reasons. For example, one reason may have to do with the struggle that many teachers have in their self–efficacy when instructed to apply newly acquired information and strategies to improve student achievement skills (Colwell & Enderson, 2016). An additional reason why some teachers may resist the application of newly acquired knowledge is if they were not a part of the planning for the PD where the knowledge was introduced (ACT, 2015).

Another possible barrier is constant accountability with both faculty and administrators. The implementation for any change requires everyone's participation. All stakeholders should be in alignment with the goals and objectives of the PD while promoting the new change (Ronfeldt, 2015). Teachers may be hesitant to collaborate once they feel isolated. They could also struggle with the revisions for fear of failing or exposure of past mistakes (Onsrud, 2015). Likewise, is

the importance of administrators being consistent with their accountability (Bryant, Maarouf, Burcham, & Greer, 2016). When one is consistent, one also highlights the significance of professional development, thus stakeholders are more likely to consider the change as essential. The issues of implementation of math strategies taught in the math PD was one of the themes that emerged from my collection of data for my study: specifically implementing strategies that were related to differentiation of instruction for SPED math learners. This could possibly continue to be a concern for math teachers if a variety of content specific strategies that include differentiation instruction do not take place with the PD as it relates to the process of receiving new knowledge and strategies for implementation. There is also the challenge of cooperation from the administrators to promote the PD implementation and this includes time and resources.

Proposal for Implementation and Timetable

This project defined the components of an operational PD program. For instance, the PD team would need to collaborate to define the goals and objectives for the PD (Korelich & Maxwell, 2015). The collaboration should focus on the teacher surveys that describe the teacher's needs and results (Ronfeldt et al., 2015). Collaboration will allow for the administrative team to have meetings throughout the summer to plan for the actual PD that should take place year-around on their campus. Scheduling the PD during the summer can afford the team numerous options that can exceed the five allotted PD days. The PD goals and objectives should be communicated and identified to the staff on the initial day of the new school year, which is five days prior to the return of students to the campus. When the campus goals and objectives are determined for the school year, the PD team can create a calendar of PDs that is determined

based on teacher appraisals, feedback and the campus needs. Once tentative dates have been determined, the dates and courses should be shared with staff to ensure that they are given the time to select a PD as well as, plain reference to dates and availability to attend. Teacher effectiveness should improve because of an effective PD that has a workable timeframe of courses that were based on teachers' preferences and evaluations (Guskey, 2009).

The local school district has allocated five days for PD 5 days during 2017-18 school year. The PD team can take advantage of the allocated days by presenting relevant effective PD training facilitated by instructional coaches, district content facilitators, consultants and other relevant team members. The PD dates should be available and easily assessable for teachers to register via email or online through the district training site and the registration should close at least five days prior to the training day. This will enable a preparation timeframe for the facilitators to collect and obtain proper resources for the PD.

Additional support should be provided for teachers who are new and those who do not have at least five years of teaching experience with this PD plan. They should have an opportunity to meet once per month during a common planning period. This meeting should be shared among the PD team to ensure that teachers are receiving content-based training during this time (Cochran-Smith, Ell, Grudnoff, Haigh, Hill, & Ludlow, 2016; Duncan et al., 2016). This will allow for this group of teachers to ask questions among their perspective teams and gain more knowledge as it relates to classroom management techniques, math strategies that are effective and other topics of concern. In addition to the previous discussions, this will be a good

time to collaborate with mentors and instructional coaches on individual concerns, challenges and practices.

All teachers must partake in a PLC meeting biweekly to discuss student's data and its alignment with the campus goals to identify progress as well as the areas that still need work. This meeting should be held during a common planning period or after-school with the content team to develop strategies that are effective by using data driven instruction methods to enable student and teacher success (Holm & Kajander, 2015; Onsrud, 2015). The meeting periods should include the common grade and content level to create an engaging rigorous learning environment that is relevant to all teams (Clark & Gökmenoğlu, 2015; Ronfeldt et al., 2015). In our local school district secondary schools, this may be challenging (Mandel, 2015) because we have several math courses and this could possibly complicate the scheduling for a common period among the content and grade level, therefore meeting after-school would be an option for the teachers to meet as a team (Carpenter & Linton, 2015). This PD can be modified annually or by semester to meet the needs of the campus and the teachers who are not able to meet collaborate should have an option to receive the information and data at a later time (Carpenter, 2016). The public school regional service center also has resources that are available for teachers PD. The center has a learning task where teachers can access videos, trainings and virtual online forums to engage teachers throughout the area. Through resources and the collaboration of all stakeholders, the integration of the PD may improve teachers' effectiveness.

Roles and Responsibilities

Whereas there is one specific administrator assigned to curriculum and PD at the local secondary school level who is accountable for organizing and creating PD sections, this administrator cannot complete the task alone, thus, the curriculum team is an essential element for the campus PD (Onsrud, 2015). The curriculum team responsible for the campus PD can create an electronic survey to administer to the teachers prior to the PD by utilizing an electronic tool online like Survey Monkey. The outcome would be instant, which is will be useful when planning the campus PD for the school year. A campus PD team would examine the results and determine the essential areas that need to be taught in the PD. Once the PD has been printed and shared with all faculty and PD presenters have been approved, the faculty can select the appropriate class and register for that specific course. This will deem all staff the responsible and accountable for obtaining and applying new knowledge to their instructional techniques. The local school district has an instructional coach for each content area who is not a teacher appraiser and she/he can provide feedback that will not be reflected in the teachers' evaluation (ACT, 2015). Instructional coaches are designated to provide support to classroom teachers solely and this can occur in the classroom or PD setting (Duncan et al., 2016). The instructional coaches can collaborate with teachers individually to address specific concerns like lesson planning and intervention strategies, as well as, demonstrating and modeling lessons with the students. This will enable the teacher to self-reflect while observing the instructional coach implement the lesson (Patti et al., 2015).

The teachers will be liable for keeping a record of their personal training whether online or in the traditional setting. The local school district has an electronic PD registration for a teacher that provides a certificate once the teacher completes the course evaluation in the system. This will allow the teacher to have both an electronic record and a certificate for the completed training. The same system has a log of walkthroughs and evaluations that has been completed and recorded for the specific teacher by their assigned appraiser. The appraiser who completes the appraisals can include the teachers' PD progression and its relevance to their growth and knowledge. It will be the teacher's responsibility to review and accept the formal evaluation in the system.

Project Evaluation

My project's purpose is to implement a three-day PD that might inspire teachers to relate new information to increase student educational achievement. To attain this objective, teachers need to be able to evaluate the PD and provide the curriculum team with a response as it relates to feedback on improving the PD's effectiveness in the classroom. Guskey (1999, 2009) suggested that appraisals should be prearranged prior to an activity. The appraisal of the PD would be presented in the same manner as the activity. For example, the appraisal should be utilized as a tool that is objective, purposeful and significant to the teacher's growth. This appraisal tool can be the driving element for developing and implementing future PD training. Guskey (1999, 2009) also commented that conducting formative appraisals during the school year could be utilized as actions of achievement as well as notations of areas that need improvements for each objective. Once the project has been completed, the PD team can

measure the effectiveness of the PD by completing a summative appraisal. In contrast to a formative appraisal, a summative evaluation would assess the PD and offer the PD team with an understanding of effective methods to improve the PD training (Guskey, 1999). These appraisals can be retrieved through the local districts' electronic PD page for direct feedback.

Another objective for the project is to conclude the effectiveness of the PD as it relates to instructional strategies used in the classroom. To determine the effectiveness of the PD and its impact on instructional strategies, the teachers need to assess students' progress in increments; for example, the benchmarks can be administered at the beginning, midway and end of the school year to determine if the instructional strategies are effective with student's achievement. The data attained from the benchmarks can be used to determination information to be reviewed and discussed in PLCs during the year (DuFour, 2014; Ronfeldt et al., 2015).

Implications Including Social Change

The PD program is beneficial to all the local district stakeholders, with the students being the most important and the primary focus. Successful scores on the state assessments along with student achievement, appropriate classroom conduct, and increasing learner engagement are some anticipated outcomes; yet, teachers will profit from the PD because they can receive cost-effective year-around PD training and it can be beneficial to teachers' instructional strategies in the classroom setting. Compensation for teachers attending PD on Saturday or during the summer could be an incentive. Many participants for my study confirmed that they have attended off- campus PD and either received a stipend or paid for the training. These participants also

conveyed that most of their advanced degrees and additional certifications were obtained in

hopes of securing a higher paying job.

By providing a PD training that is based on research, all stakeholders will benefit by the

shift in the culture and climate for the campus. A supportive PD program engrained in the

detailed necessities of teachers and learners will, certainly, increase morale and generate mutual

respect (Onsrud, 2015). The local district PD team should see less opposition for change, and an

added collaboration from teachers to achieve a shared vision (Templeton et al., 2016). A

complete PD training would also afford the PD team with a chance to cultivate in their content

area.

Upon the completion of establishing the PD training for educators, the PD can be

extended to embrace the community. Parents and all additional stakeholders, such as the local

school district board members and central staff can join in the PD. The PD would be beneficial if

it was inclusive to all staff including, support and custodial personnel (Onsrud, 2015). The initial

campus can function as an ideal school for the other campuses in the district, and, eventually, the

PD can be implemented to accomplish the objectives of other campuses in the local school

district.

Conclusion

In Section 3, I defined the foundations of a complete PD training for secondary

school teachers in a local school district. First, I identified the PD goals and objectives, as well as

providing the rationale for creating this project. I also provided a review of the literature, a

projected implementation, evaluation strategy and the implications of social change for this

project. In the concluding segment of this study, Section 4, I will provide the strengths and

limitations and make recommendations for future research studies on PD.

Section 4: Reflections and Conclusions

Introduction

In Section 4, I will convey my reflections for this project as well as provide some conclusions. More specifically, I will discuss the assets of this project and provide possible reasons of limitations for this study. I will present an analysis of myself as a scholar–practitioner and developer for this project. Section four will conclude with possible impact on social change, implications, applications and recommendations for additional research.

Project Strengths and Limitations

Establishing an environment of mutual responsibility and accountability for all students' achievement is a major focus of this project (Duncan et al., 2016; Onsrud, 2015). Throughout the data collection and interviews, the respondents were very passionate when providing their answers to the questions which were identified as a strength. It was obvious that they were concerned about their students and had a genuine interest of improving their instructional techniques. The participants also expressed a disappointment and frustration with the present PD training because of the non-relevance to their specific content, continuousness, and transmission. Freire (1998b) theorized that adult knowledge should branch from the adult's critical interpretation of the environment they reside in, this is relevant to the notion that Freire titled "transforming reality" (p. 499). In his concept of 'conscientization, 'or conscious-raising, Freire (1998b) projected that adult learners can be dynamic representatives of their own learning. Freire meant that adult knowledge is subjective by the society one resides in and the level of importance that his/her perception is taken into consideration by the stakeholders. Basically,

adult learners distinguish as their level of communication by the way they interrelate with others in their environment as well as how they take in information and learn. Communication and collaboration are essential for a well-designed PD training (Carpenter & Linton, 2016; Quebec Fuentes & Spice, 2015; Ronfeldt et al., 2015). This concluding project has the possibility to refresh teachers' perceptions of the campus PD, improve instructional strategies in the classroom, and increase self-esteem within teachers (Onsrud, 2015). A complete PD is a method to improve teacher proficiency, stimulate a sense of openness, and increase morale between all stakeholders (Onsrud, 2015).

A limitation for this project was the current budget that was approved by the local school board. The local school district struggled with a considerable amount of faculty reductions based on budgetary restrictions. Thus, it is extremely likely that the local school district cannot afford an additional math instructional coach to assist and help teachers with transmission of new knowledge gained in the PD into the classroom. For example: a repeated complaint from the participants were that instructional coaches and administrators do not follow-up or confirm with them to ensure that the information received in the PD has been applied to their instruction in the classroom. To address the lack of in–class support, perhaps, the administrative team can allocate lead teachers or peer instructional coaches to support and assist new and struggling teachers in the classroom with their instructional strategies the classroom (ACT, 2015; Bannister, 2016; Callahan & Sadeghi, 2015; Flynn et al., 2016).

A second limitation was resources and timing for the preparation and planning of training during the school year. According to the school calendar for 2017–2018, there are eight approved

faculty PD days required for all faculties to attend prior to the first day of school for the students. New teachers to the district must attend all eight days whereas returning teachers must attend five of the eight days. An alternate clarification to this issue is to propose for a surplus of training during the year, throughout faculty meetings monthly and during the PLCs. It is necessary for teachers to have a consistent schedule that gives them the time needed to reflect on areas of growth as well as areas that still need to be improved that need improvement (Onsrud, 2015). Finally, I am recommending that in addition to the PD training offered by the local district, that they also utilize an online-program to engage teachers with content specific training in their perspective areas that focus on instructional strategies that may be used in the classroom (Carpenter, 2016; Carpenter & Linton, 2015). For instance, administrative teams, instructional coaches and teachers can participate in an online setting to manage teacher appraisals and access resources for PD training, like discussion panels and teacher collaboration with teachers from other districts.

Recommendations for Alternative Approaches

During my study, I learned alternative approaches for developing an effective PD for teachers besides basic training conferences, coaching and PLCs. Many participants for the study articulated a necessity for collaboration with content team members and instructional coach for more support. However, an alternative approach to working collectively as a team is networking. For example, Edmodo and Twitter possess boards for remaining current with up-to-the-minute educational subjects as well as sharing a variety of instructional strategies among educators (Carpenter, 2016). Google is another alternative approach since its expansion to include

educational tools such as; Google+, which has become a virtual podium for educators to explore different teaching strategies (https://plus.google.com). Inside Google+, educators can develop Personal Learning Networks (PLNs) tailor-made to their precise needs and securities (Carpenter, 2016). These PLNs may possibly be located in a local campus or within the local district level (Carpenter, 2016). There are numerous websites and virtual sites that provide free webinars with a variety of instructional topics and strategies that may be beneficial to teachers. For instance, EdWeb.net and the Association for Supervision and Curriculum Development are sites that provide instructional strategies for student engagement and information for lessons to educators virtually while collaborating with colleagues nationwide (Carpenter, 2016; Carpenter & Linton, 2015). During this study, I have also learned that the meaning of PD as well as the way it is organized is a continually developing process that should be based on the needs of students and teachers.

Scholarship

One of the most influential themes that arose from this research was the fact of the variation of scholarship amongst learner to learner. Numerous data resources indicated how participants desire to learn and develop. Such passionate desire for new knowledge to become improved educators, and aid students to flourish was apparent in the participants I interviewed. Participants also shared that a great amount of information was not clear, yet they were accountable to demonstrate said knowledge in the classroom, which caused them to turn to survival approaches opposed to effective instructional techniques. Administrators trust teachers to differentiate instruction for learners, it is possible that some teachers may benefit from

differentiation of learning training also (Ermeling & Yarbo, 2016). Teachers comprehend information in their own way and must be valued and appreciated enough to give them knowledge that is content-specific and genuine (Ermeling & Yarbo, 2016; Ronfeldt et al., 2015).

I have personally learned as scholar the significance of life–long knowledge throughout this study. In the lieu of several federal directives, information changes frequently in the field of education. It has surprised me how information about educator standards, appraisals, and students' standardized assessments have transformed within the last two years. The local and national governments have dispersed an abundance of data to educators and the community that has remained quite challenging to filter through and develop an opportunity for an educational reform. Additionally, educational rulings have reformed, and strategies for PD and student results; nonetheless, this study has increased my knowledgeable and helped me in understanding my part as an educator and future instructional administrator. This study has provided me with a chance to thoroughly read educational policies and it has forced me to examine my personal professional growth of influence on student achievement. As a scholar, I learned that one not only acquires knowledge, but has to be able to apply it and to have the capabilities to reflect on that knowledge while modifying or changing it to satisfy one's personal needs (Clark & Gökmenoğlu, 2015). The above process is continuous non- stop which means you should never stop learning.

Lastly, this project helped me to realize that a well-rounded scholar cannot study in isolation. I couldn't possibly have completed my studies alone while learning new knowledge. This research enabled me to dialogue with other educators about PD and its effectiveness with

math instruction in the classroom. The participants were very passionate about their students and were willing to do whatever was necessary to improve student's achievement. I believe that educators are the greatest asset that are present in our schools, and to provide excellent instruction to learners, the school administrators must be willing to ensure that teachers have all the required resources to be successful. This will begin with providing effective PD to all teachers. I have concluded that when stakeholders place a value on the teachers, this will improve the schools' culture and climate and the students will benefit by their academic achievement. A successful district needs a collaboration of teachers who are lifelong learners to shape student learners (Ermeling & Yarbo, 2016; Onsrud, 2015).

Project Development and Evaluation

The development of this project was extremely overwhelming and time consuming. One of the most challenging sections of the project was the review of literature. The literature review was challenging because of the need to remain current with the literature and the timelines. This forced me to search for new sources on a regular basis to remain within the guidelines of current sources for the literature review sections. The project supported the procedure of a detailed PD program between teachers, instructional coaches and administrators to increase instructional strategies and student achievement in the content are of math. Interviewing the applicants were a very educational piece for me. The participants did not hesitate with their answers, they answered questions without prompting and explained follow-up questions freely which was very beneficial with collecting data.

I established that one of the most critical essentials for an effective PD training was developing the PD with a focus on participants' needs. After the triangulation of data; public documents, observations, and interviews, I was determined that an effective PD training would be a universal way of motivating the culture and climate of a campus. When the morale is great and teachers are trained effectively, there should be a contagious effect that each staff will strive to be the best teacher with a positive attitude along with a focus on student achievement. This will enable teachers to be motivated and implement the new strategies that are taught in the PD. When teachers can adjust their current instructional strategies to include the newly acquired strategies from the PD this can increase student engagement and improve their overall academic achievement (Ronfeldt, 2016).

Leadership and Change

During this study, I learned change is difficult, however, when educators feel confident and empowered to take ownership of their own learning they are motivated to make the necessary changes to ensure students are achieving the goals and objectives of the lesson. Just like teachers, leaders need to take ownership of their own learning and this may require a change in their leadership style. This may include providing more content specific PD trainings to enable the success of teachers and learners (Ronfeldt et al., 2015). Administrators should be bold and appraise their own efficiency as educators utilizing a similar tool to Danielson's (Danielson, 2007). Self–image, joined with feedback from teachers. This technique could be a means to stimulating collegiality and shared respect for teachers and administrators (Quebec Fuentes

&Spice, 2015). The administrative staff should share some accountability for teacher's knowledge and their performance.

A school administrator is not an easy task. The school administrator is responsible for the day to day operations of the school daily and this often include making decisions that everyone; nevertheless, an effective school leader is confident in making any changes that are deemed necessary. I have learned that constructing harsh choices are not essentially the problem. I believe that a leader, should be able to make challenging decisions if they collaborate with teachers and stakeholders to launch a culture of respect and trust. An effective school leader should be confident and can acknowledge when s/he does not know all of the solutions and can seek assistance from others for a solution. Lastly, I have found that leaders are also lifelong learners and they must continue to receive PD training in continuation of new knowledge (Patti et al., 2015). As a school leader, one should model and demonstrate the desired behavior required of your staff to illustrate. It is crucial for school leaders to be translucent and share with their staff when mistakes have occurred and when successes have been obtained. Identifying and implementing change when needed can be a problematic task, nonetheless effective school leaders are delicate to the way the change may impact their staff and have learned the appropriate methods to address the staff to get the appropriate result. This administrator has taken the time to build a rapport with their faculty and staff which makes them an effective leader who is able to adjust while changing the school to meet the need of all stakeholders (Patti et al., 2015).

Analysis of Self as Scholar

As a self-scholar, this project showed me the importance of nurturing genuine relations with each stakeholder as optimum for promoting a real modification in the school's climate and culture. Researchers established that the profession of teaching is usually on an isolated scale (Carpenter & Linton, 2016; Onsrud, 2015); nevertheless, that can change with positive support from the administrators. Administrators can encourage a philosophy of learning by giving teachers PD trainings throughout the school year, joining with teachers to give them exceptional learning knowledge, while providing them with continuous support in the classroom to link the knowledge from concept to practice (Quebec Fuentes & Spice, 2015).

This study has educated me on the necessary elements to create an effective PD that is not common to struggling schools only. A well created PD is more inclusive and should be used district wide to meet the needs of all learners (Carpenter & Linton, 2016). The point that there are several struggling schools should warrant creating a consistent effective PD training for teachers. I have increased my awareness of techniques that can be used to create a framework for a supportive and valuable PD training. On a personal level, this project has given me an opportunity to reflect on techniques that may be effective to narrow the breakdown that occurs among teacher programs and transferring that knowledge into the classroom. The concern for teacher PD is extensive and it involves teamwork as well as consistent communication among teacher preparation programs and post-secondary institutions (Quebec Fuentes & Spice, 2015).

Analysis of Self as Practitioner

In my analysis of myself as a practitioner, I feel stimulated to continue my research on methods to create a useful effective PD that enables teachers to practice the strategies learned in

the training. I hope to build on this study with inspiration that my conclusions may become a segment of the transformation of PD trainings in the secondary school entity. My communications with colleagues have aided me to develop as an educator and a researcher. This study has encouraged me to visualize an effective PD training that I could possibly implement if I become a curriculum PD administrator (Ermeling &Yarbo, 2016).

During this process, I learned the genuine value of individual reflection. In this study, while collecting data, I was able to reflect on my own beliefs, level of efficiency and practices. It is remarkable what one can learn when they study themselves as a general practitioner in their own profession. I have continuously remained a self–edifier; my natural quest for knowledge is why I was motivated to register for the doctorate program. I am excited about continuing my study because I now realize that there is a lot of information to learn when creating an effective PD that has a focus on nurturing and fostering teachers which will promote learners to reach their highest potential. I am committed to learning all that I can to assist in evolving teachers in a manner that actually changes teaching methods and student educational achievement.

Analysis of Self as Project Developer

In my analysis as a project developer, it became obvious that interpretation is a significant part of developing an effective PD training. Information is continuously shifting and there are several perspectives and philosophies in the arena of education. While developing an operative doctoral project, it was crucial for me to remain well-informed as it relates to trending themes in education. I know that it is important to have a network of connections with other

educators via social media or virtual educational forums to continue the development of my own proficiency.

In preparation of cultivating a successful project, I have learned that it takes a team to work collaboratively, the PD coordinator cannot complete the task individually. The formation, application, and maintenance of a successful PD involves all stakeholders who have a stake in the visualization of development and transformation in the school (Onsrud, 2015). Additionally, the achievement of a PD is dependent on the level of which the PD team take into consideration the necessities and input from the faculty and staff members (Ermeling & Yarbo, 2016; Ronfeldt et al., 2016).

Reflection on the Importance of the Work and its Potential for Social Change

In my reflection of the importance of the work for social change, I found that the answer to effective PD may appear simple to some PD trainers, however, appropriate implementation of a PD training that successfully prepare teachers remains challenging. Basically, PD has to be pertinent and content specific for teachers' essential needs and it should be available year-around to provide consistent support (ACT, 2015). When school leaders determine their school goals and objectives based on an alignment of feedback that was received from all stakeholders, the likelihood is very high that the school's culture and climate will be positive due to the shared collaboration when developing the goals (Bannister, 2015). During this project, I also learned that there was a commonality among all the participants, which is they simply want to be inclusive with making decisions that involve their instruction strategies as well as the learners who they are teaching (Onsrud, 2015; Ronfeldt et al., 2015). For example,

teachers may have experience in other districts and can share some of their successes with instruction to help other teachers who are struggling. Teachers would like to be able to be involved and engaged in the PD training, this will enable a sense of contribution to a successful PD, as well as the improvement of academic achievement at their school. By including teachers as associates, school leaders can transform the campus to a culture and climate that has a positive effect on classroom instruction and the society (Cochran-Smith et al., 2016).

Implications, Applications, and Future Research

According to the United States Department of Education, the reform of education has one common goal: which is to deliver an unbiased equal education to all students worldwide (U.S. DOE, 2015). The above goal appears to be simple: to train teachers effectively, and as evident, student academic achievement would be high. However, this has not been the result: students' performance on state assessments has been declining which can be a reflection of the type of PD (year-around or summer), and its effectiveness on teachers' instruction in the classroom (Carpenter & Linton, 2016).

Many school districts nationwide are experiencing a problem with making the connections of effective PD with instruction, in other words transferring the knowledge learned into practice (Tatto et al., 2016). One reason could be the lack of empowerment that teachers may feel as it results to their own personal growth. Teachers should be given the same level of support and respect that is required of them to give the students that they teach: teachers need to feel that their opinions and knowledge has value (Carpenter & Linton, 2016). Also, as teachers

are required to provide differentiation to instruction with students, many teachers need PD training that is specific to their content curriculum (ACT, 2015).

I have learned that providing PD is not sufficient, school leaders should ensure that there is a year-round support system in place to aid teachers after the initial PD has taken place (Templeton et al., 2016). Many of my participants conveyed the need to have follow-up sessions from their PD to continue to build and develop the strategies taught initially by sharing and collaborating with the instructional coaches. Some participants also expressed an interest in receiving in-class support from instructional coaches like modeling and demonstrating lesson in the classroom.

For my future research study, I am interested in expanding my knowledge as it relates to other content areas and the effectiveness of other-content-focused PD with instructional strategies. For this study, I only looked at math teachers and their perspectives with math PD. I asked math teachers if the strategies taught in PD year-around or in the summer were effective with their instructional practices. I have learned that the type of PD does impact teachers' choice to utilize new knowledge; even though, there can be additional perspectives that may bring significance to this study while creating an effective PD. It is a necessity for all stakeholders to be engaged with the preparation and implementation of an effective PD with any discipline (Hao& Lee, 2016). Generally, the participants for my study had a focus on the ability and desire to grow while using highly effective strategies within their classroom instruction. For that reason, I would like to further my research study on how PD strategies impact various content area teachers specifically.

Conclusion

In Section 4, I expanded on my knowledge gained throughout my project study. After collecting data from 25 secondary math teachers about their perspectives with the math PD year-around and during the summer, I concluded that the need exists for a more structured PD that is specific and held on a consistent basis year round to support teachers with instructional strategies. I also discussed strengths and limitations, myself as a practitioner, scholar and project developer in this study. My project concluded with a discussion of its influence on social change, as well as my implications, applications and future research recommendations.

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Appendix A : The Project

Math Teachers' Experiences with Math Staff Development Training

PD Training Plan

Fall 2017

PD Schedule and List of Activities

Introduction

Purpose

Audience

Implementation Timeline

Day 1- Engaging Math Teachers with Lesson Planning Techniques- October Session

     Timeline- 6 hours October Sessions

     Resources- Teacher laptop, Presentation station, School classroom

- Sign In

- Welcome

- Objectives

- Developing a lesson

- Implementing a lesson

- Assessing Lesson Strategies

- Questions

- Session Evaluation

Day 2 – Differentiated Instruction Strategies-November Session

    Timeline- 6 hours November Sessions

    Resources- Teacher laptop, Presentation station, School classroom

- Sign-in Sheet

- Objectives

- Co-teaching Strategies

- Accommodation strategies to use in the math classroom

- Modification strategies to use with math students

- Learning Styles

- Questions

- Session Evaluation

Day 3 – Discussing Data interventions strategies in PLCs

    Timeline- 6 hours December Sessions

    Resources- Teacher laptop, Presentation station, School classroom

- Sign In

- Objectives

- Strategies for Desegregation of Data Overview

- Grade level breakout for Data Review

- What works! Discussion of Data Strategies

- Questions

- Wrap Up

- Session Evaluation

Post PD Follow-up Communication

- Share Documents from PD sessions via email

- Provide feedback in response to evaluations via email

- Provide Post PD training schedule for math staff

- PowerPoint Presentations for Project

Introduction

My project is a PD (PD) plan that will provide math teachers and math instructional coaches with a tool for the implementation of learning communities school-wide. As a result of my collection of data and emergent of the themes, it became obvious that math teachers desire more time to collaborate with the math instructional coaches. In addition to collaboration, they would also like to have more time to observe demonstration lessons from their math lead teachers and coaches. In order for the local school district to be able to allow additional time for collaboration, schedules must be restructured to ensure that the team of teachers shares the same planning period per school day. Many participants expressed the necessity to examine the math curriculum with math team and to create lesson plans that may be shared with the team. I am hopeful that the PD training will provide the math teachers with an improved PD in which they can receive new strategies to improve instruction in the classroom. By using an improved PD approach with the math teachers, this will enable them to collaborate with their teams and discuss as well as develop new strategies that can be effective with their students.

Purpose

This project emerged as an alternate method to deliver PD to secondary math teachers by helping them collaborate with their teams. The results from the participants revealed that there is a need to partake in PD, however PD should have a focus on strategies that are relevant and include team collaboration. This project's purpose is to implement a three-day PD that might inspire teachers to relate new information to increase student educational achievement. To attain this objective, teachers need to be able to evaluate the PD and provide the curriculum team with

a response as it relates to feedback on improving the PD's effectiveness in the classroom. This teamwork and collaboration will serve as a main focus of the PD as well as providing effective strategies needed by math teachers. 3- day training was created based on the schedule that will provide math teachers with the time to collaborate and learn new strategies for practice with math students. The schedule will permit the PD to be incorporated into the math curriculum calendar for a semester. This will make certain that the present PD progresses successfully into an ongoing training that meets the needs of all math teachers. After the preliminary training, cooperative teacher sessions will occur on a weekly basis. The sessions will reinforce necessary information that helps teachers comprehend the purpose of the PD, as well as practice strategies they have learned about. Finally, this project will offer a technique to support instruction and learning within the local school district in which the study occurred. Teachers will benefit from the expertise of team members by sharing and collaborating as well as become co-creators of their own learning.

Audiences

The intended audience for this project is school leaders, math instructional coaches and math teachers. Upon the completion of establishing the PD training for educators, it can be extended to embrace the community, including parents and all additional stakeholders, such as the local school district board members and central staff. The PD would be beneficial if it was inclusive to all staff including support personnel (Onsrud, 2015). The initial campus can function as a model school for the other campuses in the district, and, eventually, the PD can be implemented to accomplish the objectives of other campuses in the local school district.

Timeframe

The local school district has allocated five days for PD during the 2017-18 school year. The PD team (instructional coaches, district content facilitators, consultants and other relevant team members) can take advantage of the allocated days for PD presentations. The PD dates should be available, it should be easy for teachers to register via email or online through the district training site, and the registration should close at least five days prior to the training day. This will enable a preparation timeframe for the facilitators to collect and obtain proper resources for the PD.

Scheduling the PD during the summer can afford the team numerous options to exceed the five allotted PD days. The PD goals and objectives should be communicated and identified to the staff on the initial day of the new school year, which is five days prior to the return of students to the campus. When the campus goals and objectives are determined for the school year, the PD team can create a calendar of PDs determined as a result of teacher appraisals, feedback and the campus needs. Once tentative dates have been determined, the dates and courses should be shared with staff to ensure that they are given the time to select a PD as well as, make arrangements in reference to dates and availability to attend.

PD Evaluation Tool

PD (PD) Title _____

Date_____

Facilitators_____

	Yes	NO	Neutral
Was the PD relevant to your content?			
Did you Learn new strategies in the PD?			
Are you able to use the strategies with your students?			
Do you think that you achieved the objectives of the PD?			
Were the group activities helpful?			

1. Which topic was most interesting to you?

2. What was your least interested topic?

3. What are your suggestions for improvement with future math PDs?

Thank you.

Engaging Math Teachers with Lesson Planning Techniques

Sign In Sheet

Date_____

Facilitator: Carolyn Grady

Time 8:00 AM- 4PM- 6 hours

Location- Math classroom

District ID	Last Name (Print)	First Name	Signature

Differentiated Instruction Strategies

Sign In Sheet

Date_____

Facilitator: Carolyn Grady

Time 8:00 AM- 4PM- 6 hours

Location- Math classroom

District ID	Last Name (Print)	First Name	Signature

Discussing Data interventions strategies in PLCs

Sign In Sheet

Date_____

Facilitator: Carolyn Grady

Time 8:00 AM- 4PM- 6 hours

Location- Math classroom

District ID	Last Name (Print)	First Name	Signature

Appendix B: Interview Protocol Form (Prior to Observation)

Project: Math Teachers' Experiences with Math Staff Development Training

Date: _____

Time: _____

Location: _____

Interviewer: _____

Interviewee: _____

School: _____

District: _____

Release form signed? _____ Yes _____ No

Notes to interviewee:

Thank you very much for participating in this study. Your participation and input will provide valuable insights and knowledge to this research. Most importantly, they will help improve our practice through math staff development training.

All information shall be treated with respect and confidentiality. Confidentiality will be provided by securing a closed-door meeting room that does not identify the interviewee or interviewer. Interviewee will be assured that his/her information will not be shared with other staff or administrators. Data will be physically secure and stored with the use of a computer

software program and a locked file for notes to ensure confidentiality. All individual information that shall not be included in protected archiving will be destroyed. The protocols are developed to reduce the need to accumulate identifiable information.

Approximate length of interview: 30 minutes, consisting of three major questions. Aside from the transcript, the interview shall be recorded using voice recorder.

Purpose of research:

The purpose of this study is to explore teachers' perceptions about the math PD they receive and the effect of that PD on student outcomes. The research aims to examine, over a five month time frame, if the math PD has an effect on student's future.

Dissemination of Results: All participants will receive written transcripts that include interpretations of the collected information.

Questions:

1. Can you give me a brief history of your career as math teacher in the school district? What types of PD have you received so far?

Response from Interviewee:

Reflection by Interviewer:

2. Please describe experiences with staff development training in mathematics?

What have you gained from the math PD?

What did you gain as a math teacher?

How did the PD meet your expectations?

Response from Interviewee:

Reflection by Interviewer:

Closure: Thank the interviewee, reassure confidentiality and ask permission to follow-up in case it is needed.

Privacy Statement provided to each participant as written by Walden University Research Center (2015): Any information you provide will be kept confidential. I will not use your personal information for any purposes outside of this research project, and I will not include your name or anything else that could identify you in the study reports. Data will be kept secure by the use of coding in the place of names. This Data will be kept for a period of at least 5 years, as required by the university.

Appendix C: Interview Protocol Form (After Observation)

Project: Math Teachers' Experiences with Math Staff Development Training

Date: _____

Time: _____

Location: _____

Interviewer: _____

Interviewee: _____

School: _____

District: _____

Release form signed? _____ Yes _____ No

Notes to interviewee:

Thank you very much for participating in this study. Your participation and input will provide valuable insights and knowledge to this research. Most importantly, they will help improve our practice through math staff development training.

All information shall be treated with respect and confidentiality. Data will be physically secure and stored with the use of a computer software program and a locked file for notes. All individual information that shall not be included in protected archiving will be destroyed. Protocols are developed to reduce the need to accumulate identifiable information.

Approximate length of interview: 20 minutes, consisting of two major questions. Aside from the written transcript, the interview shall be recorded using voice recorder. This is the second part of the interview. In the first part, we asked you about your perception about math PD. For this part, the questions shall be in relation to students' depth of understanding as a result of math PD.

Purpose of research:

The purpose of this study is to explore teachers' perceptions about the math PD they receive and the effect of that PD on student outcomes. The research aims to examine, over a five month time frame, if the math PD has an effect on student's future.

Dissemination of Results: All participants will receive written transcripts that include interpretations of the collected information.

Question:

1. After participating in the math PD, in what ways did it affect your teaching?

    How did the math PD improve student performance in classroom?

    How did the math PD improve students' performance on standardized tests?

Response from Interviewee:

Reflection by Interviewer:

2. After participating in the math PD, how did your students change behaviorally and psychologically?

How did the math PD improve students' appreciation of math?

Please explain how the math PD changed the attitude of the students about the class?

Response from Interviewee:

Reflection by Interviewer:

Closure: Thank the interviewee, reassure confidentiality and ask permission to follow-up in case it is needed.

Privacy Statement provided to each participant as written by Walden University Research Center (2015): Any information you provide will be kept confidential. I will not use your personal information for any purposes outside of this research project, and I will not include your name or anything else that could identify you in the study reports. Data will be kept secure by the use of coding in the place of names. This Data will be kept for a period of at least 5 years and then permanently destroyed, as required by the university.

Appendix D: Observation Protocol

Category: Teacher Experiences Demographics

Instructional Skills

Pedagogical Strategies used from PD

Teaching Style

Use of Math Technology practices demonstrated in PD

Subcategory 2: Classroom Management Skills

Student Behavior

Classroom Climate

Instructional Time

Appendix E: Walden IRB Approval

Dear Ms. Grady,

This email confirms receipt of the approval letter for the community research partner. As such, you are hereby approved to conduct research with this organization. The Walden IRB approval for the study # 04-14-16-0386165.

Congratulations!

Appendix F: CONFIDENTIALITY AGREEMENT

Name of Signer: Carolyn Grady

During the course of my activity in collecting data for this research: "Math Teachers'

Experiences with Math Staff Development Training" I will have access to information, which is

confidential and should not be disclosed. I acknowledge that the information must remain

confidential, and that improper disclosure of confidential information can be damaging to the

participant.

By signing this Confidentiality Agreement, I acknowledge and agree that:

1. I will not disclose or discuss any confidential information with others, including friends or family.
2. I will not in any way divulge copy, release, sell, and loan, alter or destroy any confidential information except as properly authorized.
3. I will not discuss confidential information where others can overhear the conversation. I understand that it is not acceptable to discuss confidential information even if the participant's name is not used.
4. I will not make any unauthorized transmissions, inquiries, modification or purging of confidential information.
5. I agree that my obligations under this agreement will continue after termination of the job that I will perform.
6. I understand that violation of this agreement will have legal implications.
7. I will only access or use systems or devices I'm officially authorized to access and I will not demonstrate the operation or function of systems or devices to unauthorized individuals.

Signing this document, I acknowledge that I have read the agreement and I agree to comply with

all the terms and conditions stated above.

Signature: **Date:**

Appendix G: Participant Profiles

1. Algebra I – This participant was very relaxed and comfortable with expressing the experiences that occur during PD sessions that are held throughout the school year. However, there were concerns about the overall contribution to instructional strategies that emerge from the PD. For example, s/he said that the on-campus PD strategies were not as effective with all students. The strategies needed to be modified for the special needs students in the inclusion classes.

2. Math Models- This participant agreed to complete the interview with some degree of hesitation since there was a concern of confidentiality. Once assured that the study will not provide any identical data, s/he was more at ease to participate and affirmed that the overall experiences were positive for the campus-based year-round PD.

3. Algebra I- Was agreeable to participating and hoped that the results would help with improving math PD, especially for the new math teachers. This participant was very talkative and felt a great need for this type of study.

4. Algebra II- Expressed the need for a more focused math content PD with modeling and strategies that are more applicable to a specific math content. Participant answered questions freely and expanded with details on many of them.

5. Trigonometry- Very detailed with answers to questions and feels that the district is providing adequate PD. However, this participant would like to see more strategies that are content specific to the math subject.

6. Geometry-Has been teaching for two years and is still learning new strategies for instruction. This participant says that the on-campus PLCs have been the most beneficial for him/her to learn strategies that are successful in the classroom.

7. Geometry- This is a five-year veteran teacher who does not rely on the districts PD entirely. However, s/he stated that the summer PD's have been more effective since there are other math teachers involved and they are able to collaborate regarding the other campuses strategies that have been successfully implemented.

8. Algebra II- Talkative and specific about the expectations and actual outcome of PDs. Feels that the PLCs were helpful because they are able to discuss data and intervention strategies with their specific teams.

9. Algebra I- Has over ten years of teaching experience with several districts. This participant was able to expand on PD strategies that were taught in other districts in comparison to the current districts' PDs. S/he felt that the campus PD throughout the year was more beneficial since teachers were able to collaborate with their colleagues and discuss strategies that are successful as well as, those that were not successful in Algebra I.

Math Models- This participant was very knowledgeable and believes that the summer PD is more effective since there is a longer time frame as opposed to the short PLCs that occur bi-weekly on their campus. The summer PD are usually 6 hours and they also having some that run2 days concurrently. These are also effective because the teachers can collaborate with other math teachers and get a variety of strategies to take back to their campus.

10. Math Models- This participant is a veteran teacher and has also taught Algebra I and Geometry. S/he said that the most effective PDs are the PLCs that are held on campus because of the collaboration and the ability to structure the strategies to fit their campus student population.

12. Trigonometry- This participant is a novice teacher and has been on the campus for several years. S/he believes the campus year-around PDs are more effective since it provided strategies that are specific to their school population.

13. Algebra II- A veteran teacher with several years of teaching experience in math. This participant believes the strategies learned in on-campus PDs are more effective with the students since they are usually facilitated by the Instructional Coaches on the campus and are more relevant to their students.

14. Algebra I- Has 7 years of experience a math teacher. Believes that the most effective PD are the PLCs held year round on the campus. This participant agrees that there are effective strategies taught and implemented based on the data discussed in the PLCs. However, s/he would like to attend a PD that is not in their district to identify research-proven effective strategies implemented with other secondary schools in other states.

15. Algebra I- Has been teaching for 8 years and is very pleased with the campus PD and the support. This participant elaborated and provided examples of some of the strategies that were demonstrated and implemented in their classroom. The strategies were judged effective because there was a direct rapport with the facilitator and the participant was able to receive assistance and modeling of strategy from the campus math instructional coach.

16. AP Algebra I - Has 9 years of teaching experience. This participant has participated with both summer and year-round PD. The most effective for this participant is the campus year-round because s/he able to link the strategies to data specific for their students. Studying the on-campus data allows the teacher to apply intervention strategies that are specific for the individual student.

17. Algebra II- has 4 years of teaching experience on this campus. H/her experiences with PD is most effective with strategies learned from on campus year-round PLCs. These are most effective because there is campus support and the team is able to discuss strategies in reference to what is successful or not and make modifications.

18. AP Geometry- Has 3 years of teaching experience in math. S/he are very pleased with the campus year-round PD and feels that meeting with the teams is very effective because of the dialogue that relates specifically to strategies that work with teaching geometry. This applicant feels that the summer PD is not very personable since it includes all secondary geometry teachers and it's usually close to fifty teachers at the PD as opposed to their team on campus.

19. Math Models-Two years of teaching experience and feels very good about the campus year-round PD since this has been a great support for them. This participant believes that the strategies learned in the campus year-round PD is most effective due to the accessibility of the teacher mentor and instructional coach.

20. Algebra I- Has five years of teaching experience and is looking forward to many more. This participant was very passionate about the PD and implementing relevant strategies. The most effective PD to this teacher is year-round because of the collaboration with campus Algebra team

members and also with the math special education (SPED) teachers. This participant was very detailed oriented and stated that some of the strategies and interventions that were received from the special education team has proven to be very effective since the SPED teachers are aware of SPED students' modifications and accommodations on campus.

21. Geometry- Six years of teaching experience and believe that the most effective PD is campus year-round. However, s/he has learned a lot of useful strategies during the summer PD from other teachers. The campus PD does offer the additional support for implementing the strategies and also review specific data which is beneficial to ensuring that "you are reaching your student's needs."

22. Math Models- Nine years of teaching experience in math. The most effective PD for this participant is campus year-round PLCs because of the data driven instruction. The team is able to develop a plan of action and strategies that are specific to the student's weak areas that are identified. This enables to the teachers to create strategies tailored for the success of their particular student opposed to the district as a whole.

23. Algebra II- Several years of teaching experience and believe that s/he have received successful strategies from both PDs. However, since s/he has to choose/he would select the campus year-round PLCs because of the support and specific information received. Even though s/he is a veteran teacher, s/he enjoys the collaboration with the team and the discussion of strategies that are successful in the classroom.

24. Geometry- Several years of experience as a math teacher. This participant thinks that the summer PD is great with implementing general strategies for teaching geometry. However, the campus

year-round is more specific with individual students since you are using the data to guide your strategies used with instruction.

25. Algebra I and AP Algebra I- Several years of teaching experience in math. This participant feels that the most effective strategies are learned in the campus year-round PD. The team collaboration is the key and this is why the campus PD is most effective. It allows the math teachers, instructional coaches, and administrators to come together and develop a plan/ strategy that will ensure that students are learning the objectives created for Algebra I.

Appendix H: Participant Confidence

Teacher Attitude

Instructional Strategy	Not Confident	Neutral	Confident
Public Data	0	30	70
Think through Math	0	30	70
Individual Conferencing	0	50	50
Group Conferencing	50	50	0
Team Lesson Planning	0	10	90
Turn and Talk	0	80	20
Private Think Time	0	80	20

Source: The information was obtained from the researcher's analysis of returned teacher surveys.

Appendix O lists the percentage of teacher's and their confidence level with implementing instructional strategies learned from the professional development.

Appendix I: Teacher Attitude Graph

Teacher Attitude Graph
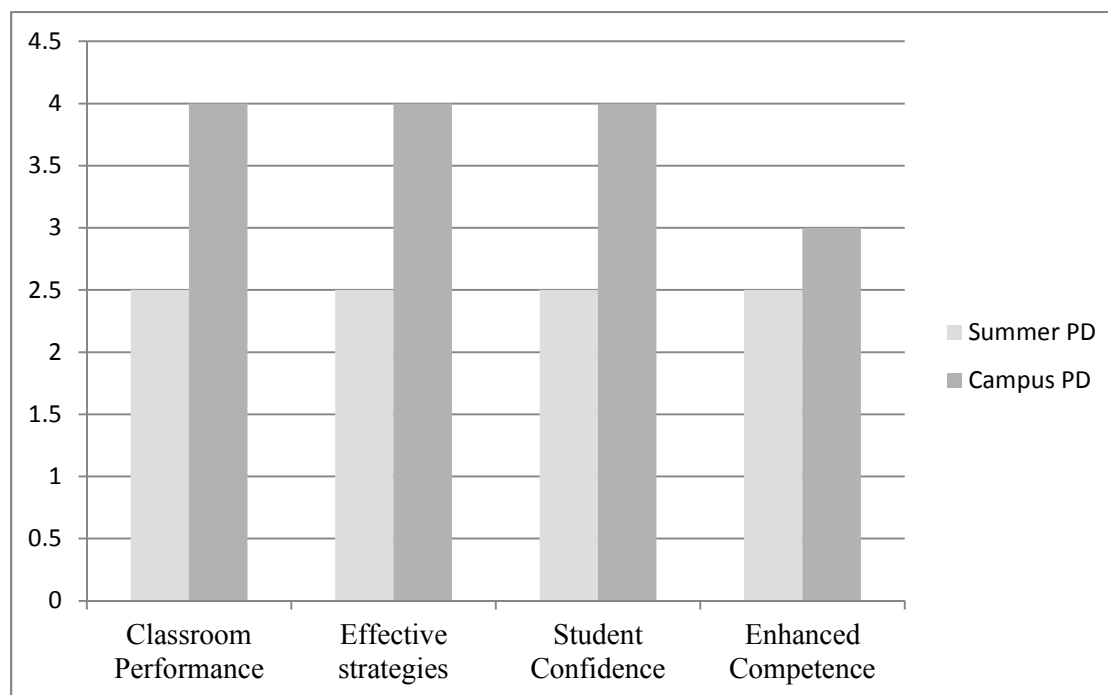
Appendix J: Instructional Strategies/Tools

Instructional Strategies Campus PD Implemented in the Classroom

Instructional Strategy Beneficial	Least Beneficial	Beneficial	Most Beneficial
Public Data	0	0	100
Think through Math	0	0	100
Individual Conferencing	50	50	0
Group Conferencing	50	50	0
Team Lesson Planning	25	50	25
Turn and Talk	0	80	20
Private Think Time	0	70	30

Source: The information was obtained from the researcher's analysis of prior to observation interviews. Appendix N lists the percentage of teacher's and their perception of implemented instructional strategies as a result of the on campus professional development.

Appendix K: PD Instructional Strategies

PD Instructional Strategies Summer PD Beneficial

Instructional Strategy	Most Difficult	Neutral	Difficult
Public Data	100	0	0
Think through Math	0	50	50
Individual Conferencing	0	50	50
Group Conferencing	50	50	0
Team Lesson Planning	0	50	50
Turn and Talk	0	50	50
Private Think Time	0	80	20

Source: The information was obtained from the researcher's analysis of returned teacher surveys.

This appendix lists the percentage of teacher's and their perception of how the summer PD implemented instructional strategies were beneficial as a result of the summer professional development.

Appendix L: Social Change Components

Teacher Perception of Social Change

Relationship	No Improvement	Neutral	Improvement
Teacher/Student	0	10	80
Teacher/ Parent	0	10	90
Classroom culture	0	20	80
Trust in Math Department	0	10	90
Student Peer group	0	0	100
Student Confidence	0	20	80
Teacher morale	0	25	75

Source: The information was obtained from the teachers' interviews held with participants post classroom observations. Appendix M lists the percentage of teacher's and their perception of social change as a result of the professional development.