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Incorporating Mathematics Stations Into The Current Curriculum

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INCORPORATING MATHEMATICS STATIONS INTO THE CURRENT CURRICULUM

By

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CHAPTER ONE

Introduction

Kindergarten is such a big step for students, families, and even teachers. The first day of kindergarten is always exciting and nerve-wracking. It may be these young learners' first time in a classroom. School opens their little eyes to so many opportunities, helping their brains grow a little at a time. Kindergartens are so loving and forgiving. They are also super flexible and always wanting to do what is right. They are willing to learn and take it all in no matter what is thrown at them. These little humans bring so much joy to everyone's lives.

Living in a pandemic has changed how school works for everyone. However, just like my colleagues and I say, "This is all that the kindergartens know, so they will be okay." Kindergartens across my district have been working so hard and learning so much despite this pandemic. Many changes have been thrown their way, but they are all still so positive. None of us thought that we would live and experience a pandemic. We all had to adjust and be flexible. Kindergartens have just been amazing throughout this all and continuing to strive for more.

I currently teach kindergarten and I love everything about it. I never thought I would teach kindergarten because I always worked with older students. When the opportunity came along, I took it and have never regretted my decision once. Every day is a new and exciting journey with these wondrous minds. This is why I chose to explore the research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

Overview

This chapter touches on my personal experience as a student along with my experience as a teacher. It discusses how my educational background impacts my current and future teaching. This chapter will also talk about my current curriculum and my thoughts around it along with the importance of math stations for young minds. It ends with my rationale around why math stations should be implemented in a kindergarten classroom.

My School Experience

Growing up in the Twin Cities, I had amazing teachers who I admired. Since I was a little girl, I always wanted to become a teacher until I got to middle school. This is probably why I am an elementary school teacher and not a content teacher. I remembered that my teachers were always loving and supportive of us all.

I attended a magnet school that focused on math and science, so all I remember from elementary school were those two subjects. Reading and writing were taught but that was not the main focus. Since math was a big content area, we were put into different groups and had a different teacher for math. In these math classes, we did not have small groups or even math stations. We did a lot of work as a whole group though. I remember playing fun games during math and practicing my multiplication facts in pairs or in groups. When we had time to work with other students, I learned my math the best because I was competitive. Looking back, I wished that small groups were implemented in my classroom. My math skills could have been improved with the support of my teacher. My teacher could have pushed me to think critically about math so I could have a better understanding of numbers. If math stations would have been implemented I would

have enjoyed math so much more. However, since math stations or small groups were not implemented, my skills and love for math were just as they were with whole group instruction.

As for my math skills, I would say that my math skills were up at the top of the class. I understood math and it came easily to me. Math was one of my favorite subjects until I got to college. I was supposed to pick up a minor in math so I completed all the calculus courses. However, I ended up dropping the minor in the end since the courses got complicated. Math was something that I could memorize and use correctly. I always liked helping other people in math and would not mind tutoring others in math. Math courses were always fun and intriguing because I performed well. I performed well so I want my students to perform well too.

My Teaching Experience

Teaching was not what I thought I was going to pursue in college or postgraduate. I thought I was going to go to law school and become a lawyer. I even took a Law School Admission Test (LSAT) preparatory class to get ready to take my LSAT. However, I graduated with my Bachelors of Arts in Sociology of Law, Criminology, and Deviance a semester early, so I decided to find a job to make some money before law school. I had a relative who worked at a charter school and they were hiring an educational assistant. I thought that since I was teaching Sunday school, I could help kids, too. I applied and got hired to work with two third grade classrooms.

Little did I know that my love for teaching and helping students would continue to grow. Many teachers thought that I had been working with students all my life. However, this was my first year working with students. Teaching came naturally to me and I never

knew. I thought I could never teach kids because I did not know how to make things understandable for them. However, I should have known since my mom and dad had both worked in the education field previously. I guess it runs in the family and now my sister and I both work in the education field. After working with these students for half a year, I moved to work with middle school students at a new school.

As time went on, I figured out that I wanted to be the teacher. I did not want to be an educational assistant anymore. I wanted to make a big impact on my own students and show them that anything is possible. This was the year I decided to start my teaching studies at Hamline University.

Hamline University always wanted what was best for their students and for them to be well-rounded students. I ended up doing a lot of field experience or clinicals with different and diverse schools. My student teaching was in the Mounds View School district. As a student teacher, I was placed in second grade. My cooperating teacher and I implemented math stations that aligned with the Everyday Mathematics curriculum. Students were very successful and we were able to reach all students during small groups. After earning my teaching degree in the winter of 2018, I decided to work with Teachers on Call to get experience with the different districts. Two months later, I was hired on as an Extension Teacher. This position was only for 4 months and I would need to find a new job. Fortunately, a full-time kindergarten teacher position opened up and I was offered this position.

I never thought I would teach kindergarten at all. My experience was always with third grade and up. I did not think I was qualified enough or know enough to nurture or teach kindergarteners. However, I decided to take on this challenge and I do not regret it

one bit. I have grown to love my kindergarteners so much. Their hearts and souls are so loving. Now I cannot see myself working with another grade.

As I went through my first year of teaching kindergarten, I followed the curriculum pretty closely since I was still learning. I asked my colleagues many questions because I wanted to perform well my first year. In math, we follow the activities we have to teach our students. Most of this curriculum is based on a whole group model since a lot of it involved verbal instructions. Kindergarteners use a lot of manipulatives to learn so they manipulate by themselves to practice. I followed the curriculum as best as I could and thought my students would perform well on our math Fastbridge testing. However, it came back with my students scoring lower than I expected. As I looked at my math teaching every day, I noticed that some of my students were falling behind and could not catch up to the current lessons. I had to pull them from playtime to work on some review even though I thought it was not the right thing to do. I know that playtime is extremely important to young minds. So as I pondered how I could incorporate math small groups or math stations, Covid-19 hit and we ended up going virtual.

Distance learning teaching is another kind of world. I am sure that many teachers will agree with me on this. Mathematics in the virtual classroom has been hard without all the manipulatives that students can use. Since we could not send manipulatives home, we had to use what we could. Students were given the option to move items virtually through Seesaw in order to have the feeling of using manipulatives. Many lessons are created for students to experience the feeling of manipulatives. However, it was just not the same for students without being able to feel and move it. Distance learning made it hard to work with students one on one. Most of the lessons were taught in a whole group

setting. Math stations or rotations is a really hard concept for virtual learning as well. However, creating opportunities for students to work on a few things based on their own preferences might be a step if we continue distance learning in the long run. Many educators like me believe that students need to learn in a variety of ways and pay attention to learning preferences in order to enhance students' learning (Bender, 2013). As a teacher, I am required to have small groups for reading. However, we have afternoon math groups that I dedicate to math or phonics. It is interchangeable depending on what the students need most. These math groups have been a great time for students to shine and build on their mathematical skills. I have seen my students able to perform better and understand math a little more than the curriculum itself. I want to be able to teach my students number sense because, in my opinion, if they are able to build a good number sense, they would be able to grasp some of the other math concepts better. These math small groups have been implemented by me since I saw a need for smaller group work. I definitely was not able to do this last year when I was in my classroom. This opened my eyes to all the opportunities that small groups can bring to my students.

Overall, throughout my educational career, I have had many instances of phenomenal math experiences that have leaned me towards finding what will work for my classroom. I am hoping to be able to try math stations with my students in person and see the success it has on my students in math.

Math Curriculum in Schools

The math curriculum in every district is different and unique to their students. In the past, I have worked with Envisions and Everyday Mathematics. The current curriculum that I am teaching is called Math Expressions.

Math Expressions has been a good curriculum with many great components. This curriculum has five core structures. The five core structures are quick practices, building concepts, math talks, student leaders, and helping the community. Quick practices have helped my students with building their fluency skills with numbers. The more practice the more proficient they all become with numbers.. Usually during our quick practice, we include a calendar to add a few more items. As for building concepts, Math Expressions believes in building key concepts in a spiral method. The spiraling method allows for exposure to a particular skill and brings it back for review in a later lesson. Math is a content where students build a foundation in order to learn more challenging math concepts. Math Expressions included this spiral method in their curriculum because they want students to remember what was learned to help with the new key concepts. The main concepts of the five units in Math Expressions always build on a specific big idea. It hits all Minnesota Standards and gives students time to review math concepts. Math Expressions always works hard to include student leaders in the classroom. In quick practices, students are leading it instead of the teacher. This provides students with time to be their own teachers. When students get to be a teacher, they build intrinsic motivation and end up learning so much more. My students always loved to volunteer during mathematics and show their knowledge to the whole class. Math Expressions also puts an emphasis on helping the community. The curriculum does this by creating lessons that bring mathematics into the real world. Students need to know how math works in the real world and how it can help the community. Math Expressions always wants the family to be involved and know what is going on in math. In order to do this, there are letters that can be sent home to families and activities that students can do at home. So

overall, Math Expressions's five concepts are well thought out and feasible for the classroom.

These five concepts are excellent but when one of my students falls behind, how am I able to reach them? These have been the struggles that I have faced in my first year of teaching. Math Expressions is a curriculum that just keeps going. There are not many days for review. Half of my students are able to grasp the concept and move on. However, I have a handful that cannot keep up with the curriculum. Some of them do not have a strong number sense so it takes them a while to understand the new concepts. Math Expressions spiral back and review a few things, but sometimes they repeat some things too many times. My students will ask me why we are doing it again and again. I understand that practice makes perfect but we do the same thing that there is not much meaning behind it anymore. Finding a balance between the current curriculum and time and space for those who need it is the focus I want to lean towards.

Importance of Small Groups

Small groups are the backbone of many teaching and learning strategies. I personally enjoy having them so that students and teachers get the opportunity to build rapport. It also gives students more individualized attention in many different subjects. Students always crave attention and this is the setting that will give them the opportunity. Small groups can also work on a variety of skills that only pertain to those students. This will provide a time to build on skills or reteach a skill that is needed. Small groups usually range from two to six students, depending on the comfort level of the teacher. However, these groups are implemented and done differently based on the preferences of the teacher too. I have seen the impact small groups have taken on my students this year,

particularly in math. They have learned to think about numbers differently and are still working to better their own math skills.

Many elementary classrooms implement small guided reading groups to help students grow in reading. These are usually based on students' reading levels since students can be on a variety of levels. Having students work with other students in the same groups provides them the chance to grow their reading skills. I have seen the positive effects of small guided reading groups for my students so I wanted to implement them in math as well.

Small groups can be a part of the math stations that students participate in. These groups will be focused, so that students will get the most out of it. Small groups can help increase opportunities for students to learn from one another which can result in enhanced instruction for a modern world (Bender, 2013). This is one of many math stations that will be offered to students. By creating a math small group based on skill, students will be able to develop their mathematical skills and be able to review skills they need more practice with. Overall, creating differentiated instruction for the students.

Rationale

In many elementary classrooms, math stations or rotations have been implemented. They provide students with many opportunities to learn differently and are not always fixed. Math stations have benefited a lot of students and I have seen the impact of them through my many years of working with students.

I do not have math stations in my current classroom and I would love to create and plan out math stations that can incorporate the current curriculum to increase students' math skills. I plan to revise the current kindergarten Math Expressions Unit One

to include math stations to meet the needs of all students. In the previous section, I mentioned that Math Expression is a curriculum that keeps ongoing one day after another without much review. This is detrimental to my struggling students. These students are not receiving the best instruction they can get. In teaching school, we are taught to focus on differentiation. Andreason and Hunt (2012) agrees that math stations are an effective way to deliver differentiation opportunities in a classroom environment.

Building relationships with students is one of the most important things. If your relationship with your students is solid, learning will come. Having time in small groups during math stations will provide teachers opportunities to build better relationships with their students. When in a whole group or big setting, students do not get enough individual attention. In a small group setting, it is easier to get to an individual level. Giving time to build a relationship with the student will provide a teacher insights about the students' academic skills. Small groups will give students a chance to get one-on-one feedback right away and give teachers a chance to review or teach new concepts to students. Teachers are also able to assess their students much closer as well.

Given the chance to have some choice and some variety is what students always crave. Oftentimes in the classroom, everything is instructed with a one-way street without much choice or variety. With math stations, students will be given a variety of things to do rather than concentrate on one thing the whole time. Especially with younger students, sitting and doing one thing for a long period of time is really hard for them. Having movement and variety will keep their brains moving and thinking. This will help their math skills flourish.

Creating meaningful and impactful mathematics stations for my kindergarten students is what I desire for this capstone project. Seeing my students thrive in mathematics will greatly increase their love for math and school. Not only will I create meaningful and impactful math stations, but lessons that incorporate these stations that fit well with the curriculum as well. My research or capstone project question is: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

Chapter Summary

In this chapter, I explained why I decided on my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?* I started off with an introduction to kindergarten. Next, I discussed my personal education as a student in elementary school and then on to my teaching experience. My teaching experience is the main reason for me researching what is the best for my students. Every day I am always brainstorming about what I can do to improve my students' learning. After my teaching experience discussion, I talk about the current mathematics curriculum and then the importance of small groups for math stations. I end with my rationale for my research question.

In conclusion, I hope to be able to research how to better my students using math stations and will continue my work into chapter two through four. In Chapter Two, the literature on mathematics stations is reviewed. The main topics that this chapter will touch on are young children's development, mathematical mindsets, whole group instruction versus small group instruction, description of math stations along with the benefits of math stations. In Chapter Three, the project description will be explained

along with the curriculum framework, the audience and setting, and my timelines for my capstone project. Lastly, in Chapter Four, a reflection and a conclusion will be discussed.

CHAPTER TWO

Literature Review

Introduction

Meeting the needs of students in a classroom setting has always been my top priority. One's strength might be in reading, writing, math, or another subject. Not everyone learns the same way or enjoys a certain subject. Our job as a teacher is to provide the best instruction and differentiation to meet the needs of all students. In reading, teachers have been implementing guided reading groups to help students' reading levels grow. However, in math, many classrooms do not implement math small groups to support students who are struggling. Small groups are implemented using math stations. The purpose of this capstone project is to show the importance of mathematics stations through my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

In the first section of this chapter, I will be discussing the significance of young children's development and understanding of mathematics. Children's development and understanding of mathematics brings light to why math stations are needed. This is followed by what kind of mathematical instructions are provided in a classroom. Mathematical instructions have changed over the years. Instructions are taught in a whole group or small group setting. These two types of instructions will be further discussed to see what the advantages and disadvantages are in the classroom. This will help inform why math stations should be implemented in the classrooms. Next, I explain what math stations are and how these stations will be set up in a classroom. Finally, I move on to

talk about the benefits or advantages of mathematical math stations for students. In this section, I will be diving into what math stations can provide for students. My literature review will help me think through further steps of how to complete my project as I answer my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

Young Children

Young children's development and understanding of mathematics are unique. They can be anywhere from toddlers to eleven or twelve years old. For this research, I will refer to young children from four to six years old. Young children, especially kindergarteners, are eager to learn. However, to better serve them, teachers must know how their brains develop and how they understand mathematics. In this section, the development of a young child is explained from the perspective of Jean Piaget, Lev Vygotsky, Howard Garner, and Richard Mayer. Lastly, the topic of young children's mathematical mindset and learning will be discussed.

Development

Human development can be categorized into physical development, personal development, social development, and cognitive development (Woolfolk, 2014). Young children's physical development is growing every day. Their personal development is building with time along with social development. Children's cognitive development is also growing and getting complex, too. Furthermore, a few psychologists have more to say about children's developments such as Jean Piaget, Lev Vygotsky, Howard Garner, and Richard Mayer.

Theory of Cognitive Development. Jean Piaget's theory of cognitive development emphasizes the different stages that humans go through. He points out that babies and adults are radically different, developmentally. He also points out that babies are smaller than adults, so their minds are small as well (Sutherland, 1992). Piaget believes that as humans grow, they pass through four stages in order. Piaget's stages are sensorimotor, preoperational, concrete operational, and formal operational (Woolfolk, 2014).

In the sensorimotor stage, children ages zero to two are seeing, hearing, moving, touching, tasting, and many other things (Woolfolk, 2014). They are developing the basics to get to the next stages of their cognitive development. During this stage, children develop object permanence where they only know that objects exist if it is in front of them. If an object is taken from their sight, the object does not exist anymore. Much of this stage involves action schemes. In this stage, as children develop more, they should be able to have goal-directed actions. Goal-directed actions happen when a child's brain can create a small goal and take steps to reach it (Woolfolk, 2014). This is the stage that a child is unable to speak or talk, thus most of the mental world is towards doing (Sutherland, 1992).

When children have reached this goal-directed action, they slowly move onto the preoperational stage. The preoperational stage begins when the child starts to talk and uses language or symbols to represent objects. Children use language and symbols in the present and only in one direction (Woolfolk, 2014). This thought of using language and symbols often refer to symbolic representation. Piaget says that this stage is dominated by action. Children at this age are now able to internalize the action. Another development

in this stage is children starting to use more language. They often ask questions such as, "Why?" then "What?" (Sutherland, 1992). At this stage, children do not understand the point of view of another person. Children at this stage can only think things through but cannot physically put action to it. As children move along this stage to the next, they struggle with reversible thinking. Reversible thinking involves thinking backward, from the end to the beginning (Woolfolk, 2014). One example is in mathematics; students are still unable to understand that five plus three is the same as three plus five. Also, having the equal sign in the beginning of the equation is confusing because it is not common practice. Reversible thinking is that of transductive reasoning. Children are unable to correlate the meaning between events which makes everything a one way street (Sutherland, 1992). Once children can think backward and know that things can be changed or transformed but are still their original characteristics, children have moved to concrete-operational thinking.

The concrete-operational stage usually starts in first grade and they can logically think about hands-on problems. Children can understand the past, present, and future (Woolfolk, 2014). A big part of this stage is that children are able to hold an idea in their head while dealing with a problem. However, they are unable to do this mentally and will need the elements to be physical such as blocks or counters for math (Sutherland, 1992). This is the stage that students can build on the basic knowledge in math and use it. They are able to use reversible thinking at this time too (Woolfolk, 2014). Children should also understand the conversation of numbers, which is when students realize that five pencils in a group is the same as five pencils spread out. Piaget believes that children should

know this by age seven (Sutherland, 1992). The last stage is the formal operational stage that is usually from adolescence to adulthood.

The formal operational stage involves hypothetical and deductive reasoning. This stage is the stage where a lot of higher-order thinking skills are used and complex mathematical concepts and skills are introduced (Woolfolk, 2014). Adults would reason logically without concrete objects. Sutherland (1992) mentions that the formal operational stage is hypothetico-deductive, which means that adults are able to think of new ideas, try it out mentally, and then test it. Many perspectives and views are considered at this stage and one does concern themselves with social issues, identity, and justice issues (Woolfolk, 2014).

Piaget's cognitive development explains how a human develops cognitively and how that affects one person. He believed that teachers should listen and pay attention to their student's way of solving problems in order to help guide them. He also thinks that people construct their own understanding by being actively engaging with the material. Students need to interact with teachers and other students to get themselves thinking (Woolfolk, 2014). Piaget's theory of cognitive development brings out the importance of the environment. A safe environment is a place that provides the students time to develop and grow (Sutherland, 1992). Teachers often try to provide a safe learning space for students for the best learning possible. Therefore, paying close attention to the level of cognitive development of a student will help a teacher with instruction.

Sociocultural Theory. Lev Vygotsky believed that human activities must be acknowledged in their cultural or social setting. The cognitive development of a human can be detected in interactions with others along with the tools of language and culture.

He also presses on the idea that development appears in the interactions between people and then inside the person. Vygotsky was a major spokesperson for sociocultural theory. Sociocultural theory emphasizes the fact that cooperative dialogues between children and more knowledgeable people shape cognitive development. While Vygotsky believes in the interaction of children and knowledgeable people, Piaget believed that peer-to-peer interactions challenge each other's thinking (Woolfolk, 2014). Vygotsky also believed that ongoing qualitative changes in the environment individually helps with new developmental milestones. He says that a child's social development starts with the people's interaction level and then moves on to an individual's inside. Cultural influences also affect an individual (Salkind, 2004). Thus, social interaction and culture influences development.

Vygotsky also believes that the best learning happens in an area called the zone of proximal development. The zone of proximal development is an area between what a child can do independently and the level that a child could achieve with adult guidance (Salkind, 2004). Vygotsky's zone of proximal development is a place for teachers to stretch a child's skills. In a typical elementary classroom, guided reading groups use this notion of the zone of proximal development. A group of children reads at an independent level B; however, the teacher will use a C leveled book to teach the guided reading group. When students are reading and receiving direct feedback and guidance, students will become better readers (Oostdam et al., 2015). Receiving instant feedback and guidance helps students to do better in any subject. Thus, reading is not the only subject that providing small groups can benefit from. Vygotsky's theory suggests that teachers guide and assist students in learning, such as scaffolding. Scaffolding is providing the support

that allows students to grow into independent learners (Woolfolk, 2014). Thus, implementing student and teacher interactions will help students achieve in school.

Theory of Multiple Intelligence. Howard Gardner was a psychologist who developed the theory of multiple intelligences. Gardner refers to intelligence as a capacity that processes certain kinds of information which comes from human biology and psychology. Intelligence has the ability to solve problems or fashion products. Gardner viewed the theory of multiple intelligence as a divergence from the traditional points of view of an intelligence quotient (IQ) test. Intelligence is not just based on answering correct questions, but rather on one's biological origins of each problem solving skill (Gardner, 2008). The theory of multiple intelligences suggests that there are eight different abilities. Gardner says that a human being has their strengths and their weaknesses. These eight intelligences are logical-mathematical, linguist, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist (Woolfolk, 2014). However, Gardner (2008) does believe that one person requires a combination of intelligences. One example he gave was that someone who is exceptional in violin has musical intelligence. Even so, this violin player must also have bodily-kinesthetic dexterity and intrapersonal intelligence to relate to an audience. Gardner's advice for teachers is for teachers to look at the students' differences and differentiate instruction based on it. The second piece of advice is for teachers to always teach things in several appropriate ways. Students learn in many ways and understand things at different rates (Woolfolk, 2014). Gardner (2008) believes that no two individuals have the same exact intellectual profiles. Therefore, teaching students should not just be one way but in multiple ways to reach all students.

Visualizer and Verbalizer. Richard Mayer and Laura Massa (2003) suggest learning style of the visualizer-verbalizer dimension. They believe that there is a distinction between visual and verbal learners. The results indicated that the visualizer-verbalizer dimension is multifaceted. There are three facets of this dimension, which are cognitive spatial ability, cognitive style, and learning preferences. Through Mayer and Massa's (2003) research, they found out that there is a distinct factor from learning preference to cognitive styles. Cognitive ability can have a high spatial ability or low spatial ability. Those with high spatial ability in the cognitive ability facet have good abilities to create, remember, and manipulate images and spatial information. As for the cognitive styles, there is either a visualizer or a verbalizer learner. A visualizer in this facet thinks using images and visual information while a verbalizer thinks using words and verbal information. The third facet is learning preference with a visual or a verbal learner. A visual learner in this facet prefers instruction using pictures while a verbal learner prefers instruction using words (Woolfolk, 2014). Learning styles can be accommodated, but younger learners may not be the best judge of their own learning style. Some may choose the easiest and most comfortable route while some learners choose the route they just know. In brief, knowing your students' learning styles or preferences can help with learning in many ways.

Overview of Development. All learners develop at a different pace. There are cognitive developments that students may fall into. However, every learner is unique and may grow a lot more than what is presented. Piaget brings in the importance of peer-to-peer interaction for learning while Vygotsky believes in the interaction between the learner and a knowledgeable person or teacher (Woolfolk, 2014). Both of these

interactions are important to any learner, creating the ability to be successful and understand all concepts (Woolkfolk). Math stations involve peer-to-peer interaction along with interaction with a knowledgeable person which would help with understanding. Students learn differently, so teachers should provide a variety of learning opportunities based on their cognitive abilities. Gardner believes that every human being is born with a gift or intelligence. A child might be gifted in spatial learning while one is gifted in music (Woolfolk, 2014). Every child is gifted, so teachers should not teach one way only but be wary of how to differentiate for all students. Small groups during math stations would allow for differentiation for students. Children may be more of a visual or verbal learner according to Mayer and Massa (2003). Using multiple lenses or visual and verbal would give students access to knowledge. Providing opportunities for this through mathematical stations would greatly impact learning. There are different levels of cognitive abilities among children. Teachers need to understand the different levels so they are better informed of how and what to teach. Overall, a child's cognitive development is super important to how lessons are planned and implemented within a classroom.

Learning Mathematics

Mathematics is already informally developed in young children, according to research (Lee &Ginsburg, 2007). Human brains can grow, adapt, and change. Synapses fire when one is learning; however, it is not only in the classroom but learning happens everywhere (Boaler & Dweck, 2016). The general population think children are unable to learn certain mathematical concepts; however, there are many researchers that have evidence that young children are capable of learning a wider range of mathematical concepts. Young learners can and are ready to learn stimulating and challenging math,

this learning does not need to be limited to concrete but abstract concepts, too (Lee & Ginsburg, 2009). In the later paragraphs, mathematical growth mindsets and how students learn or think of math will be discussed.

A growth mindset is often described as believing that one can and will develop based on hard work and perseverance. Young children are often taught about growth mindset for subjects such as reading and writing. However, a mathematical growth mindset has been relatively new. As Boaler and Dweck (2016) quoted, "The fixed mindsets that many people hold about mathematics often combine with other negative beliefs about mathematics, to devastating effect" (p. viii). Many children think that they are either good at math or horrible at it. Mathematics has ruined students' spirits, and many adults are traumatized by their math experience. Hence, adults who have been traumatized have negative feelings towards mathematics. Boaler and Dweck (2016) bring up a story about a woman named Jane Garvey at BBC, who was scared to interview them since she was terrible at math and scared of math altogether. Garvey also told her two daughters that she was bad at math in school, which according to Boaler and Dweck (2016), is something you should never do. Other adults may also have been devastated by math experiences in schools. All students, especially young children, should be taught mathematics in a way that is not traumatizing to them. Boaler and Dweck (2016) say, "No one is born knowing math, and no one is born lacking the ability to learn math" (p. 5). Everyone's brain is different and learns differently; however, the brain growth experiences are much more important. Boaler and Dweck (2016) also point out, "A lot of scientific evidence suggests that the difference between those who succeed and those who don't is not the brains they were born with, but their approach to life, the messages they

receive about their potential, and the opportunities they have to learn" (p. 5). Many studies have shown that when students' mindset shifts from fixed to growth, their learning becomes a lot more positive and successful. Students who have a growth mindset are said to have a positive brain activity when mistakes do happen. When those with a growth mindset take on a hard task, they think of it as a challenge and motivation to do better. Thus, the highest-achieving students are those with a growth mindset and they perform better than other students by more than a year of mathematics (Boaler & Dweck, 2016).

Young children think that math is a performance subject rather than appreciating the beauty of mathematics, asking deep questions, exploring connections, and how math can be applied to other things in life. Students think that mathematics class is just to show how well they can do in this subject (Boaler & Dweck, 2016). A growth mindset does play a role in this thinking. As Boaler and Dweck (2016) have put it, mathematics is a set of ideas, connections, and relationships about the real world. While using math, there are patterns that emerge and as we understand them, it helps us develop new and powerful knowledge. Children should grow up understanding the beauty of mathematics. However, most students' joy and fascination with mathematics are replaced by dread and dislike when all that is taught is a dry set of methods and they are just told to accept and remember (Boaler & Dweck, 2016). Teachers often teach one-to-one correspondence, counting, and numbers, along with naming and sorting shapes. However, children are much more capable of learning complex concepts (Lee & Ginsburg, 2009). From birth to age five, young children often develop informal concepts of more and less, taking away shapes, size, location, pattern, and position. These informal thoughts are developed

everyday usually without direct instruction (Ginsburg et al., 1993). Children begin to use math symbols, like addition and subtraction, at a young age. However, special written symbols are the hardest form of language for children to learn and understand (Lee & Ginsburg). For many students, math is confusing and the methods do not make sense. Eventually, this turns into students having a strong belief that mathematics is simply following instructions and rules. Boaler and Dweck (2016) state, “When students see math as a broad landscape of unexplored puzzles in which they can wander around, asking questions and thinking about relationships, they understand that their role is thinking, sense-making, and growing” (p. 34). Students and adults would be much more engaged when there is an open-ended problem and allowed to work through with methods and pathways. Problems that require a calculation and answer do not help students' reasoning skills in math. Reasoning through a problem helps students think through using their own knowledge which helps to build on their math skills. Teachers agree that young students should engage in mathematical learning in a fun and playful way that uses the natural interest of students (Lee & Ginsburg, 2007). A vast majority of children, about 95%, can and are able to understand and grasp mathematical ideas. Nevertheless, adult guidance and instruction are crucial to building a structure and foundation for a child’s mathematical background (Lee & Ginsburg, 2009).

In conclusion, a child’s mindset and understanding of the beauty of mathematics play a big role in their educational life. Building a growth mindset for mathematics will help students understand the beauty of mathematics and succeed in many other aspects of their lives. Some have had good or bad experiences, and this has affected the way they perceive mathematics. Creating a community of learners where math is enjoyable and

understandable involves having math stations. Math stations will help with creating a math growth mindset. By building a growth mindset and teaching that mathematics is not a performing subject, students will appreciate the beauty of math. This will hopefully lead to understanding the importance of mathematics. The next subtopic will discuss the types of mathematics instruction in mainstream classrooms and how that affects students.

Mathematics Instruction

Instruction in a classroom varies from teacher to teacher. A teacher might prefer whole class instruction while one teacher prefers a quick mini-lesson and small groups. Either instructional model has its advantages and disadvantages. Instruction involves a lot of differentiation since students come from all walks of life. Teachers are taught to differentiate the lesson so that every child is able to access the knowledge or information taught. Differentiation looks different in whole group instruction and small group instruction. In this section we will be talking about the advantages and disadvantages of whole group instruction and small group instruction.

Whole Group Instruction

Whole group instruction has been the model that is presented as the base for teaching manuals in many mathematical curriculums. This type of instruction is considered the traditional method of instruction that is still used daily. Whole group instruction can sometimes be referred to as direct lessons or instruction. According to Bender (2013), direct lessons or whole group instruction has about six parts. The first part of this instruction is an orientation to the lesson. At this stage, the teacher relates the lesson today to the content taught previously. Teachers will use questions to activate students' thinking at this point. Next is the initial instruction, where the teacher will lead

to complete many sample problems, model how to complete the problem, and point out the difficulty of the problem. The next part is for teacher-guided practice. During teacher-guided practice, students will get the opportunity to practice problems in class. Teachers will monitor students' completion and assist those who are in need. Students may also discuss the problem with each other for further understanding. Then, after students have been successful, the teacher will send students to do independent practice. Independent practice gives students a chance to practice without much assistance so that they are able to make mistakes and learn from them. After completing independent practice, the teacher will check on student performance on independent work. This gives the teacher information to let them know if reteaching is needed. The last step is only necessary if the teacher feels that reteaching is needed (Bender, 2013). Teachers may see a pattern in students' independent work that may require reteaching. These six steps are what most whole group instruction follows and what is in today's classrooms.

Whole group instructions have many benefits and advantages. This instructional plan was designed to maximize instruction time or time students get to engage with each other using the content. It is also believed that since all students are being taught the same content, all students are learning and acquiring the same knowledge (Bender, 2013). Whole group instruction gives teachers the chance to increase opportunities for student participation, engagement, and self-evaluation. When these things are implemented effectively, there are high rates of opportunities to respond, high-probability requests, and choices for students to make. It also helps students to feel like they belong in that classroom since they are able to have multiple peer interactions and be active participants in discussions. Aside from these few things that teachers can implement to make whole

group instruction effective, teachers should find ways to question all students. This helps to promote student interest, activate prior knowledge, and improves understanding of the content (Nagro et al., 2016). Whole group instruction was found to be less traumatic to students because they were not categorized into groups and labeled by their peers. Students catch on quickly and notice how they are grouped, which could lower their self-esteem in mathematics. Actively teaching and effective classroom management of whole group instruction helps with less management problems in the classroom as well (Eaton, 1988). The less management problems, the more time for instruction and learning for students. As DiCarlo (2012) says, "Whole group instruction has been shown to increase a sense of community in the classroom" (p. 154). The feeling of belonging for students is a big part of how students will perform in a classroom setting. Overall, there are advantages to whole group instruction for students.

The disadvantages of whole group instruction are more prevalent in many studies and articles. One of the biggest disadvantages of whole group instruction is that it assumes that all students' background knowledge, learning styles and abilities are relatively the same (Bender, 2013). However, in the current society, teachers know that students come from all diverse backgrounds and that teachers will need to differentiate in order to provide the best instruction for all students. It is noted that in an average size classroom, there are a number of advanced students, as well as those performing below grade level. During a whole group instruction, advanced students are often bored since many of them may already have mastered the mathematical skills prior to the teacher teaching it. For students who are performing lower, this instruction often fails to engage these students because they usually lack the prerequisite skills to engage. Since the

concepts are new and these students do not have the skills beforehand, some of the students can display off task or disruptive behaviors. Since these students are distracted, they are not learning and engaged with the lesson. The whole group instruction is considered more of an authoritarian approach and does not give students an opportunity for peer-mediated learning (Bender, 2013). Students need time to engage with other students and get personal attention. As Eaton (1988) points out, large group settings lack the attention needed for an individual. Teachers are unable to work closely with students and provide feedback that will help with learning new concepts. Thus, many students fall behind or are disengaged since whole group instruction assumes all students are at the same level of learning (Eaton, 1988). In turn, it does not help students succeed in mathematics.

Overall, whole group instruction has advantages and disadvantages. Some advantages of the whole group range from less classroom management to building a community in a classroom to providing less traumatic experiences for students. A few disadvantages are that students come from a variety of academic backgrounds which makes whole group instruction boring, along with whole group instruction not providing individual attention and not meeting the needs of all students. Traditional ways of teaching involve direct instruction assuming all students are around the same academic level (Bender, 2013). However, in the current society, students need much more than just whole group instruction to meet their needs. Later on, mixed instruction will explain how differentiation will work with whole group instruction in an effective way.

Small-Group Instruction

Math classrooms do not commonly structure time for small group instruction. Guided reading groups are a form of small group instruction that many have implemented in their classrooms. During guided reading groups, teachers group students based on their reading levels and meet one group after another. Guided reading groups are a form of small group instruction. Small group instructions are often done during reading since it has been proven to enhance students' reading skills. Small group instruction is when teachers group students based on their skill or learning abilities to give more direct support to the students (Nagro et al., 2016). Advantages and disadvantages of small group instruction will be discussed below.

Small group instruction has been a big advantage for many classrooms. One of the big reasons for this is for teachers to be able to reach all students' needs since the student population is diverse. Students were found to be more productive since they are in their ability groups. Eaton (1988) says "Ability grouped instruction was also found to be very productive because management problems of multiple ability groups were held to a minimum or were even overcome" (p. 9). When students are productive, they are learning and being engaged with the content. Small group instruction also provides students with a more individualized learning experience (Clarke, 2020). Students often seek attention and in small groups, teachers are able to provide this attention to students. Small group instruction also provides teachers with information about students and their learning. This is a way for teachers to be able to informally assess their students in a classroom. A study was conducted to see how small group instruction and whole group instruction affect students, below is what Benders and Craft (2016) found:

> The pre-test and post-test results suggest tremendous growth in student achievement. The data from the pre-test shows that all 11 students scored below mastery level with a mean average of 24.5% and median score of 30%. The post-test results indicated an increase in student growth to an average score of 90.9% and mode score of 100%. According to the post-test, 6 students reached "Mastered" level while 5 are considered to be in the "In Progress" level. The below-level benefited far more from small group instruction than from whole-class teaching. (p. 6)

This study did show that small group instruction helped students more than whole-class teaching. Small group instruction does not need to be rigid but can be flexible in order to reach all students. Groups help students improve their understanding of math concepts and lets students ask questions while in the group. Students are also able to have a smaller space where their voices can be heard and for them to feel comfortable enough to talk and engage with others. Providing a space for engagement for students allows them to discuss different strategies for solving problems. Talking and explaining strategies help students to make connections between mathematical processes and their understanding of the world. Thus, providing small group instruction has a lot of advantages for students and teachers.

Small group instruction does carry a few disadvantages. One of the main disadvantages of small group instruction is classroom management. Managing other students while having small groups can be challenging. Many teachers are discouraged from forming small instructional groups for math because of the minimal supervision for the other students. Teachers need to have some degree of faith in order to do this type of

teaching (Bender, 2013). Another disadvantage of small group instruction is the trauma it can give students. Students sometimes can figure out that their group performs lower than others. This can lower their self esteem in mathematics. Another challenge is that teachers will need to plan small groups along with other things for students, which could demand additional planning time (Bender, 2013). Taking time out of the day to plan for small group instruction is not an easy task. Thus, these are the disadvantages of small group instruction.

In conclusion, small group instruction has advantages and disadvantages. The advantages of small group instruction range from individual attention to meeting the needs of students to providing a safe space to engage (Craft, 2016). Disadvantages were more on the end of teachers needing to manage students and taking time to plan for small group instruction (Bender, 2013). As discussed above, advantages of small group instruction seem to outweigh disadvantages. Math stations involve small groups that would help students with understanding and would help with differentiation. However, the decision is up to the teacher to make in order to better teach their students. The next section will further talk about what mathematics stations are and it can be set up in a classroom.

Mathematics Stations

Mathematics stations are rotating stations that teachers can use in a classroom. Teachers are the experts who choose if they implement math stations or not. However, teachers are aware that some students need more time to learn and practice while others are ready to move on. Mathematics stations provide many opportunities for students to explore and further their understanding of a concept or skill. In this section, mathematics

stations will be explained along with how to set up mathematics stations in a classroom. Math stations can vary from a few to many stations based on the preference of the teacher.

Math Stations

Math stations are an approach to help differentiate practice and assessment opportunities to reach every student in the classroom. Differentiation helps students to access the curriculum by giving entry points, learning tasks, and outcomes that match students' learning styles and abilities (Andreasen & Hunt, 2012). Math stations allow teachers to instruct and assist small groups of students, which is the most effective classroom organization for teaching and learning according to Hilbery et al. (2003). Hilbery (2003) says that four outcomes of activity centers are fairness, harmony, inclusion, and academic excellence. Fairness refers to creating opportunities for assistance from teachers and peers along with instruction for all using conversations and collaboration. Harmony is where collaboration is happening peacefully with peers on a shared product. Inclusion is the act of including everyone which will help increase participation from students. Lastly, academic excellence is achieved since instruction is relevant and meaningful, there are opportunities for engagement using academic language, and instruction is challenging which helps students advance in understanding. Hilbery et al. (2003) also says that there are three reasons for centers. The first reason is that teachers use the most effective strategies to increase learning opportunities for all students. Second is that activity centers help promote the use, elaboration, and application of academic concepts to help better students' understanding. The last reason is that these

centers encourage participation, collaboration, and extended reading, writing and speaking using academic language. Hilbery et al. (2003) states:

> The goal of reorganizing a classroom into activity centers is to allow the teacher to provide the highest quality instruction to a small group of students, while other students work productively, independently, and cooperatively in a variety of interconnected tasks at other activity centers. (p. 2)

During math stations or centers, students shift from one station to another, getting the chance to complete all stations. Students participate in meaningful activities while teachers assess students and provide assistance when needed (Hilber et al., 2003).

Setting Up Math Stations

Math stations can be set up in a classroom in many ways. According to Hilbery et al. (2003), there are five phases for setting up math stations. Phase one focuses on opening and closing instruction along with a whole group instruction. This phase works on building up values, classroom management, and routines. Students are working on follow up activity with the teacher floating around. Phase two is where the teacher will have two to five stations while the teacher assists one station without students interrupting. This phase works on students being independent in the stations without much assistance from the teacher. Phase three is where students have been working successfully in the stations with smooth transitions. This phase is where the teacher will provide more feedback for students. Phase four is focused on academic content where the teacher will work with students on conversations using academic vocabulary. Phase five is where the teacher has a guided small group with everything else running well. These five phases are starting small and building up. M.E. King-Sears (2007) also believes in

starting out stations with only a few stations and builds it up. Both believe that teachers should focus on content that has been taught and the content that will be taught. This way it provides students practice, exploration, building on, and time to review. When setting up math stations, there needs to be values, routines, and classroom management built in to make it successful for all (Hilbery et al., 2003). Math stations can consist of small groups, individual practice, group work, math games, math technology, and many more. Overall, math stations can be set up in many ways, but the teacher makes the best judgement to see what works for them. The next section will go into detail of the benefits of implementing math stations in a classroom.

Benefits of Math Stations

Mathematical stations can benefit all children. Children are used to the traditional whole group instruction. However, mathematics stations give children a different approach to learning. In this section I will describe the advantages of having math stations in a classroom. I will start with how mathematics stations can incorporate differentiation for all students. Afterwards, I will talk about how movement is important to a child's development and learning. Next, I will touch on the advantages of providing students with time for peer support and collaboration. Last, I will talk about the importance of independent work. Group work and independent work are essential for learning in a classroom setting.

Differentiation

Math stations provide teachers with the chance to differentiate for their students. Differentiation has always been a huge part of instruction in the mainstream classroom. This is the process in which teachers get to review, challenge, and teach new learning by

matching students' learning needs to it. Andreasen and Hunt (2012) point, "Differentiated instruction allows all students to access the same classroom curriculum by providing entry points, learning tasks, and outcomes that are tailored to students' needs" (p. 240). Students come from many different backgrounds and so teaching everyone the same thing and expecting all students to absorb the same information is not ideal. According to Andreasen and Hunt (2012), there are three different types of differentiation. One is process differentiation where the teacher provides many ways for students to understand the teaching point during practice, instruction, and assessment. Another is content differentiation where multiple interpretations of the content are being taught to give access to all students. The last type of differentiation is called product differentiation, where students are offered alternative ways of demonstrating what they learned and know. Encompassing all three kinds of differentiation in a classroom would be the ideal instruction (Andreasen & Hunt, 2012). Thus, providing many chances for differentiation during math stations will allow students to learn and grow throughout the year.

Movement

Math stations allow movement for students during the day. Mainstream classroom instruction consists of sitting and listening to the teacher which does not provide much movement. Children ages three to five should be physically active throughout the day. Ages six to seventeen should have about sixty minutes of physical activity a day. Moving more and sitting less has many benefits for everyone. Physical activities foster growth and development, along with making people feel, function, and sleep better. It also helps with reducing the risk of many chronic diseases (Piercy et al, 2018). Involving movement into a classroom can bring joy and happiness for many. In the study of McMullen and the

other colleagues (2019), students expressed happiness and being active when movements were incorporated into the lesson. Many were able to remember what they learned because of the fun movements involved. Children in this study positively perceived movement integration and wanted more. Many said it was fun, provided time to learn, and gave them exercises throughout the day (Piercy et al., 2018). Math stations can involve movement within the station; however, when students are moving from one station to the next, they are receiving movements they would not get in a mainstream classroom. Overall, providing movement benefits students and math stations will provide that movement needed for learning.

Peer Support and Collaboration

Peer support and collaborations are a big part of math stations that benefit the students in many ways. The saying that two minds are always better than one runs true in the classroom. Students, especially young children, love to talk and communicate with their peers. So why not provide them the time and space for them to do that and learn at the same time? Peer support and collaboration is also known as cooperative learning. Cooperative learning happens when pupils work together in a small group to help each other learn. Cooperative learning helps to improve learning, interpersonal relationships, psychological health and social competence (Jolliffe, 2007). This type of learning involves the social aspects of students. Students' social and academic lives should be important and things should be set in place to address both in tandem (Harris & Meltzer, 2015). In all, peer support, collaboration, and cooperative learning are beneficial to students.

Independence

Math stations include practicing independence, which has benefited students for decades. As Raeff (2006) refers, “Independence has been used to refer to aspects of human functioning that involve being a physically and mentally separate individual” (p. 524). Most of the time, teachers want students to practice independently to prove that they understand and can apply what they have learned that day. This is used to help with reteaching or simply reviewing for further learning. However, sometimes students are too dependent on teachers and parents they do not trust themselves. Independence teaches students to take risks and adventure a little (Williams, 2013). Teachers teach independence to help students with skills that can be used lifelong. Overall, independence plays a big role in math stations that can be used as a lifelong skill. The next section will talk about the implication of the literature review as a whole.

Implication

Math stations play a crucial role in how differentiation is implemented during the math block. To understand why mathematics stations are important for students, we need to know about how a child develops and understands math along with what type of instruction is needed for success, what math stations are, and what benefits do students gain from math stations. These topics bring me closer to answering my research questions: *How can mathematical stations be incorporated into the current curriculum and increase students’ math skills in a kindergarten classroom?*

Every child develops physically, mentally, and socially at different rates. Some children are not able to use reversible thinking while some children are able to understand that two plus one is the same as one plus two. A child also needs peer to peer interaction along with interactions with teachers. This provides students a chance to be engaged with

the material along with being challenged by an expert. Math stations provide students with small groups to address the different levels of cognitive development as well as provide interactions throughout the math stations. Cognitive development is important as well as sociocultural development. Students need to be social and interact with the material at hand. By interacting with the materials, students are able to grasp the concept and apply it. Math stations give students the opportunity to be social with other students as well as the teacher during small groups. We also know that children are unique and different from one another, and that could mean that children might have a higher intelligence for one thing than another. This means that we should not teach everything in the same way all the time and provide a diversity of instruction or stations for students to use their intelligence. We also need to provide a variety for students so they are able to grasp the concepts being taught. Aside from different intelligences, some students are more verbal learners than visual ones. If we are consistently providing only verbal instruction, students such as English language learners will struggle since they need the visual piece to learn. Math stations provide for a variety of verbal and visual learning that will help to meet the needs of all students. As teachers we need to know where our students are developmentally in order to meet their needs in a classroom. Thus, math stations take into account how students develop physically, mentally, and socially.

Students need to build up their growth mindset in math, but this will rest on the environment and type of instruction given. Students are usually taught in a setting of whole group instruction with independent work to follow. For students, this is boring and rote. In order to really understand and grasp a new concept, students need a safe environment that will allow them to learn. Students need affirmation that math is not all

about memorization, but understanding what they are learning on a deeper level. Math stations provide students with a chance to experience different stations that will enhance their knowledge of a new concept. A quick mini-lesson followed by creative and innovative stations is much more effective than a whole group lesson with independent practice. In short, to build a growth mindset, teachers need to be intentional about the instruction and lesson planning.

Mathematics stations are stations that provide students with a chance to learn in a diverse way. They can consist of small groups, group work, math games, art, technology, independent work and many more. Math stations provide differentiation that students need because of the wide range of learning abilities. Differentiated instruction is a big part of teaching. Often, teachers are asked how they differentiate a lesson. When implementing math stations, teachers are able to group students by skill or other areas to differentiate along with what kinds of activities are appropriate for which group of students. Aside from differentiation, math stations provide movement for students. Students are used to moving very little because of the strict expectations in a classroom. However, with younger students, movement is important for learning. As mentioned earlier, peer support and collaboration will be included in these stations. Teachers understand the importance of this to build a community of learners and be engaged in materials. Lastly, having a chance to be independent and practicing provides students with assurance that they understand a skill or to show the teacher if something needs to be retaught. Overall, this literature review combines the concepts of development in young children, growth mindsets, best instructional practices, math stations, and benefits of math stations to help guide me in answering my research question: *How can*

mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?

Chapter Summary

This chapter outlines the literature that helps guide me to answer my research questions: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?* It started off with discussing the development of young children who have a unique cognitive development. By understanding where each student is developmentally it will lead to better instruction for students. Knowing students develop differently, teachers need to differentiate by using mathematical stations to reach all students. After this section, mathematical instruction was brought up using whole group and small group instruction. Whole group instruction is important to deliver information to students but is not ideal for differentiation. Small group instruction involves more work but meets the needs of students. Using a combination of both is ideal for a classroom. A combination of both will involve having a whole group mini lesson followed by small groups which are mathematical stations to support the objective. After this section, the benefits of mathematical stations were addressed. Mathematical stations provide differentiation, movement, peer support or collaboration, and independence. This literature review has brought forward the importance of implementing mathematical stations into the classroom.

In Chapter Three, I will use my literature review to summarize what my project will entail. I will provide a description of my project, a timeline, my intended audience, and setting. There will be a more in depth discussion of my project in detail.

CHAPTER THREE

Project Description

Introduction

As a fairly new teacher in a kindergarten classroom, I have found a few things that are missing. One of the first is how closely we follow our math curriculum that we are unable to help differentiate for our students. This is the reason why I decided to write my capstone about math stations. My final goal for my project is to be able to implement mathematics stations into my classroom. Thus addressing my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

This chapter will begin with an overview of my project followed by the framework I followed to design my project. The framework is important to know and follow to be accurate and efficient. Next, I will explain my project's setting and audience since it is essential to my research question. Then I will go into details of my project to explain how I created these lessons. Afterward, I will provide a timeline of how I completed my project. Lastly, I will end with a conclusion to close out Chapter Three.

Project Overview

My capstone project is to revise the Math Expression curriculum by incorporating math stations to fit. Math stations have been implemented in many classrooms. However, it has not been implemented in my school since we follow the Math Expressions curriculum where math stations are not used. Many educators have been asked to differentiate for all students since we know that every student is unique. To differentiate, math stations will be designed to meet the needs of the students. My lessons incorporate math stations to boost the new concept and differentiate for all students. The next section will go into detail about what research paradigm or framework I used to complete my project.

Curriculum Framework

The curriculum framework I followed to create my four-week lessons is called Understanding by Design (UbD) by Grant Wiggins and Jay McTighe. Understanding by Design (UbD) is big on developing and deepening a student's understanding. There are three stages that UbD uses to create a curriculum. The first stage is identifying desired results, followed by Stage Two which is determining acceptable evidence, and Stage Three is planning learning experience and instruction accordingly. UbD emphasizes the backward design since the most successful teacher starts with the learning outcome and evidence that proves learning has occurred. While designing the curriculum, UbD wants us to keep in mind the expectations, instruction, learning activities, assessment, and sequence and coherence (Wiggins & McTighe, 2011).

Stage One is clarifying and identifying desired results which includes two components. The first component of stage one is the transfer of knowledge. Students who are able to transfer their knowledge from one thing to another are more successful than

rote knowledge. The second component is meaning, which consists of understanding and essential questioning. Wiggins and McTighe (2011) say that understanding is thought about reflecting and analyzing one's learning. Essential questions help students to dig deeper and learn more. Teachers should know what they want their students to understand and what questions they should have after the lesson.

Stage Two emphasizes determining needed evidence to know if students have met the identified knowledge, skills, and understanding of stage one. This stage involves assessments teachers will need to select or develop tasks to know if students demonstrated understanding of stage one. Wiggins and McTighe (2011) say an evaluative criterion is needed for these assessments to judge students' responses. Aside from the main assessments, there are other assessments that teachers can use as evidence. Understanding by Design emphasizes that these summative assessments are not the ultimate determination of students' understanding and achievement. The long-term goal is always a transfer of knowledge and not specific answers or tasks done at one time (Wiggins & McTighe, 2011). Thus, assessments are to be used, but not be all-determining factors of the learning.

Stage Three is where the planning begins. The planning must align with the goals in Stage One. The framework should always be flexible and able to be adjusted. Teachers are encouraged to think of the trouble spots and how to adjust or monitor them before the lesson. Stage three includes the diagnostic and formative assessment rather than in stage two. It is the plan to map out the learning plan and not full lessons for each day. After creating a learning plan that achieves the desired results, daily lesson plans can be mapped out to meet the important goals needed (Wiggins & McTighe, 2011).

Overall, Understanding by Design (UbD) is a framework that helped me design a well-thought-out learning plan for my project. This framework emphasizes backward lesson planning to make sure we met the goals at the end. By starting with the goal, it will help ground the instruction needed to meet it. This is the reason why I chose UbD as my curriculum framework. UbD includes three important stages that should be followed to meet the overall learning goals. These three stages are clarifying and identifying desired results, determining desired results, and planning (Wiggins & McTighe, 2011). Thus, providing the best learning experiences for students.

Setting and Audience

The setting for my project is for any kindergarten classroom that uses the Math Expressions curriculum. However, these lessons could be used by any elementary school based on the needs of their students and learning. Math stations are versatile and can be changed to fit any classroom. This project is specific to the Math Expressions curriculum since that is the curriculum that I currently teach.

The audience for this project is kindergarteners. However, as I stated above, these lessons can be modified to meet the needs of any elementary student. My specific targeted audience for my classroom is about twenty to twenty-five students who come from backgrounds such as Hispanic or Latinos, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian, White, and multiracial. There are 33 percent English learners, 15 percent special education students, 45 percent free or reduced-price meals students, and less than one percent homeless students. This particular school is also a Title I school where we get funding to help students in need. We have about 59 staff members but we do not get extra help during math lessons. I plan

to use these lessons for my students next year. If this goes well, I will be able to present it to the rest of my team and maybe the rest of my district. The next section will discuss my project in more detail.

Project Description

My project is to revise the current kindergarten Math Expression curriculum to include math stations. I plan to revise unit one of this curriculum which consists of 18 lessons altogether. I also plan to stick closely to this curriculum because I want it to be accessible to teachers who use Math Expressions in their classrooms. Next, I will describe in detail the Minnesota State Standards implemented, project format, assessments and outcomes, project contributions, and a summary.

Minnesota State Standards

The standards that will be addressed in this project are the Minnesota State Standards in Table 1.

Table 1

Minnesota State Standards Addressed

Code	Standard	Benchmark
K.1.1.1	Understand the relationship between quantities and whole numbers up to 31.	Recognize that a number can be used to represent how many objects are in a set or to represent the position of an object in a sequence.
K.1.1.2	Understand the relationship between quantities and whole numbers up to 31.	Read, write, and represent whole numbers from 0 to at least 31. Representations

		may include numerals, pictures, real objects and picture graphs, spoken words, and manipulatives such as connecting cubes.
K.1.1.3	Understand the relationship between quantities and whole numbers up to 31.	Count, with and without objects, forward and backward to at least 20.
K.1.1.5	Understand the relationship between quantities and whole numbers up to 31.	Compare and order whole numbers, with and without objects, from 0 to 20.
K.1.2.1	Use objects and pictures to represent situations involving combining and separating.	Use objects and draw pictures to find the sums and differences of numbers between 0 and 10.
K.1.2.2	Use objects and pictures to represent situations involving combining and separating.	Compose and decompose numbers up to 10 with objects and pictures.
K.2.1.1	Recognize, create, complete and extend patterns.	Identify, create, complete, and extend simple patterns using shape, color, size, number, sounds and movements. Patterns may be repeating, growing or shrinking such as ABB, ABB, ABB or ●,●●,●●●.
K.3.1.1	Recognize and sort basic two- and three-dimensional shapes; use them to model real-world objects.	Recognize and sort basic two- and three-dimensional shapes; use them to model real-world objects.

Project Format

My lessons include all components of a lesson along with a description of each math station to follow. It includes the Minnesota Math standard(s), learning objectives or targets, assessments, and feedback, accommodations for learning differences, mini-lesson

using the curriculum and which math stations will be used that day. Each math station are described along with what will be taught in the small group led by the teacher. However, with the small group, teachers are able to review skills or concepts if needed for each group created. I plan to create a "How to Set Up Math Stations" document. This is for teachers who have no experience and need a small background on how to set it up. The lessons that I created include how the math stations will be introduced and set up. This document is just for reference if a teacher needs it. Next, I will be explaining how these stations will be incorporated into the curriculum.

The plan is to ease the math stations into the curriculum because kindergarteners are new to the school and still learning how to do school. The plan starts small and eventually gets so efficient at stations that students understand the routines. The first five days will follow the existing curriculum. Math stations will not be implemented at this time. These five days will be learning how to do math class and the expectations that come along with it. Math stations will not be implemented but students are learning how to work independently and talking to friends for learning. The teacher and students will talk about how independent work looks and sounds like. This way the expectation is clear.

In lessons six and seven, students will be building and using blocks to solve simple problems as a station. The teacher will be at this station to help students understand directions. This station is for students to learn how to use blocks and counting cubes to use in math. During these lessons, the teacher will teach the mini-lesson and then divide the students up into two groups. One group completes independent work while the other group plays with the blocks and cubes. After 15 minutes, students will

clean up and switch. This is to teach students how to transition from one station to another.

Lessons eight and nine, a game station will be implemented and taught. The teacher will be at this station to monitor and give expectations for this station. The game station will be created to meet the needs of each lesson. At this point, there are a total of three stations but with the teacher's direction to switch from one station to the next.

In lessons ten to fourteen, a technology station will be added. This station might take a little longer to implement, so I have decided to take four days for this. The teacher will be at this station helping and guiding students while still monitoring the other stations.

The last station to be implemented is the small group station because by this time, the teacher will have enough information to create groups based on skills or other factors. By this time, students should know expectations for each station and how to transition from one station to the next. This gradual release helps students learn and know expectations without so much at once. The next section will be talking about the assessments and outcomes of this unit.

Assessments and Outcomes

This project includes assessments and unit outcomes. There is going to be a pretest and a post-test. The unit provides a pretest and a post-test that will be used for unit one. This will show the progress that is made throughout the unit. Also, there is a self evaluation for students with faces of how they feel math is going and what they would like to see next. This way teachers are able to know how the students are feeling about math stations. Aside from the assessment, the unit outcome is for students to solely focus

on understanding numbers zero through ten. This involves counting with or without objects, adding and subtracting, comparing numbers, and reading, writing, and showing zero to ten. This is important to providing a foundation for students in kindergarten. The next section will discuss the project contributions.

Project Contributions

This project was created to provide differentiation for students. It is also used in order to meet the needs of all learning styles of the students. The project is to provide a starter for teachers to use in their own classroom. This project is able to be changed to work with other curriculums and grades based on what is the best for that classroom, providing the best instruction for all students. The next section will conclude the project description.

Summary of Project Description

Overall, I revised the kindergarten Math Expressions curriculum and created an 18 lesson unit that will be user-friendly to any teachers looking to try something new or differentiate in their classrooms. Minnesota state standards will be followed to meet the goals of the state. The revision to the curriculum involves incorporating math stations slowly. By the end, there should be a total of five stations for students to rotate to. A pretest and post-test will be given to see the growth of the student. Also, the unit outcome is for students to understand numbers zero to ten to build a foundation for the rest of the year. The last section emphasizes on the public contributions and how it can be used in any classroom. The next section will discuss my timeline for this project.

Timeline

Once I complete my capstone project, I want to implement it into my own classroom the next following school year, which is 2021-2022. I completed my capstone project in the summer of 2021. I created two to three lessons per week so that I finished the unit by the end of July. Then in August, I edited it and wrote Chapter Four. Everything went well and my capstone project was completed.

Conclusion

Chapter Three discusses my project that addresses my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?* My plan is to create 18 math lessons that include a mini-lesson along with math stations to enhance it. My lessons will be thorough each day so that any teacher is able to try this out in their own classrooms. This capstone project is for a kindergarten-specific classroom using the Math Expressions curriculum. However, this can be altered to meet the needs of other grades and curriculum. Chapter Four will be a reflection of my capstone project. This reflection will include the relevance of my literature review, implications, limitations, future plans, my takeaways, and conclusion.

CHAPTER FOUR

Conclusion

Introduction

My educational journey to where I am today with my capstone project has been a tough and curvy road. I remember when I was about to start the research design course for this capstone project, I was talking to my sister about dropping. I did not know what I wanted to do my project on so I wanted to quit. Luckily, my wise and loving sister convinced me otherwise and look where I am today. When I started to think about what I wanted to research, I knew that I wanted to do something that I would be able to take it to my own classroom. I needed a project that would motivate me. As I took a look at what I can create for my classroom of kindergarten students, I thought of what was missing in my classroom and came up with revising the math curriculum. This is how I came to the conclusion of my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?*

Chapter Four will include seven sections along with a conclusion at the end of this chapter. The first section will emphasize on the major learnings that I have made before, during, and after completing my capstone project. In the second section, I will revisit the literature review to see what literature helped or did not help with my project. Section

three will discuss the implications and limitations of my project.The next section will be about the future projects or research that can come from my project. Section five discusses how I will communicate my results or my project to the public. The last section before the conclusion is a section about the benefits that my project makes to my profession as a teacher. Lastly, the conclusion will summarize chapter four and conclude my capstone project.

Major Learnings

This whole capstone project journey has been a rollercoaster. I had times where I was low and times where I was high. However, I have learned that I have become a better writer, researcher, and learner.

Growing up, English was never a subject that I excelled in. So this means that writing was always hard for me. I wish that I have been better at writing. I am bilingual and I think this is possibly why English was always hard for me. However, through this capstone project, I feel that my writing skills have improved. I never thought that I would be able to write more than 30 pages. I have never written this much in my life. My paper is probably going to be more than 60 pages and I am so proud of myself. I know that I am not the best writer but being able to write these many pages is a big accomplishment for me.

As a researcher, this is the most that I have ever done for anything academic in my life. I did work as an undergraduate research assistant for the Minnesota Population Center. However, I never did the research itself. I just had to find some papers and check references but that was it. Having the chance to find my own literature for my capstone project has been rewarding. Searching through many literature to find what will make my

review accurate and useful has expanded my knowledge. I learned so much about my topic about math stations along with many other things such as mathematical mindsets, development, and instruction. I feel like throughout my journey as a researcher, I am now able to research anything I want now. I have gained a lot of knowledge on finding high quality literature and how to use it wisely.

As I have stated above, I have learned so much throughout this journey as a learner. I learned so much that I can take into my classroom as well. This project was made in order to be implemented into my classroom so that my students are able to benefit from them. As a learner, I learned to have a timeline for myself and to work ahead if possible. By not procrastinating and pushing myself, I made steady progress on my capstone project. I also learned as a learner to be open minded to revisions and flexibility. None of my learnings were unexpected because I know that as a learner, we must be open to learning and using a timeline to stay on track. Overall, as a learner, it has been a wonderful experience.

In all, this wonderful rollercoaster has given me so much confidence in myself as a writer, researcher, and learner. I almost dropped my research design class and I am happy that I did not. The experience, knowledge, and learning gained from this capstone project has been worthwhile. The next section will discuss the literature review used and not used to create my capstone project.

Revisiting Literature Review

When I was creating my capstone project, I took into account much of my literature. Some of my literature reviews were thought about and used more than others. However, this literature review has taught me so much.

One of the most important and used literature that I kept going back to was the literature done by Hilbery, Chang, and Epaloose. Hilbery et. al (2003) stated that there are five phases for setting up the math stations for a classroom. As I was looking at unit one of the math expressions unit, I had to decide how to implement these. I went back and looked at the phases. Phase one focuses on opening and closing instruction along with a whole group instruction. This phase works on building up values, classroom management, and routines. I decided that since I have 18 lessons, I will make the first five lessons minimal since my students are younger. I planned my first five lessons to include how to work independently because this would be something new for kindergarteners. Phase two is where teachers will slowly start to add stations where the teacher assists one station without interrupting. Knowing young students, I know that adding so much at once is hard so I planned to add only one station at a time until there were a total of five stations total. Phase three and four is where students are practicing and doing well in each station until phase five for small groups. The last station I added in my lesson plan is small groups. This literature really helped me to pace the math station throughout the unit which made the unit accessible to all students. In all, this specific literature played a big role in implementing math stations in a classroom.

While planning the math stations itself, I looked back a lot at Jean Piaget and Lev Vygotsky theories. Piaget brings up the importance of peer-to-peer interactions which is what I wanted to include in my project (Woolfolk, 2014). I included math stations that included students working with each other to learn the material even better. Vygotsky brought up the point that students need to be interacting with a knowledgeable person or teacher to learn (Woolfolk, 2014). This literature was vital to creating small groups that

have teachers interacting to help students understand the station and finally the teachers leading small groups as the last station. As teachers are leading small groups, teachers can plan these to the student needs and further their learning. Overall, creating interactions throughout the lesson.

One more important literature I kept looking back on was the study done by Boaler and Dweck. Boaler and Dweck (2016) emphasize the mathematical growth mindset along with helping students to understand the beauty of mathematics. As I was creating lesson plans, I wanted to make my station engaging and help my students with their growth mathematical mindset. I want my lessons to be enjoyable and learnable. So as I was planning, I kept thinking what would benefit my students the most.

In conclusion, many of my literature reviews were great but I took into account about four. These four were the main ones I used to help me create my revisions for the Math Expressions curriculum. The next section will talk about the implications and limitations of my capstone project.

Implications and Limitations

The implications of my project are mostly geared towards the classroom and academic setting. One of the implications of my project is for students in a kindergarten classroom to receive the attention they need in math. At times, students are falling behind but no direct help is given so my project is able to provide that help to increase student learning. This implication is the main reason for my project in the beginning. I wanted to be able to reach all my students so that no one is left behind.

Another implication of my project is for teachers to be able to use these lessons and are able to alter to their own classroom. I know that this project is based on my

preference for my classroom and the student population I have at my school. Based on these lessons, I hope that teachers will be able to see what they can do differently to meet the needs in a classroom despite the different curriculum given by the district. I know that some districts are really strict on following curriculum closely but I know that you can still incorporate your own take on things to make it fit your own classroom. Students are always our number one priority.

The only limitation of my project is that it is geared towards kindergarteners only since I am using the Math Expressions curriculum. I made this very specific because I wanted to create something that anyone who teaches kindergarten with this curriculum can use these lessons right away. However, the way I have formatted the lessons will allow teachers to utilize the materials I have created based on their own grade level and curriculum. The next section will talk about future projects or research to come.

Future Projects or Research

This phenomenal journey through my capstone project made me want to keep going with more projects and maybe even a thesis. As I got to understand math stations a little more, I wanted to actually test out the impact it makes with students to see if there is a significant difference. I may do this in my own classroom with permission from my principal to see the impact it has compared to the previous years I have taught. However, I am sure there will be many things to consider when conducting this new research. As for another project that I have wanted to do is to continue my project with the rest of the Math Expressions curriculum. This way, my project can be used in my classroom and possibly others as well. I plan to use this project in my classroom this upcoming school year and hopefully continue throughout the school year with math stations. Overall, I

plan to continue this work to benefit my future students. Next up, I will talk about how I will communicate my results with the public.

Communicating Results

When I started this my capstone, I wanted to do a project that will benefit my classroom and students. I also wanted other teachers in my district or any teacher that is using Math Expressions to be able to use this project to help reach all students. I plan to use this curriculum revisions with math stations in my classroom. After using this project, I plan to introduce this to my kindergarten team at my school. Then I plan to introduce this to my school coach to see if I could share this with the rest of the kindergarten teachers in my district. I know that some teachers may not like the idea of math stations but it is a different way to look at something that can benefit their students. Overall, I plan to launch this project small and hopefully go bigger with it. The next section will discuss the benefits my project has to my profession.

Benefits to Profession

In the beginning, I knew that I wanted to create something that I could bring into the classroom. As a teacher, I am always trying to find new and different teaching methods to help my students succeed in the classroom. This project benefits the students and teachers. For students, this project will provide a different scope that will reach every students' needs. The needs are met by giving all students more hands on and math appropriate stations. As for teachers, this project gives teachers a new outlook so they can reach all students. Overall, this project is flexible and can be altered to the needs of the students and teachers which will benefit both. Finally, I will be concluding my capstone project.

Conclusion (Summary)

In this chapter, I was able to share my thoughts and learning that led from my research question: *How can mathematical stations be incorporated into the current curriculum and increase students' math skills in a kindergarten classroom?* I touched on my major learnings of becoming a better writer, researcher, and learner. I am so proud of the journey I have taken so far with this capstone project. I also revisited my literature review and discussed four major literature that helped me with my project. One of the major ones was the literature about the five phases of setting up math stations. Then I moved on to talk about my implications and limitations of the project which brings up the implication of having teachers use these lessons later on. A limitation of my project was that it was only made for kindergarten, however, I feel that my lessons could be a template to be used for many other grade levels too. Next, I brought the future projects and research I could do, which was continuing my revisions of the curriculum for all five units or conducting a full research to see the results of my project. Finally, I shared about how my project is benefiting students and teachers since my project provides a different lens to math.

In conclusion, I am so happy that I was able to grow so much from this journey. I did not believe in myself because of the pandemic but I am almost at the end of the road. I hope to use this in my classroom soon and I hope for many teachers to see the importance of meeting every child's needs. Making a difference in the classroom has always been my number one goal and here I am trying my best to make it even better.

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