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## Implementing The Math Workshop Model: Techniques And Benefits

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IMPLEMENTING THE MATH WORKSHOP MODEL: TECHNIQUES AND  
BENEFITS

By

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A capstone project submitted in partial fulfillment  
of the requirements for the degree of Master of Arts in Education.

Hamline University

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## CHAPTER ONE

### Introduction

#### Overview

Hearing the word *math* used to make me cringe. Any form of math, even if it was simple addition or subtraction, kicked my anxiety into high gear. I was not “good” at math and it was something that never came easy to me. No matter how hard I tried, mastering specific skills or equations seemed beyond me in addition to the challenge retaining any information or skills connected to math. In 2015, as a first year 2<sup>nd</sup> grade teacher, one of my biggest goals was to make math something different for my students; a part of the day they would enjoy rather than cringe at. In order to make this possible, it was necessary to explore new and different math strategies and load up on any math related professional development that were available. This exploration of new ideas and professional development lead to me being introduced to the math workshop model (Newton, 2016).

Math workshop (Newton, 2016) was something completely new and no one in my building had participated in professional development related to its implementation. As a teacher, math workshop (Newton, 2016) was my solution to ease the anxiety around math for students in my classroom. Not only was I unaware of what this workshop would look like in my classroom, but I was also at a loss as to how to implement it into a classroom. This is what led me to my research question for my capstone project: *What are the necessary components of professional development to support second grade teachers in implementing math workshop?* In this chapter, I will provide more insight on my personal experience with math and the struggles I encountered, how it has affected my

professional experience and choices to be more involved with the math community, give purpose to my research and provide background information on the different components of math workshop.

### **Personal Experience with Math**

In elementary school (1997-2002), I still remember my friends who were whizzes in math; they always knew the answer and could get it incredibly quickly. I remember this taking a toll on me, my constant struggles began to define who I was as a math student, which was not something I was proud of. I was always one of the last people to finish my assignments, I would often times get frustrated which would lead to tears, and I always needed peer or teacher assistance during math time. Throughout middle school and high school, my fear of math and the challenges that came with math did not leave me.

In middle school, I slipped through the cracks and got by, which later caught up to me in high school. I struggled throughout high school leveled and paced math classes, causing a lot of frustration and anxiety. I attended tutoring sessions weekly, got extra help from teachers before and after school, and my parents were also a great support system. Even with each of these areas of help, when it came to standardized testing and having to pass the math MCA's as part of new state graduation requirements beginning in the fall of 2009, I knew it would be a problem. I had to retake this test multiple times in order to pass and then to graduate. Looking at myself as a student in other content areas (English, Social Studies, and Science), I received straight A's and participated in honors and AP classes, so this obstacle that math was creating for me became very upsetting. Even with

these high levels of success, I still viewed myself as a failing student because of the identity math gave me.

As young math students, many begin the quest to answer the question, “who am I?” As educators, it is critical to help students write a narrative that includes strong belief that they were born to do math, just as much as their peers were. Many students struggle in math classes because at some point along their mathematical journey, they bought into the idea that they are not a “math person”. Students need to see that the keys to success are passion and dedication, not speed and always being right (Peart, 2018). It is crucial for students’ math identities that they begin to see math through a lens that allows them to understand that math is beyond memorizing steps and algorithms and getting answers quickly and correctly. According to Peart (2018), in order to create a positive math identity for students, they need to be exposed to a positive math environment. Within this environment, they need many opportunities to engage in math discourse, as talking about their learning deepens their understanding.

Though I overcame the challenges in high school, I went to college with doubts that I would not succeed if I had to face any sort of math class. I entered a selective liberal arts college in the upper Midwest with an undecided major, but the thought of teaching was on the back of my mind, as that had always been a dream of mine. Through completion of general, but required courses, the idea of teaching became more and more present. I pursued the college path of elementary education and was accepted into the program the second semester of freshman year. With this acceptance, the idea of teaching math still caused an uneasy feeling as I had no confidence in myself when it came to this subject.

One of the required courses throughout my college career was Methods of Teaching Mathematics, which would end with a completely new math mindset for me. This course taught the importance of teaching math, but also allowed for us to put ourselves in our future student's perspectives and learn strategies that will help them be successful. My fixed mindset, one that says some people were born to be great mathematicians while others definitely are not, was quickly changed to a growth mindset, one where students understand that productive struggle and even mistakes are opportunities for learning and growing their minds, that making me excited to teach math and make it something enjoyable for my future students. Though the math workshop model (Newton, 2016) was not introduced to me in college, plenty of relevant information for teaching math in a way that works for students, was, which prompted me to make the choices I have so far in my professional experience.

### **Professional Experience as an Elementary Teacher**

I graduated from college in 2015 with an Elementary Education major and an endorsement in Language Arts. Post-graduation, I accepted a job offer teaching kindergarten. This was the same school district I grew up in and I knew there were endless possibilities for me as a teacher, but also for my future students. Thinking about Kindergarten math did not spike my anxiety, instead, it made me excited to be the person that was going to introduce math to many students for the first time. In 2015 as a new teacher, my first year was a whirlwind; trying to understand the proper techniques and components of all literacy workshops, learning how to communicate with parents, attending professional learning communities (PLC's,) and learning the in's and out's of classroom management. Math was something that was easy for me to plan. I knew where



I wanted to start each day and what the outcomes were. Even though the skills were basic, I was still able to get my students excited about math and not fear it, something that I was never exposed to.

After my first year of teaching, I relocated to another school in the district for a 2<sup>nd</sup> grade position. The past two years (2016-2018), I have taught second grade, I have taken the accelerated math students for a faster paced class, meeting more of their needs. Since I started my role as a 2<sup>nd</sup> grade teacher, I have also been the math representative for my team. I am a part of a committee that works on “Frameworks 2.0” – an interactive Google Doc filled with math materials for all teachers in our district. This team would meet to collaborate about what is working well in our math classes, to learn from others, and to explore and create new materials for the 2<sup>nd</sup> grade teachers in our district. In addition, I also joined in on Math Workshop model training beginning in the summer of 2017, which was hosted by the math coaches in the district. This team met for two days in the summer, as well as three times throughout the school year. Each meeting described specifics of math workshop, the importance of teaching math this way, and strategies to continuously be implementing within math workshop. This concept was new to many teachers, myself included.

At first, it seemed undoable and incredibly overwhelming. The more I learned and dug into the concepts, the better I felt and knew it was a must for my students to learn math in this way. Not only does math workshop provide for engaging math lessons and activities, it also allows students to act as mathematicians and feel successful in what they are working on. The math workshop model exposes students to the idea that it is okay to make mistakes – because that is how our brains grow. Since my trainings, I have

continued to attend meetings, research and read about the workshop model independently, and am continuously thinking and brainstorming ways to make my workshop during math time the best possible for my students.

### **Components of Math Workshop**

When looking at math workshop, it is important to break it down into separate components. According to the professional development I participated in, each component of the workshop plays an important role for student learning in math, as well as building a math community. The first part of math workshop is beginning with an opener, or a warm-up. The warm up does not have to be related to whatever skill set or topic you are currently working on with students, but rather, a problem to get their minds switched to math and engage them right from the start. The warm up should only be around four to five minutes long; giving students enough time to solve, but also time to script and walk through the problem.

After giving students a small amount of time to solve, the teacher should call on a student or students to walk through their solving strategy. Meanwhile, the teacher is scripting on the smartboard, document camera, chart paper, or any other available resource used for whole group learning. This provides others with a visual who may have solved differently, or who were stuck and did not get started. It also gives exposure to math talk – hearing a peer describe what they did using mathematical words and strategies. Following the warm up is the mini-lesson.

The mini-lessons lasts seven to ten minutes, depending on the content being covered. During this time, the teacher is explaining new skills, strategies, or working on example problems to see how students begin solving, even if the skill has not yet been

taught. The amount of time allotted for the mini-lesson keeps students engaged, and promotes them to become inquiry based learners and problem solvers. The teacher may not be explicitly explaining step-by-step how to solve a certain type of problem, but rather, walking through strategies or ideas students may have and building off of those to come to an end result. The mini-lesson can vary in format. Some days, the teacher may decide to read a math book related to the topic they are learning about, whereas other days, the teacher may be working on a word problem with the whole group, it is up to the teacher to decide what makes the most sense for the group of learner's present.

After the mini-lesson comes to an end, students are sent to their work spaces to complete independent math work. Again, this can vary in how it looks depending on the day and the content being covered. Some days, the teacher may give students a set of five problems to work on, complete, and get checked off or turn in. Other days, the students may be working with manipulatives to solve or be writing their own math problem.

While students are working on independent math work, the teacher begins to meet with small guided math groups. These groups can be formed based on ability or not.

Throughout my experience as a teacher, my preference is to group by students who need more practice on specific skills. This information comes from reviewing students' independent work. Guided math helps narrow in on specific skills that a small group needs extra practice or instruction on. This can be done through guided practice, math games, or other activities known by the teacher.

Once students have finished their independent math work and are not meeting in a guided math group, they move on to their math stations. Math stations, or math workplaces, are set up by the teacher prior to each math day. Most times, teachers have a

rotating schedule for stations or workplaces. Each station is compiled with four to five students all working on the same task. Stations range from math games, independent math (a separate folder filled with extra practice on varying topics – usually the only independent math station), iPads or chromebooks if accessible for online sites, such as MobyMax or DreamBox. Some teachers may choose to put a guided math group as part of the stations, allowing rotation to happen each day for a new group. Students stay within the same math station for the day. Teachers will have routines set in place as to what students can do if they finish their station before it is time to clean up. Much like the other parts of math workshop, stations are flexible and up to the teacher to decide what is placed at each station based off of the needs of their math learners.

Finally, the workshop ends with a quick, three to five minute closing session. Students gather to the common, whole group meeting space. Again, sharing routines can vary depending on teacher preference and what is best for the students. Ultimately, the purpose of the closing session is to review the day's learning and have students share with their peers what they learn as mathematician during the day's session. Whether the students' sharing is coming from the warm up, mini-lesson, guided math group, or stations, it is an important skill for students to be able to talk about their learnings and for other students to hear from their peers. The closing session can also be used to give students a preview of what tomorrow's math time will look like.

### **Purpose of This Capstone Project**

One purpose of this research is to explore the benefits of using the math workshop model to help students successfully learn math. From my experience, I know that math can be something that becomes daunting, something that identifies you as a student. Math

may not come easy to everyone, and even if it does, it still needs to be engaging. This research will demonstrate the importance of teaching math using the workshop model for student learning and success versus the “traditional” ways of teaching math, like a lecture, note taking, and/or a worksheet.

Another purpose of this research is to develop professional development sessions to help support teachers when implementing the math workshop model in their classrooms. Around the environment of the school I teach at, one of the biggest topics of conversation related to the math workshop model is that teachers do not know where to start or what they are doing. As one of the only teachers that has been exposed to the implementation of math workshop within a classroom, I want to teach my learnings with my 2<sup>nd</sup> grade team. Not only will this allow for professional learning, but also help us plan together as a team to help think about all angles of student learning in relevance to their success in math. By creating professional development plans for my team involving research and information of all components of math workshop, it can better the learning for my future students, my 2<sup>nd</sup> grade team, and their future students. Within this research, the importance of norms will be established, as well as ways to properly incorporate them into math time.

### **Summary**

Going forward, Chapter Two will look at other methods that have been used to teach math and their success level for student learning and retention in math content, effective ways students learn math, necessary resources for proper implementation of the math workshop model, the importance of creating and implementing math norms stemmed from already in place classroom/community norms, and the big questions and

concerns around professional learning communities and how they enhance teacher and student learning. Chapter Three will provide a deeper look into the project being created, the audience, setting, and purpose of the professional learning community project.

Chapter four will provide an overview of the project completed, discuss new learnings, revisit the literature review, discuss possible implications and limitations, talk about future projects, and finally, discuss the benefits this project has on the profession of education.

## CHAPTER TWO

### Literature Review

#### Introduction

The methods and strategies in which teachers use to teach math throughout the years varies. However, Buchman (as cited in Ball, 1990) described what most people picture taking place in a typical math classroom, they envision the teacher lecturing, students taking notes, and then completing an assignment out of a textbook. This teaching practice shows the textbook to be the authority – theorems are proved by coercion – not reason – and confusions are addressed by repeating the steps in “excruciatingly fine detail.” This mode of teaching represents the dominant approach to mathematics in the United States (Buchmann, as cited in Ball, 1990). Though this method to teaching may have been what most educators would label “effective” for their students learning, there are many new methods to teaching math for students to learn and understand concepts as a whole, not just focusing on finding the correct answer.

The math workshop model (Newton, 2016) is a method to teaching mathematics that has changed the way a math classroom functions. This chapter will provide an overview of research regarding the importance of the math workshop model and implementing this learning within professional learning communities (PLCs). It will also help answer the research question: *What are the necessary components of professional development to support second grade teachers in implementing math workshop?* Section one provides a deeper insight on the past methods and strategies of teaching math and the negative effects it has on present day teachers, also pointing out the importance of implementing newly researched teaching methods (like math workshop). Section two

focuses on necessary resources for proper implementation of math workshop. Section three discusses the importance of creating mathematical norms for successful workshop time. Finally, section four focuses on the big concerns and questions when creating a professional learning community centered around math workshop in order to provide all necessary components for professional learning.

### **A Past Method to Teaching Math**

According to a study done by Stodolsky, (as cited in Ball, 1985) “classrooms are dominated by a recitation and seatwork pattern of textbook centered instruction” (p. 11). In about 20 of the classrooms that Stodolsky observed, most of the math time was spent on whole-group instruction, not necessarily meeting the differentiated needs of all students. If time remained, students worked individually at their own pace. “Rarely did students work in small groups or with partners” (Stodolsky, cited in Ball, 1985, p. 11). Generally, educators and math teachers introduce new concepts to children and tell them (not teach them) how to do the arithmetic in small groups, rather than whole group instruction to help with deeper understanding. Once the new material has been presented to the students, extensive time is spent on repetitive practice in a whole group or small group setting.

In past practices, textbooks have dominated this approach to mathematical instruction. Because of the textbook approach to teaching, it has been found that teachers are rarely adding new mathematical content that is not covered in the textbook (Schwille, cited in Ball, 1983). This leads to two failures or consequences for student learning. Stodolsky (as cited in Ball, 1988) wrote that when teachers just use concepts presented in a textbook, they are inadequately teaching students to develop understanding because the



textbook usually only provides one or two examples, with an emphasis on “hints and reminders” about what to do. A second consequence of teaching from the textbook is that this method of teaching allows for little to no use of manipulatives or other concrete experiences for students to learn and explore mathematical concepts to develop deep understanding. Instead, students spend most of their time doing written practices and problems from their textbook.

### **The Effects of this Method on Current Teachers**

Buchmann (cited in Ball, 1988) described one outcome for the many educators who grew up with this lecture and textbook type method. Many teachers use this method to teach math, as they assume there is “no other way.” Current teachers may think of their past math teachers and experiences, and then reflect upon how badly their teachers taught them math and how they might have made them “feel stupid”, but still, they [current teachers], lack alternative images of mathematics teaching - having no guidance on further methods (Ball, 1990). “These experiences may inhibit open-mindedness, freeze ways of looking, or engender undesirable attitudes” (Ball, 1990, pg 12). A take away from this research is that experiences can therefore limit possibilities for continued learning.

For example, past students [now current teachers] have developed the idea that math teaching involves giving directions about what to do, assigning work, and, as one teacher mentioned throughout Stodolsky’s observation, “sitting at my desk and waiting for people to come up for extra help or to get their papers checked” (Stodolsky, as cited in Ball, 1990). This then leads to the consequence of teaching just how they were taught, causing the downward spiral for students to understand the equations of arithmetic and

not the necessary content for deeper understanding. Thus, leading us to the present day math classroom: a mix between the “old” methods to teaching math, which does not meet the needs of students, and attempts at implementing a new method – the math workshop model, which meets the target needs for how students learn math.

### **Effective Strategies for Improving Student Learning in Math**

According to Zhang, Trussell, Gallegos, and Asam (2015) the traditional ways of math have led to many elementary school students struggling with acquiring basic math skills. According to the National Assessment of Educational Progress (National Center for Educational Statistics, as cited in Zhang, et al., 2015) in the United States, 59% of fourth grade students performed below the level of proficiency in mathematics, and only 8% of students achieved the advanced level. These poor results have caused many researchers and educators to look for more effective ways to teach math in relation to how today’s students more effectively learn.

Researchers such as Bjorklund et al. and LeFevre et al. (as cited in Marsicano, Morrison, Moomaw, Fite, & Kluesener, 2014) explored effective ways to learn math and noted how math-related activities are said to be an effective tool for increasing math skills. They continue that math-related activities also provide a positive and engaging experience featuring play-like, adult-child interactions. This type of learning opportunity can be provided during both structured learning activities (e.g. whole group math instruction), and unstructured activities (e.g. free choice math games in stations). One outcome of using math-related activities (Marsicano et al., 2014) is that students who are exposed to both types of learning (whole group and free choice) during math instructional time are more likely to fully grasp and understand the presented concepts.

Chang, Yuan, Lee, Chen, and Huang (as cited in Zhang et al., 2015) wrote that educational technology has also been long recognized as a valuable approach to improving student learning and reaching mathematical achievement of elementary school children. According to the National Council of teachers of Mathematics (2000), “Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning” (p. 32). With the recent development of tablets and computers, software now offers new potential for math learning.

Baker, Gersten and Lee, (as cited in Zhang et al., 2015) stated how the development in software [in apps] has been reported to have a generally positive effect on students’ math achievement. These authors note that math apps allow students to work on math problems at their own pace, which can be particularly useful for struggling students who need more time to solve a problem. Math apps can also provide immediate feedback to individual learners about their performance, which would otherwise be difficult to achieve during general instruction (like stated when looking back at the textbook method of mathematical teaching) and providing this feedback to students in a timely manner is important for student learning.

The math workshop model (Newton, 2016) allows math to come alive by considering the powerful impact of building a community of mathematicians who make meaning of real math together. An outcome of the math workshop model described by Newton (2016) is that when students do real math, they learn it. They own it, they understand it, and they can do it. Every one of them. The author continues that math workshop (Newton, 2016) is about a group of children learning and working together

throughout the year in a structured instructional format. It allows for individual, partner, and small-group work.

Newton (2016) suggested that throughout this strategy, students collaborate and learn about math in a space that is invigorating, rigorous, and standards based. As a result of this collaboration noted by Hunter and Anthony (as cited in Newton, 2016) is that it is productive and effective because it allows students to produce positive mathematical behaviors (how people act as mathematicians), model mathematical thinking (engage their minds with mathematical concepts and talk about what they know), and foster a productive disposition (how people see themselves as mathematicians and how motivated they are to engage in mathematical concepts). This approach to teaching and learning math also allows for students to build confidence, flexibility, perseverance, interest, creativity, appreciation, reflection, and monitoring skills – all which are crucial to develop the necessary skills to be a successful mathematician, student, and learner.

### **Summary**

Teaching methods and learning strategies for students becomes critical when looking at success rates and developing necessary skills as mathematicians. Looking back to the traditional textbook method, it is clear to see that this method only worked for advanced, understanding math students. For other students, especially those that struggle in math, this is not an effective strategy. It teaches the bare minimum and only focuses on learning the shortcuts to arithmetic problems. Often with this strategy, students are working on practice problems that do not provide immediate assistance or feedback as to how the student is doing. Moving forward with mathematical research and advancements, it is clear to see there are many other effective methods to teaching math and strategies

that work for students to fully grasp and understand mathematical concepts. Strategies such as math activity based learning, technology and app based learning, and the math workshop components can all help increase success rates for students and understanding math.

### **Implementing Math Workshop**

“Start today. Start small. Be confident. Do it step by step” (p. 3), Newton explained when thinking about action planning and implementing the math workshop model into classrooms. Boucher (2018) stated that in order for math workshop to be successful, educators need to methodically and deliberately introduce the students to the expectations, routines, and procedures. In order to do this, it works best to make a plan.

Newton (2016) suggested making the plan by thinking about where it makes most sense for students to start learning about this workshop model. The author notes that all educators do not introduce the workshop model in the same way. For example, some educators start by introducing the different components of the workshop, others may start with diving deep into the first component for the whole week. Newton (Newton, 2016) suggested that perhaps the most efficient and effective method for implementing this model is to follow a weekly plan implementation model. Within this plan, it starts small and then builds to the complete workshop in action. In order to have math workshop be functioning in a meaningful and successful manner, it is crucial that educators are implementing step-by-step, practicing routines and reiterating expectations throughout the process, Boucher (2018) explained.

### **Weekly Implementation Plan**

Newton (2016) has a suggestion for how to begin the journey with math workshop. According to her, the first week focuses on establishing math workshop as a structure for teaching and learning math. During the first week, teachers introduce math workshop in general, and then the ways of being and doing as mathematicians. During this week, teachers should emphasize communication and participation. Newton (2016) suggested teachers can also use this time to state what it is they expect during mathematical discussions. Along with learning discussion expectations, students will also learn that they will be working together respectfully to learn all the math they need to learn for the year.

Newton (2016) stated that the focus of week two is on learning to persevere, reason, and talk mathematics. According to this structure during the second week, teachers should introduce students to problem solving. Students will learn about persevering through a problem, modeling their thinking, and then explaining what they did. It is also important to spend some time on the idea of perseverance. “This is one of the greatest gifts you can teach your students” (2016, p. 5), Newton explained. Students need to learn that they need to stick with it and “wrestle” with a problem. To help promote perseverance, the teacher can create posters and routines that students can refer back to throughout the course of the year. Next, teachers should introduce students to reasoning. Students should begin to use mathematical talk to prove their reasons. Examples of this include: *prove it*, *convince me*, and *true or false*. Newton (2016) stated that these reasoning statements are all part of a routine where students have to prove their thinking, convince others that their argument makes sense, and decide whether a given problem or equation is true or false.

Week three focuses on implementing what students know and skills to double checking it. This is when teachers should spend time talking about modeling thinking and using tools. Students should understand that they can model their thinking through drawings, manipulatives, acting out, and diagramming (Newton, 2016). An important skill to learn through this conversation is for students to understand that great mathematicians model their thinking in order to show their deep levels of understanding and to teach those around them. Newton (2016) stated that ending this week, teachers should implement the idea of precision. Students should learn to start using precise language and double-check their work for accuracy. Teachers can help students understand that math is a language that they will be learning and using all year long. Regarding accuracy, students should learn to check their math and check that the answer matches the question. An important lesson within double checking is teaching students that they shouldn't feel bad about getting the answer wrong (Price, as cited in Newton, 2016).

Finally, Newton (2016) discussed how the last crucial week (week four) for the implementation requires focusing on introducing math workstations and the guided math groups. Students will learn how to get out the work stations, do the math, and then put them away. They will learn how to work alone, with partners, and in small groups. Teachers should make sure to introduce each station, play the games and do the activities with the students before sending them to work on their own or in their station. Teachers should not start small groups until all students understand what they are doing. If students do not know their routine or what the expectations are for independent work and station time, they will not be productive or on task, causing distraction for the teacher and small

group students during their time together. After students have learned how to work with the math work stations, teachers should begin to form them into small guided math groups. Students will practice coming to small groups and learn the architecture of the small-group lessons (Newton, 2016). During this time, students participate in the introduction of the content going to be covered, the student activities – playing games and doing math – and then the summarization of what students gained during their small guided math group.

### **Tools and Materials**

For proper implementation and a successful math workshop, Newton (2016) stated that students need to be exposed to tools and materials that will enhance and support their learning. Tools are what students use to think. Tools and manipulatives work as step-by-step visual models and help develop conceptual understanding. Students are not only more engaged when using tools and manipulatives, but they are also developing more concrete understanding of content and skills. There are a few different types of tools that become a part of math workshop.

The first type of tools are the actual items, like counting cubes, tiles, decimal squares, base-ten blocks, ten frames and number lines. The second type of tools are the templates, like geoboard paper, pattern block paper, hundreds grids, and decimal grids. Not only is it important that students have these tools and know how to use them properly to help their learning, but making sure they are available for use whenever needed. Often times, tools are hung on the wall and serve no purpose, rather than as “wallpaper” (Newton, 2016). Teachers should have number lines, number ladders multiplication tables, and all other tools available for students to hold, touch, and use when they need.



Besides manipulatives being available whenever students need them, they should also have their own Thinking Notebook, according to Newton (2016). It is important students know that a Thinking Notebook is a space where they are writing down ideas based on their thoughts. Thinking Notebooks are an important tool for students to use when working on word problems and reflection/share time. This tool allows students to work out (think) different types of word problems by using words, pictures, and other strategies. This tool also can be used to write about the day's learning or reflect on what was accomplished during workshop time. Thinking Notebooks can be used as a quick access of student understanding and thinking skills for teachers to review to understand where they are at in the learning process on a concept or skill.

Another tool mathematics teachers should have accessible during implementation periods are graphic organizers.

Graphic organizers are visual and spatial displays that make relationships between facts and concepts more apparent (Kim, Vaughn, Wanzek, & Wei, 2004). This research has shown that using graphic organizers as a method to teach routines and concept vocabulary terms has been effective. "Organizers are promoting more meaningful learning techniques and allowing students to facilitate their understanding and retention of new material by making abstract concepts more concrete and by connecting new information with prior knowledge apparent" (Kim, et al., 2004, pg. 34). The most common way teachers are using graphic organizers during math workshop is by helping students learn to represent their knowledge as imagery.

According to Goodwin (2011), connecting their knowledge to imagery helps with student visual-image processing, which then helps them to better recall new information

later. Not only can graphic organizers help with image processing and retention, they can also help students with facilitating communication and understanding of information, which could be used during the share section of math workshop. Because of the way information can be organized using this tool, it can allow for more explicit conversations and teachings from students using them as a tool to solve.

### **Additional Resources**

Beyond the weekly plan resources, tools and materials, there are additional resources teachers and educators can use to best support their learners during the initial stages of implementation. One resource many schools and districts across the country are using is mathematic specialists or coaches in an effort to improve teaching and learning in mathematics. This can vary from coaching practices in one-on-one settings (one coach and one teacher, group settings (one coach and multiple teachers – much like a professional development setting), or coaches interacting with students in the classroom. Hoffer (2012) stated that these strategies work to impact two areas: improving teacher instructional practice and improve student achievement. Though it is understandable that not all schools have a coach accessible, those that do can use them as an additional source for gathering information for math workshop. Math coaches can work to help find resources for warm ups, mini-lessons, independent work, math stations, and assessments. Because time is such a thing of value for teachers, this resource can help teachers stay on top of the workshop by not investing all of their time finding things that coaches could help support with students in the classroom.

According to Newton (2016), another popular resource that can assist math workshop and can be implemented is using resources and materials already created that

are found in school math libraries or online sources. There are many teacher-researcher created materials, such as: games, worksheets for independent work, posters, activities, and problem-solving projects. By incorporating materials that are already created, teachers can save time, which becomes essential during the already time-consuming implementation of the math workshop model. These types of materials are already “teacher-tested”, which means they are also most likely kid approved. Rhoda (2018) discussed that using already created resources will also almost always guarantee that they are meeting the common core standards and fitting curriculum, another great advantage of using these resources is that they can be edited, meaning they can be kept current, unlike many large purchases of textbooks and other materials made by schools.

### **Summary**

The central purpose of the math workshop model is to develop students’ ability to solve problems accurately and efficiently by implementing targeted instruction based on a formative assessment. Implementing math workshop can be an exhausting, large task for many educators because of the vast amount of components and preparation that goes into it for successful student learning. From my experience of implementing, I remember feeling constantly overwhelmed throughout the beginning stages of implementation.

Mid-year, I began to realize the importance of the hard work and dedication I gave for switching to the math workshop model and the truly incredible outcomes I saw within my student learning and retention rates. Using the weekly implementation plan and setting up routines and procedures for students can truly make a difference for a successful math workshop and increased student understanding of content.

Providing and incorporating the necessary tools, manipulatives, notebooks, graphic organizers, and outside sources also assist in the learning of math for students. It is imperative that our math instruction transforms from traditional ways to the math workshop model using tools, manipulatives, and hands on learning activities in order to meet the demands of the 21<sup>st</sup> century.

### **Building a Math Community**

Building a community of learners takes time. It is worth the investment at the beginning of the year so that students can thrive throughout the year and work together as a community. A community of mathematical learners is compiled with students that can explain, listen, question, justify, verify, expand upon, critique, model, defend, and show what they know. In order to create this type of environment, the teacher should use talk structures and language stems that promote listening carefully to the conversations taking place. Talk structures and language stems also help students express their thinking and respond to the thinking of other classmates. The norm in the math classroom should promote “intellectual risk taking” so that the students develop “mathematical argumentation, intellectual autonomy and mathematical power” (Hunter & Anthony, as cited in Newton, 2016, p. 19). Another aspect of a math community is the use of collaborative learning (Krussel, Springer, & Edwards, 2004).

A math community is based on groups of students meeting regularly in a social atmosphere to work collaboratively in solving challenging mathematics problems. Krussel et al. (2004) described how by allowing the collaboration within the math community, research has shown it to be successful in increasing the academic success rates and participation of lower groups of students . The authors attributed this success to

the deeper understanding of mathematics that comes from students engaging in meaningful, social interactions, such as whole group discussions or small guided math groups. In other words the more students can converse and work together on math related activities, the more likely they are to develop deep understanding and retention of skills and concepts.

### **Importance of Math Norms**

Math norms are a set of expectations established to increase active participation of all students and teachers. They are set in a positive tone and applied to all situations revolving around math. Math norms help facilitate daily behavior and rules regarding all components of math workshop to help lead to student engagement and higher achievement rates. Often times, norms are established during a whole group gathering time with the teacher acting as the facilitator. The norms within the classroom are highly necessary elements in establishing meaningful interactions that support mathematical discourse and a community among students (Cobb, as cited in Newton, 2016). If teachers put forth their best efforts and attitudes for creating a caring and well-structured classroom environment with high expectations for all students, the class is more likely to increase their engagement levels (Larson, as cited in Newton, 2016). Math norms also maximize student learning and promote a positive math environment. They give clear, positive, achievable expectations for how students and teachers will interact within the math classroom, which holds all students to the same accountability levels.

### **Classroom Norms Versus Classroom Math Norms**

In building a classroom of curious, confident, public mathematicians, you naturally infuse the social norms of the everyday classroom. It is important to distinguish

between regular social norms and sociomathematical norms. Newton (2016) explained sociomathematical norms take the thinking directly to the math. It is the idea that mathematicians do share common ground with other disciplines, but there are ways of being and doing in math that are specific to math. When looking deeper into the differences between traditional social norms and sociomathematical norms, the differences can be seen when looking at a few specific components: questioning, explaining thinking, problem solving, solving strategies, and making mistakes.

Questioning for traditional social norms focus on the teacher and the students questioning each other's thinking, whereas in sociomathematical norms, the teacher and students ask each other questions that press for mathematical reasoning. This can include proving, justifying, defending, elaborating, clarifying and challenging. When students explain in a traditional norm, they say what they are thinking – there are no set parameters or expectations for their explanations. Explaining for sociomathematical norms, students have to explain their solutions using math words, strategies and models. They have to provide a “mathematical reason or justification for their thinking rather than just a description of their thinking” (Hunter & Anthony, as cited in Newton, 2016). Students are expected to agree or disagree with an argument regarding a problem or solution.

Traditional social norms in classrooms have students work together to solve problems. In sociomathematical norms, students are required to not only get a solution, but to think about the different ways to approach a problem mathematically and compare those ways. In relation to this, traditional norms have students solve problems using a variety of approaches, whereas sociomathematical norms have students think about the

efficiency of approaches and the various models to show their thinking. They are expected to “revise, extend, and elaborate on sections others might not understand . . . predict questions that might be asked and prepare responses . . . work together to check, explain, re-explain” (Hunter & Anthony, as cited in Newton, 2016). This is allowing students to expand their knowledge about mathematical strategies and discussing which strategy has the most effective and efficient approach them with those around them.

The last important norm to compare traditional social norms and sociomathematical norms is the concept of mistakes. Social norms have students seeing mistakes as part of learning. Sociomathematical norms not only have students learn from their mistakes, but also ensures students unpack their mistakes, look at them deeply, and then see how their mistakes help them learn math. Mistakes can be an important norm to address for student learning, especially when considering the sharing portion of the math workshop model and students accepting and listening to all answers and ideas, even if they may not be accurate.

### **Critical Norms to Implement**

When creating an environment and community, it is important to think about the necessary norms to put in place. The review of the research for this capstone identified five norms that are critical to implement when creating a math community. They include norms related to:

- Preparation
- Evidence of learning (Connor & Ruegg, 2012)
- Expectation of active participation (Bennett, 2014; Connor & Ruegg, 2012)
- Inclusion

- Safe learning environment

Next is further explanation of these norms.

A math norm relating to preparation should be in place. Students should come prepared, reading for discussions, taking notes throughout math workshop time, bringing examples from learning, etc. O'Connor and Ruegg (2012) also suggested that students should be bringing evidence of their learning in order to show the process they went through to get to their current level of understanding.

Next, Bennett (2014) stated that creating classroom norms surrounding the idea of participation is a necessary second step in implementing meaningful discourse and creating equitable learning experiences. In a math classroom, this norm is inclusive, and all individuals' comments and ideas are valued and respected. All students are engaged in the open sharing of ideas and students collectively shape understanding with guidance from the teacher as needed.

O'Connor and Ruegg (2012) talked about how being an active participant throughout math time needs some guidelines. Students need to understand types of talk; that it is expected that their math talk is focused on reasoning, it is respectful, and it is equitable. Participants should ensure that their discussions are authentic and academically rich; all sharing should be on topic and ask questions that students really need to know.

Though there are many critical math norms, a final norm to point out that makes a difference for student learning is the idea of the learning environment being safe for all students. An excerpt from the book *Making Number Talks Matter* (Humphreys & Parker, 2015):



Tell students on the first day of class that you won't put them on the spot, but that you will give them lots of opportunities to share their thinking when they choose to. Try hard to not violate this trust. Teachers should want the learning environment to be safe for all students. Talk with kids about how important it is for them to talk about and explain their thinking. With quieter students, ask them, one-on-one, to share with you about how they thought about a problem. Once they have had a chance to rehearse their thinking with a teacher, ask them to think about whether they might be willing to share their ideas with the whole group during sharing time. Once students have had their own way of thinking recognized and valued, they may become more confident in sharing their own ideas. (p. 169).

This insight into creating a comfortable and safe learning environment can show the true impact of slow steps for students that may be necessary, as well as how far some students can come once a safe learning environment has been established. The environment in which students learn and explore math in can be a vital element related to math understanding. According to O'Connor and Ruegg (2012), if a student does not feel safe or their ideas valued when sharing their learnings, they are less likely to feel motivated to continue diving deeply into math content and participating in class discussions.

Jo Boaler, a British education author and professor of mathematics and education at Stanford Graduate school of Education, discussed other important norms to consider implementing in a youcubed article about creating general norms and expectations about mathematics that can help promote a culture of thinking in math class. Some of these include: making sure students understand that everyone can learn math to the highest

levels – encourage students to believe in themselves and that there is no such thing as a “math” person, mistakes are valuable – mistakes make your brain grow and it is a good thing to struggle through them, questions are really important – always ask questions, math is about creativity and making sense – math is a very creative subject that is all about visualizing patterns and creating solution paths that others can see, discuss, and critique, math is about connections and communicating – math is a connected subject and a form of communication, depth is much more important than speed – mathematicians should think slowly and deeply, and finally, math class is about learning not performing – math is a growth subject and it takes time to learn and it is all about effort (2017).

Each of these norms represent different ideas that are important for student learning and understanding. It allows students to understand that errors are “gifts that promote discussion” (Boaler, 2017, p. ?) and that answers are important, but they are not the math. It also allows for students to talk about each other’s thinking and ask questions until their ideas make sense. Students are gaining insight on the importance of using multiple strategies and multiple representations by knowing that this is what is expected throughout the norms put into place.

### **Summary**

Math norms can help promote a culture of thinking in math class. Norms help offer a progression of expectations and taught behaviors for supporting authentic discussions within elementary school students. Norms help set the tone for appropriate, respected, and valued discussions amongst students during math sharing time, but also help set expectations during work time and station time, whether it is independent or with other peers. Without norms, the math workshop model and a math classroom cannot

function properly; students do not know what to expect from the teacher and from their peers, as well as what is expected of them during mathematical learning times. Norms can help lead students to a mathematically rich and meaningful learning experience, as this continues to be a critical need in the classroom (Cobb & Hodge, as cited in Bennet, 2014).

### **Professional Learning Community**

The term professional learning community (PLC) is becoming well integrated into the vocabulary and routines in American education. A learning community is a group of autonomous, independent individuals, who are drawn together by shared values, goals, and interests and committed to knowledge construction through intensive dialogues, interaction, and collaboration (Harmon & Jones, as cited in Loving, Schroeder, Kang, Shimek, & Herbert, 2007). The concept of a professional learning community originated from a democratic, student-centered, inquiry based philosophical perspective grounded from the works of Lev Vygotsky. Vygotsky's work on knowledge construction through social interactions in situated and meaningful sociocultural contexts is related to building learning communities, where learners engage in critical thinking under the scaffolding provided through peer and staff interactions from an instructor or administrator (Bonk, Malikowski, Angeli, & East, as cited in Harmon et al. 2007).

When looking into the perspective of educators, some see professional learning communities as extending classroom practice into the community and utilizing community resources. For others, it suggests bringing community personnel into the school to enhance the curriculum and learning tasks for students. Then there are some who believe professional learning communities means having students, teachers, and

administrators aligned with engaged learning (Hord, 1997). Overall, when thinking about the term learning community or PLC, the common theme becomes that it is a group of teachers in a school and its administrators continuously seeking and sharing learning, and acting on their learning. The goal of a professional learning community is to enhance teachers' and administrators' effectiveness as professionals for the students' benefit.

### **Benefits of Professional Learning Communities**

Darling-Hammond (1996) observed that schools that require professional learning community meetings have teachers that are more willing to spend their time redesigning and rethinking their responsibilities as teachers (and administrators) compared to schools that do not require teachers to participate in such meetings. This leads to important, and potentially necessary, changes occurring in teachers' classrooms and administrators' schools to better meeting the learning needs of students and staff. Darling-Hammond (1996) went on to share her research that because of PLC meetings, there is more collaboration and more collegial conversation among school staff than ever before.

Not only does this create learning opportunities for staff and administration, but also brings together staff to bond and work with one another, leading to a more welcoming and positive school environment. It also allows teachers and administrators to view themselves as "all playing on the same team and working toward the same goal" (Hoerr, as cited in Hord, 1997, p. 10). When staff and administrators are bonded on the same common ground, working towards the same goal of bettering their teaching for the learning of their students, teachers are noted to be more positive and driven for their students. Teachers are more likely to be consistently well informed, professionally renewed, and inspired so that they can inspire students (Boyer, as cited in Hord, 1997).

Professional Learning Communities also lead to “Collective Creativity” as Peter Senge’s book, *The Fifth Discipline* stated (Senge, as cited in Hord, 1997) PLC’s allow people to continually expand their capacity to create the results they truly desire. They help create new and expansive patterns of thinking. People are continually learning how to learn together and creating things they really want to create (Senge, as cited in Hord, 1997). This is done by having staff conduct conversations about students and teaching and learning, and identifying related issues and problems. From here, they (the teachers and administration) work together to create solutions for student learning and for said issues and problems. Teachers and administration also work together to learn how to apply new their new ideas and information to their problem solving.

When teachers partake in professional learning communities, they are able to agree on a vision of authentic and high-quality intellectual work for students that includes intellectually challenging learning tasks and clear goals for high-quality and differentiated learning. More authentic pedagogy [instruction and assessment] is also constructed and applied in classrooms, giving high-quality student learning, benefiting students of all social backgrounds (Lynn, as cited in Hord, 1997). This research identifies the power of an organized professional learning community and its impacts on making advancements in student achievement.

### **Necessary Core Characteristic of PLCs**

According to Louis and Kruse (1995), there is a necessary core characteristic of professional learning communities that needs to be implemented in order to receive the desired outcomes of the meeting time. This core characteristic is having a community that is willing to accept feedback and work toward improvement. By having all involved in

PLCs willing to accept this characteristic, teachers will develop positive attitudes toward schooling, students, and change, as well as heightened interest and engagement with learning. Without the agreement of accepting feedback and working towards improvement, nothing in schools or classrooms will change. All individuals' beliefs, ways of seeing the world, skills, and capabilities must be open in order to give an environment conducive to change for the benefit of students (Senge, as cited in Hord, 1997).

In addition to the necessary characteristic, others are also needed. These include: respect and trust among colleagues at the school and district level, possession of an appropriate cognitive and skill base that allows for effective teaching and learning, supportive leadership from administrators and others in key roles, and relatively intensive socialization process.

### **Conclusion**

In order to provide learning of high intellectual quality in mathematics for students, the traditional ways of math classrooms versus a math workshop model classroom, steps to properly implement the workshop, mathematical norms, and the needs of a professional learning community need to be considered. The most successful schools provide learning of a high intellectual quality through organizational capacity during professional learning communities. Teachers help one another, take collective (not just individual) responsibility for student learning, and work continuously to improve their teaching practices, which are then applied to classrooms to help students successfully work the routines and meet the goals of the math workshop model. The research in this chapter will be used as a framework for chapter three to create effective and sequential

professional learning community sessions to help a second grade team begin the implementation process of the math workshop model successfully.

## CHAPTER THREE

### Project Description

#### Introduction

When I began teaching, my goal was to find a way to meet all of my student's needs in learning math content and retaining information. Throughout the past four years, this goal has remained while I have continuously tried new and engaging ways to teach math. The math workshop model has shown many benefits for student engagement, deep understanding of math content, and improved retention rates since it has been implemented within my classroom, but also many in other elementary schools. In my literature review, my intent was to better understand how students learn math, what materials and resources are necessary for proper implementation, the importance of math norms, and what benefits to teaching and learning professional learning communities withhold. Each of the areas researched in chapter two assisted in answering my research question, *what are the necessary components of professional development to support second grade teachers in implementing math workshop?*

It is important to examine the components of the math workshop model and how it positively affects students learning math content in order to fully understand the necessity for implementation within classrooms. According to Staub (2017), the math workshop model not only helps students develop deeper understanding of math content, but it also helps with differentiation, mathematical confidence, building individual practice skills for problem solving, allows time for one-on-one interactions between students and the teacher, open opportunities for risk taking, and incorporates meaningful mathematical conversations to build understanding.



Not only do classroom teachers need to understand the positive benefits of the math workshop model, but they also need to learn and develop techniques about how to successfully implement the workshop model into their classrooms. The purpose of this project is to create professional learning community sessions for a team of second grade teachers in order for them to learn about the math workshop model, proper implementation, and how to use PLC time to plan and create mathematical content for their students. This chapter will include the project's target audience, the setting the project will take place in, a description of the project, the rationale for the project, and a timeline for project completion.

### **Target Audience**

The intended audience/participants for this capstone project is the 2nd grade team I work alongside with. This team is compiled of one teacher with four years of experience, one teacher with 29 years of experience, and two first year teachers. Administrators within my school could also benefit from this information, as they could share it with other teachers on their staff in hopes of implementation to take place.

### **Setting**

The setting for this project is in a K-5 elementary school. The size of the school is 498 students. There is a variety of staff working together in the school community. Our Kindergarten team for the 18-19 school year is five teachers (growing a section by one from the 17-18 school year), 1st grade has three teachers (dropping a section from the 17-18 school year), 2nd grade has four teachers (growing a section from the 17-18 school year), 3rd grade has three teachers (staying consistent with the 17-18 school year), and 4th and 5th grade has three teachers (staying consistent with the 17-18 school year).

Beyond classroom teachers, there are many support staff working in various areas, such as: music, gym, and art teachers, special education, English language, occupational therapy, social worker, school psychologist, lunch room clerks and custodians, administration and office staff, and workroom (copy room) staff. The entire staff works together to build a safe and welcoming community for the students. Of the classroom teachers, there are three male teachers and the rest are female. The age varies from first year teachers to experienced teachers with 25+ years. The demographics within the staff are primarily white, with few staff members of color.

Looking at student demographics, there are 1% of students who are Native American, 13% who are Asian, 4% who are Hispanic, 13% who are Black and 69% who are White. Within the population of students, 16% of students are on free and reduced lunch, 17% of students are in Special Education, and 12% of students are English Language Learners.

Looking at the community, there are multiple housing developments surrounding the school, ranging in all types of homes (trailers, single-family homes, and large homes on the golf course). There are also a few stores, gas stations, and places to eat. As a whole, the community is a welcoming, safe spot for students and their families. The school community is welcoming, and teachers and staff take a lot of pride in each of their students. As a school community, we do many fundraisers, school pep-rallies, and music concerts to watch other grades perform.

### **Project Description**

This project will include a 4 session sequential professional learning community (PLC) sessions for my 2nd grade team. My PLC team meets 1x/week on Thursdays.

Every other Thursday is dedicated to math (versus literacy). Within the PLC sessions, I plan to inform on the different components of math workshop, create background knowledge of the benefits of using math workshop, and how we can use our PLC time to plan, create, and implement the math workshop model together. In order to teach my team the components of the math workshop, I will use the first session to give an overview of each component (the warm up, mini-lesson, independent work time, stations, and guided math). I will include visual examples of what each of these components may look like within our classrooms in order to provide deeper understanding. If time allows during the first session of this PLC sequence, we will use it to look at more examples and allow my teammates to ask any additional questions that we did not get to throughout the math workshop component teaching.

During the second session of the sequential PLC, I will provide my team with background knowledge about the benefits of math workshop. I will share the research I have found relating to improved understanding of math content and higher retention rates. As teachers, we thrive off of rationales for doing something that takes a considerable amount of time. This will help my team understand the purpose of the time investment we are making to implement the math workshop model for our students.

During the final session for this grouping of PLCs, I will provide resources we can use in order to plan, create and implement the workshop model during our math time. I will provide my team with interactive app suggestions and websites for materials. I will also share books that I have used throughout my research process and with my math students in the past. In addition to providing necessary resources, I will also work with my team to create an efficient plan of how we will spend our time during our math PLCs

in the future to support our implementation process and continued success with using it within our classrooms.

My project will include an outline of the three sessions, as well as the slides/presentation I use to help inform my team about the workshop model. I plan to share all of this information via Google Slides or Google Docs, allowing my team to participate during the PLC sessions and add their own learnings and ideas. This information will be helpful to all the teachers on my team, but it will be an additional benefit to two of the teachers, who are first year teachers joining in the fall to the team.

### **Rationale for the Math Workshop Model and PLCs**

The math workshop model is something that has become an expectation to be implemented within elementary schools in my district, even with limited training for teachers. As the math representative for the 2nd grade team, I attend four meetings a year working with other 2nd grade teachers and our district math coaches to support the learning needs and teacher material needs. I also attended a four day training on the math workshop model, something that has not been shared with many teachers in the district as they have decided to do it in phases. With this information, I have a solid background on the workshop model.

The central purpose of the math workshop model is to develop students' ability to solve problems accurately and efficiently by implementing targeted instruction based on informal assessment. McREL (2010) described effective math pedagogy as "highly interactive as students explore problems, formulate ideas, and check those ideas with peers and with their teacher through discussion and collaboration" (p. 66). The math workshop model components work together to do exactly what effective pedagogy is

suggesting. Through the warm up, mini-lesson, independent work time/practice, math stations, guided math, and share outs, students are interactive, exploring problems, and formulating their ideas. They bring these ideas to the teacher and their peers throughout the share out time.

In addition, an author that supports the math workshop model is Dr. Nicki Newton, who wrote the book: *Math Workshop in Action* (2016). This book describes the ins and outs of the workshop model, including the benefits this framework provides for students. Newton (2016) discussed,

The math workshop model helps engage students and helps them learn math . . . it helps math come alive by considering the powerful impact of building a community of mathematicians who make meaning of real math together. When students do real math, they learn it. They own it, they understand it, and they can do it. Every one of them. (p. 3)

Newton's work goes to demonstrate the powerful impact the math workshop model creates on student learning and retention for math content.

Alongside the math workshop model, my project also incorporates professional learning communities (PLC), I found research discussing the benefits of building a community made up of teachers and administrators, and how it directly correlates to student learning. Darling-Hammond (1996) observed that schools that require professional learning community meetings have teachers that are more willing to spend their time redesigning and rethinking their responsibilities as teachers [and administrators] compared to schools that do not require teachers to participate in such meetings. Professional learning communities provide large opportunities for staff to work

and think together to better the needs of students, much like my 2<sup>nd</sup> grade team PLC sessions will do in regard to the math workshop model implementation.

### **Project Timeline**

To complete this project, it was important to consider all areas and details that needed to be in place before beginning. Prior to starting, it was necessary to first have solid drafts of chapters 1-3 to fully understand the research, findings, and data that supports The Math Workshop model. From here, beginning the project was smooth because the necessary learnings were in place. I created a Google Slides presentation that included the following components: the reasoning behind my capstone topic, stating an overview for the presentation, sharing my research question, teaching the past methods that have been used to teach math and the effects it has had on student learning, teaching new ways students best learn math, and understanding The Math Workshop model as a whole. This included stating the weekly, step-by-step implementation process, as well as strategies and reasoning for teachers to include this model into their mathematics time throughout the day. When looking at a timeline of creating this project, it took about two weeks from start to finish to have all the research, presentation, and details in place and ready to present or share for professional development.

### **Conclusion**

This chapter introduces and discusses the foundation of where the idea for this project came from, the purpose of the project, the audience and setting for the project, the rationale of the math workshop model and professional learning communities, and the intended timeline for completion. Through examination of literature and research on the ways students learn math, the benefits of math workshop model, and the effectiveness on

teaching through professional learning communities, this project examines the research question: *what are the necessary components of professional development to support second grade teachers in implementing math workshop?* Research on the above topics has been analyzed and utilized to create materials to provide effective professional learning communities for my second grade team regarding successful implementation of the math workshop model. In chapter four, I will provide an overview of the project completed, discuss new learnings, revisit the literature review, discuss possible implications and limitations, talk about future projects, and finally, discuss the benefits this project has on the profession of education.

## CHAPTER FOUR

### Conclusions

#### Overview

*What are the necessary components of professional development to support second grade teachers in implementing math workshop?* This question was the motivation behind the creation and design of my professional learning community/professional development sessions containing information on implementing the Math Workshop model into elementary level classrooms.

In chapter four, I will discuss and provide an explanation of the new insights and major findings I gained through the process of creating this project. I will also refer back to my research, which provided me with important concepts that helped guide and shape the professional learning community/professional development sessions I created. Then, I will provide specific examples of the implications and limitations that are associated with this capstone project. Finally, I will share how the results will be communicated with others, how this project is beneficial to other professionals in the education field, and how this project has impacted me and my teaching of mathematics.

#### Learnings

When asked to describe oneself, most teachers will likely add in the word “curious” to their list of descriptions. We are curious to learn about our students, ways in which students learn, processes that will help better our teaching, and curious to see what strategies and skills work and those that need adjusting. I feel as though my curiosity has helped guide me through this capstone project. Initially, my curiosity helped direct me to



a topic that I wanted to spend time researching and learning more about. Then, it helped influence me to create a project centered around educating others about The Math Workshop model. Finally, I feel as though my curiosity has led to me learning more about how students learn math and effective ways in which teachers can teach it, but has now allowed me to want to continue this learning and teaching around mathematics.

Prior to starting the research and literature review process, I thought I had a solid understanding of beneficial teaching strategies for helping students learn math and using The Math Workshop model to guide their learning. Looking back at where my knowledge began prior to the research, I can now see that my initial understandings were basic and on the surface. Prior to my research, I had a good understanding of how students learn. For example, I knew that students learn in different ways, and not one strategy or explanation is going to meet the learning needs of all students. Now, I have a deepened understanding of what that really means, and how in math, the workshop model can target the needs of *all* learners, not just the majority. Through this process, I have also come to solid understandings of the why regarding The Math Workshop model.

Through my research, I have learned the reasoning, components, and ideals of The Math Workshop model. Knowing each of these areas has helped shape and create a more detailed understanding of math and the importance of meeting the learning styles of all mathematicians. These understandings have provided meaning and depth to concepts I already had initial knowledge. It has given me more confidence in my mathematics teachings and justifies the amount of time that is being put forth to prep for and implement the workshop model. The learnings and understandings that I have developed

through this process are the same goals I have for my students, but also for my second grade team members and other building educators.

Overall, this capstone process has really broadened my knowledge in the ways students best learn mathematical topics and how to best implement them into the classroom setting. It has also allowed me to understand the process of creating professional development sessions and what they should include to be engaging and meaningful for other staff members and their needs. I have learned valuable information that will help guide my instruction during math periods of the day to best meet my students' needs.

### **Literature Review**

The literature review process really helped strengthen my understanding of many key areas and concepts. One of the main areas of growth for me was in regard to the effective strategies used for improving student learning in math. Though each strategy was individual, they each are able to be implemented into The Math Workshop model in different ways. Some of the strategies I learned through my research and literature review that tend to be the most effective for student learning in math include: math-related activities (featuring play-like, adult-child interactions), whole group instruction to teach initial skills, small guided math groups to target necessary skills, partner work to allow for practice with specific skills and collaboration, and educational technology. The Math Workshop model allows for each strategy to perfectly align with a component of the workshop model.

During my time reviewing literature and writing this section, I kept referring back to research conducted by Dr. Nicki Newton. This researcher has published many books

and other resources for teachers that are new or established in The Math Workshop model. Dr. Newton focuses on meeting the individual needs of each student and how learning math may look different for every single student. Newton could not have stated it better, that “The Math Workshop Model is a method to teaching mathematics that has change the way a math classroom functions” (Newton, 2016, p. 4). When thinking back to the ways in which I learned math during my elementary school days, I so deeply wish that these findings on the importance of the workshop model were discovered. It is clear that it provides a positive, engaging, and worthwhile experience for students.

Another main concept that my literature review helped deepen my understanding is regarding the implementation process for educators. “Start today. Start small. Be confident. Do it step by step” (p. 3), Newton (2016) explained when thinking about action planning and implementing the math workshop model into classrooms. This process seems overwhelming at first, but the ways in which the research behind implementing specific components at a time can help teachers and students, really made a difference. This research really solidified the meaning behind making a plan to best implement the expectations, routines, and procedures. Newton suggests that it is best to start the plan with information for students to start learning about this workshop model. I think this is also true for when thinking about teachers and other educators learning about this process – a plan can make all the difference. I used this research to help guide the planning process for my professional learning community/professional development sessions, too. From here, Newton shares a weekly, step-by-step process for implementation the first four weeks of teaching The Math Workshop Model.

A final component of my literature review I found especially critical was the idea of tools and materials and how proper use and teaching around this area can make a difference for student learning. Newton (2016) stated that students need to be exposed to tools and materials that will enhance and support their learning. I also learned a proper way to explain to students, teachers, and other educators the purpose behind using tools and manipulatives. Tools are what we use to think, and they work as a step-by-step visual model to help develop conceptual understanding. I also learned that not only are students (and adults) are more engaged when using tools and manipulatives, but they are also developing more concrete understanding of content and skills. This area helped support my actions in making sure my classroom has proper and meaningful tools and manipulatives for my mathematic learners.

Through the literature review process of my capstone, I learned many valuable aspects that helped in the creation of my professional learning community/professional development sessions, like the major components listed above. The literature review process was a vital component of the successful completion of my PLC sessions.

### **Possible Implications**

The school district I teach in is in a suburban community in Minnesota. This school district, and more specifically my school, is fortunate enough to have many resources available to educators. These resources range from manipulatives (ones, tens, and hundreds blocks, pattern shapes, and counting tools) to some technology tools (iPads, smartboard, and Chromebooks). In grades 4-12 in this district, students are 1:1 with iPads. With all of these resources, making the workshop model function properly has high potential. These resources can be implemented during station time, independent

math work time, or small guided math groups. Although some teachers have already begun implementing these tools into their math time, it became clear that many different are looking for more direction. They want to ensure they are using the tools and manipulatives appropriately and making it meaningful. These feelings helped guide me into creating my professional development sessions to help teach those who were feeling unsure on how to use tools in a meaningful manner in during their workshop time.

This district is also known for a wide spread of cultural diversity. Within this, the conclusion was drawn that The Math Workshop model has not been adapted to all cultures. Many cultures within our school are prone to using “traditional” ways to teach their children math. For example, they will fall back on using algorithms or formulas to solve problems, rather than adapted strategies and a variety of solving methods that The Math Workshop model provides. Because of this, students learn a variety of solving strategies that are then unfamiliar at home with parents.

My goal within the creation of my professional learning community/professional development sessions is that teachers and educators will begin to use the sessions to rely on for proper implementation and support in areas that may seem challenging. As teachers and educators become familiar with the different techniques for implementation and the variety of teaching strategies that come within The Math Workshop model, my goal is that they will begin to share these resources with their students. While these sessions can be very helpful and useful for both teachers and students, I am also hoping that this information can be present to parents, so they are familiar with the methods being used in the classroom, so they can help support these techniques at home.

### **Project Limitations**

My school district does an outstanding job of providing extended education options for teachers. From professional development sessions to outside training opportunities, all teachers are welcome to learn more on many topic areas through the district. Though many sessions are available regarding literacy, The Math Workshop model has only been lightly touched upon for training sessions. Only select schools were able to receive training on this workshop model and its proper implementation strategies. Because of this, many schools in the district have little to no information on The Math Workshop model. This causes lack of knowledge for teachers who want to implement this model into their math time, which then leads to teachers falling back on “traditional” ways of teaching math. This does not allow students to learn in the way that best suites them, or allow for differentiation.

Another limitation I found while creating this project is the concept of time. The adequately address each component of The Math Workshop model, it takes times to set up, plan, and then teach the routines. Especially in an elementary school setting, math is not the only subject area that teachers plan for and teach; they are responsible for a variety of subject areas and with that, comes a time constraint. Teachers begin to feel overwhelmed when implementing something that is new within their classroom or teaching methods, and not having enough time to set up and plan becomes a problem.

This method of teaching also takes time within the school day, not just the preparation before and after school. The Math Workshop model takes a lot of time for the educator to fully understand the instructional techniques and how to apply it to their classroom. In addition, it takes a lot of time for students to get used to a new routine of learning. It requires a lot of time for the teacher to model and explain what every

component looks, sounds, and feels like. Students also have to practice gaining stamina for working independent, which for primary grades, can be a lengthy process. Overall, it takes time to fully implement this method of teaching in order for it to be done in a successful manner, which may hinder a lot of teachers wanting to implement it into their math periods.

### **Future Projects**

After presenting my professional learning community sessions to my second grade team, I would like feedback on what is missing and what could added or adapted to help other teachers learn in a meaningful manner. From here, I would then like to present these sessions to the whole school staff during a professional development session. This would allow for a larger audience to gain insight on The Math Workshop model, especially those who have not yet received in additional training on this method. I would use an anonymous survey to gather feedback, which would allow those present to share their honest opinions. Based off of the results, changes would be made to help enhance the project. Some future projects that would be similar to this would could be additional sessions based off of educators needs for areas of support or a visual way to teach students about the workshop model so they are understanding the importance of each component.

### **Benefits to the Profession**

Prior to the start of my research and project, I had conducted some of my own research and attending outside training opportunities on The Math Workshop model and strategies for successful implementation. After some trial and error, things began to run smoothly and students began picking up some of the new strategies and routines. The

process to achieve this level of success was definitely a learning process. Looking back, I realize now that I did not have enough background information on the ways that students learn mathematics, and what techniques actually hinder student understanding and retention on mathematical topics. If provided with more resources, support, and guidance, I feel as though I could have provided a less “rocky” start to using the workshop model in my classroom. The basic and foundational understanding I had beginning this project is now evident. I thought I was implementing every component of the workshop model, but really, I was essentially using bits and pieces from each component, which didn’t allow for the highest success rates to be reached. I was using the only knowledge I had to implement those pieces, when really, I should have been using the learning needs of my students to guide me.

Even though my professional development sessions are an introductory presentation on The Math Workshop model, it provides information to teachers who have not been exposed to any knowledge regarding this method. My project will benefit educators within my school, and potentially others within the district by sharing my project amongst other schools. This project will not only provide information on implementation, but it can also help sort out the ways in which we can use the resources we have available to us, like tools and manipulatives.

### **Summary**

Throughout my time of reading, researching, and analyzing information, I have learned a variety of new ideas and methods to teaching math through The Math Workshop model. I have also been enlightened on ways to successfully implement this method of teaching mathematics in my classroom, using strategies that my students will



understand and that make it manageable for me as the teacher. I have discovered many quality resources that provided me with knowledge to help answer my research question: *What are the necessary components of professional development to support second grade teachers in implementing math workshop?* Through my new learnings, I was able to develop a concrete amount of information that I can use to enhance my teaching, as well as educators around me.

This project has allowed me to learn how to best meet the needs of my students, as well as support my second grade team and other educators within my school building. I want students to be excited, engaged, and motivated to learn new math routines and concepts. With the implementation of The Math Workshop model, I know each of these components and my goals can be achieved.

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