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Implementing a Multi-Tiered System of Support for Mathematics Instruction in Preschool

Classrooms

Jenny Petty

Capstone Project: A School Improvement Plan

Northwestern College, Orange City, Iowa

Abstract

Early intervention in preschool mathematics instruction is key. Studies have shown that the development of early math skills may be the single most important factor for determining future school success. This school improvement plan lays out the necessary steps that the Sioux City Community School District (SCCSD) can follow to implement a Multi-tiered System of Support (MTSS) for the Preschool Initiative classrooms that are a part of the Iowa Statewide Voluntary Preschool Program for Four-Year-Olds. This plan includes providing teachers who are a part of the Sioux City Community School District's early childhood special education classrooms and the community partner classrooms with the necessary resources and supports to develop MTSS within their own classrooms so that they can ensure that all students can be successful in learning early math concepts. Equipping the youngest learners with early mathematical skills will lay a solid foundation for future math learning and success.

Keywords: mathematics, intervention, MTSS, preschool, professional development, Tier 1 2, & 3, coaching, data decision-making, IGDIs

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Implementing a Multi-Tiered System of Support for Mathematics Instruction in Preschool Classrooms

Current research suggests that children's early mathematics skills are the strongest predictor of later academic success, and that preschool mathematics ability predicts mathematics achievement through age 15, even after early cognitive skills and family characteristics are accounted for (Whittaker et al., 2015, p. 2, as previously stated by Hooper et al., 2010; Pagani et al., 2010; Watts, Duncan, Siegler, & Davis-Kean, 2014). The problem is that many schools are failing to provide this much-needed math instruction to meet the variety of learning abilities of preschoolers. "The early childhood years are critical in developing early mathematics skills, but the opportunities one has to learn mathematics tend to be limited, preventing the development of significant mathematics learning" (Wang et al., 2016, p. 692). How do we then ensure that preschoolers are equipped with the proper mathematics skills and instruction they need to succeed? By implementing a Multi-Tiered System of Support (MTSS) for math instruction in preschool, students can be provided with the best foundation to prepare them for future learning success.

The purpose of this school improvement plan is to detail and establish a Multi-Tiered System of Support for mathematics instruction in preschool classrooms within the Sioux City Community School District Preschool Initiative Classrooms. This work will include focusing on three tiers of instruction: Tier 1 (universal for all), Tier 2 (targeted for small groups of children who need more support), and Tier 3 (individualized), along with tackling and overcoming factors that deter this work (Steed and Shapland, 2020, as previously stated by Sugai and Horner, 2010). In discussing each tier of instruction, this plan will discuss groups of students benefiting, ways to

progress monitor, and what instruction will look like. As a result of instituting a MTSS for math instruction in preschool, student learning and scores will improve and provide a solid foundation for future learning for young students.

Growing evidence continues to mount for the importance of teaching mathematics skills in preschool classrooms, along with the need to instruct students at the proper level so that all students can be successful. Research gathered for this school improvement plan includes over twenty peer-reviewed journals found in DeWitt Library in which most work was completed within the last ten years (2014-2020). Two articles dated 2011 were also included as the content was relative to other material shared in the literature review. Some articles include the topic of Response to Intervention (RTI) but for the sake of the research reviewed in this action plan, we will use the term Multi-Tiered System of Support (MTSS). Topics covered within the peer-reviewed journals include but are not limited to MTSS, MTSS in preschool, MTSS in kindergarten, MTSS for literacy, and MTSS for mathematics. In addition to peer-reviewed articles, there are websites, videos, and other articles included in this paper. The work done in the field of MTSS instruction in mathematics for preschoolers is new, therefore practices within preschool MTSS for literacy instruction will be included to help guide the research.

“Educators, policy makers, and researchers have highlighted the importance of early mathematics learning for later school success, and the resulting need for evidence-based approaches to mathematics teaching early in childhood” (Rosenfeld et al., 2019, p. 241, as previously stated by Duncan et al., 2007; Denton & West, 2002; Jordan, Kaplan, Ramineni, & Locuniak, 2009; Krajewski, 2005; National Mathematics Advisory Panel, 2008). By taking time now to make a MTSS for preschool mathematics instruction a priority for current students, future

success will be promoted. In doing so it is apparent that a one-size-fits-all approach to this instruction will not work. Studies reviewed share insight on the need for three tiers of instruction and detail what this instruction should look like, what evidence-based practices are most successful, how student achievement will be monitored, and what is needed from the district to make the system successful.

“Children are entering kindergarten unprepared in the areas of mathematics and science, largely as a result of inadequate exposure to early experiences and high-quality interactions in these domains” (Whittaker et al., 2015, p. 1). Therefore, a need to establish a MTSS for mathematics instruction in preschool classrooms exists. A key feature to this work will be identifying what each tier of instruction will look like, who it is intended for, and how student achievement will be monitored. In addition, particular attention will be given to factors that may need to be considered when planning for implementation of a math MTSS in preschool classrooms and how the district can overcome or tackle these issues to implement a successful system. Finally, it is important to note that research is ongoing in the area of preschool MTSS for mathematics, which reinforces the need for the district to stay current on practices related to this area.

Review of the Literature

Establishing a Need for a MTSS in Mathematics

Currently time is not being spent focusing on math instruction in most preschool classrooms. “For example, Early et al. (2010) observed that, in the average state-funded prekindergarten classroom, only 8% of the day was devoted to mathematics; in comparison, 17% of the day was spent on literacy. Fully 44% of the day was, on average, spent in transitions or

other non-instructional time” (Hindman, 2013, p. 230). Similar findings show that preschool students spend less than half the amount of time engaging in math activities than they do in literacy/writing activities (Hofer et al., 2013). Valuable instruction time is therefore being lost in the early years of a child’s education when it comes to laying a solid foundation for learning early math skills. Preschools therefore have a unique opportunity to spend more time focusing on teaching math skills.

While an uneven distribution of time spent in mathematics instruction exists in preschool, one must see the value in establishing equal time for the teaching of math skills. “In a meta-analysis of six longitudinal studies, Duncan and colleagues (2007) found that early math skills were more predictive of later school achievement than early reading skills, early attention skills, and early social-emotional skills” (Hardy and Hemmeter, 2019, p. 234). This study alone shows that math instruction needs to become a part of everyday teaching practices in early childhood classrooms. In addition, other professional organizations are emphasizing the importance of math instruction in early childhood settings.

‘The National Council of Teachers of Mathematics (NCTM) and the National Association for the Education of Young Children (NAEYC) affirm that high-quality, challenging, and accessible mathematics education for 3- to 6-year-old children is a vital foundation for future mathematics learning. In every early childhood setting, children should experience effective, research-based curriculum and teaching practices’ (Hofer, et al., 2013, p. 487 as previously stated by NAEYC/NCTM, 2002, p. 1).

The result of these studies and the guidance of professionals in the field of both math and early childhood education therefore have given the justification and need for math instruction to become a priority in preschool classrooms.

According to “...the National Research Council, in a report on math in early childhood, recommended that ‘all early childhood programs should provide high-quality mathematics curricula and instruction’” (Hardy and Hemmeter, 2019, p. 234 as previously stated by Cross, Woods, & Schweingruber, 2009, p. 345). By establishing a MTSS for mathematics instruction, all students receive instruction at the Tier 1 level while those needing additional instruction to succeed are provided that support at the Tier 2 and Tier 3 level. While curricula such as Building Blocks (Clements & Samara, 2007) and Pre-K Mathematics Curriculum (Klein & Starkey, 2002) exist and are effective, work still needs to be done to determine what specific math instructional practices teachers should use (Hardy and Hemmeter, 2019). In addition, other curricula such as Early Learning in Mathematics and Experimental Mathematics Curriculum have been utilized in recent studies (Wang et al., 2016). It is important to note that direct instruction in mathematics is not the only way for students to gain a solid foundation in math skills. While time needs to be spent learning about basic math principles, preschoolers also need time to participate in math activities and discussions about math throughout the day.

Students need to be provided with opportunities to be exposed to quality math instruction and embedded math activities throughout the day. This is even more important for children at risk as opportunities to learn about mathematics outside the school setting are often not available. “In general, children growing up in poverty often show markedly lower mathematics performance—characterized by gaps as large as a full standard deviation—as early as

kindergarten, likely because of lack of access to high-quality learning opportunities in their homes and communities that are well aligned with the content that will be expected by the school” (Hindman, 2013, p. 230, as previously stated by Crosnoe & Cooper, 2010). Finding a Tier 1 curriculum is only the first step in establishing a MTSS for math instruction. Next, schools need to consider Tier 2 and Tier 3 students who may need additional instruction and what curriculum resources can be added to supplement students needing additional tiers of support. “The use of evidence-based instructional practices is important, as it is becoming increasingly apparent that many young children with disabilities and those who are at risk for delays and disabilities will need individualized and intensive instruction in addition to a universal curriculum” (Hardy and Hemmeter, 2019, p 235, as previously stated by Ochsendorf, 2016). The results of this research therefore support the need for and importance of establishing a MTSS for math in preschool classrooms.

A Tiered Level of Instruction

While work has been done to show the need for time and focus on math instruction in preschool classrooms, research also shows the importance for this work to involve many layers of instruction through the use of a MTSS. Researchers argue, “Given the wide diversity of skills with which children enter preschool, it is imperative that teachers can individualize and differentiate instruction for all learners, including the most at-risk children who have the lowest skill levels” (Kaminski, et al., 2015, p. 314, as previously stated by Cabell, Justice, Konold, & McGinty, 2011). Often seen in the pyramid form, a vast majority of students, typically around 80%, will require only Tier 1 instruction while 10-15 % will need Tier 2 instruction, and finally 5-10% will need an intensive Tier 3 instruction. According to Greenwood et al. (2015) and

similar findings by Abbot et al. (2015), Tier 1 encompasses whole class instruction, Tier 2 adds an additional layer of learning most often in a small group setting, and Tier 3 instruction is a more intensive often individualized intervention.

Much of the work and research completed for preschool MTSS instruction in language and literacy can be utilized in the development of preschool MTSS math practices. For example, Greenwood et al. (2015) discuss one early childhood MTSS model, Recognition and Response, utilized in work done for a MTSS for preschool language and early literacy instruction.

“Recognition and Response is a three-tier model for public pre-K, childcare, Head Start, and preschool instruction providing differential instruction to 3- to 5-year-old children based on assessed need” (Greenwood, et al., 2015, p. 251, as previously stated by Buysse & Peisner-Feinberg, 2010). Recognition and Response has developed the following MTSS components: screening to include progress monitoring, research-based curriculum, and instruction along with interventions for individual children who need them, an intervention hierarchy, and a collaborative (teachers, specialists, parents) team to problem-solving (Greenwood, et al., 2015).

Ongoing data collection through progress monitoring is a vital component of a MTSS. Thus, it is important that districts find a screener that can not only provide baseline data but also progress monitor students so that data-based decisions can be made to determine if more intensive levels of intervention support are needed to improve student outcomes. Work done by Greenwood, et al. (2011) found one such form of measurement called Individual Growth and Development Indicators (IGDIs). IGDIs support universal curricula for all students and identifies students who may benefit from interventions using progress monitoring screenings to determine next steps (Greenwood et al., 2011). While IGDIs may be the best screener for determining

which students would benefit from more intensive instruction (McConnell et al., 2014), in first early literacy skills and later early math skills, later research has shown that IGDIs may not be able to answer all questions after the problem has been identified (Greenwood et al., 2019, p. 272). More research is needed in the fields of both early childhood math and literacy MTSSs to answer additional questions that may arise.

Establishing curricula to use for math instruction at all three tiers is another vital piece of the MTSS process. Studies done by Wang et al. (2016) have utilized the following curricula when researching early childhood math interventions: Building Blocks Curriculum, Early Learning in Mathematics, Experimental Mathematics Curriculum, and Pre-K Mathematics Curriculum. Similarly, work done by Hardy and Hemmeter (2019) has also looked at the use of Building Blocks and Pre-K Mathematics Curriculum which have both been effective in increasing children's math knowledge. Findings from Wang et al. (2016) uncover that the most practical conclusion would be for programs to use supplemental add-ons to existing curriculum and that of the curricula listed above Building Blocks, had the strongest effect. In addition, research done by Clements et al. (2020), found similar positive results regarding using Building Blocks (BB). "BB (Clements & Sarama, 2007/2013) has produced positive effects on mathematics in rigorous evaluations (Clements & Sarama, 2007, 2008), including large-scale implementations across diverse settings (Clements, et al., 2011; Sarama et al., 2012) as well as improvements in oral language (Sarama, Lange, et al., 2012)" (Clements, 2020, p. 302).

Next steps in the MTSS process involve developing an intervention hierarchy. Students not responding to Tier 1 instruction are then supplemented with additional curriculum support at the Tier 2 level. Tier 2 instruction should be provided in a small group setting. Work done by

Clements et al. (2020) shares that this is a researched-based teaching strategy that is more effective than other approaches (Chien et al., 2010) and is often not utilized by early childhood teachers (K.E. Diamond et al., 2013). Findings by Clarke et al. (2019) support the use of small group instruction showing the benefits of providing Tier 2 instruction in a small group setting. “A meta-analysis examining group size in reading found larger effect sizes for smaller groups (Wanzek & Vaughn, 2007), and research in which instructional content was held constant found that smaller groups (1:1 or 1:3 teacher-student ratio) had greater effects when compared to a larger smaller group (1:10 teacher-student ratio)” (Clarke et al., 2019, p. 131). Kaminski et al. (2015) also mirror these findings stating that Tier 2 interventions with groups of children from 2 to 10 may be effective but greater effects are found with smaller sized intervention groups (as previously stated by Vaughn et al., 2003; Wanzek & Vaughn, 2007).

Data-informed decision-making practices may inform teachers through the use of progress monitoring procedures such as IGDIs that students may need an even more intensive level of intervention. According to the findings in a study completed by Barnes et al., “Although many children in the intervention conditions made considerable gains in mathematical knowledge over the pre-kindergarten year, it is clear that there is also a subgroup of children who did not make sufficient gains to prepare them for mathematics instruction in kindergarten” (2016, p. 601). The work of several researchers shows that Tier 3 support needs to become even more individualized and intensified. Greenwood et al. (2015) emphasizes the importance of Tier 3 being an individualized intervention. Similarly, work done for early literacy skills at a Tier 3 level by Kaminski et al. (2015) shows that providing instruction at a Tier 3 level can therefore best be met in a one-on-one or small group of no more than 2 students during center or small-

group time (as previously stated by Denton et al., 2013; Gersten et al., 2008). Finally, Hardy and Hemmeter (2019) share that struggling learners need multicomponent, individualized, and long-term interventions.

Along with a more individualized approach to Tier 3 instruction, other factors can be considered at this intensified level. For example, “Such procedures include increasing opportunities to respond within lessons (e.g., Carnine, 1976; Greenwood, Carta, & Atwater, 1991; Sutherland & Wehby, 2001), ensuring that the intervention is systematic and explicit (e.g., Archer & Hughes, 2011; Brophy & Good, 1986; Gersten, Schiller, & Vaughn, 2000; Rosenshine, 1997), and/or increasing support for students through careful ‘scaffolding’ of instruction (e.g., Foorman & Torgesen, 2001)” (Kaminski, 2015, p. 320). In addition, preschool teams can and should include parents, especially when moving to the highest level of intervention, Tier 3. Work done by Greenwood et al. indicates that family members are a child’s most important teacher (2011, p. 264, as previously stated by Greenwood, Bradfield, et al., 2011).

Factors to Consider

As a MTSS is developed in preschool programs for mathematics, particular attention should be given to certain factors that need to be considered when implementation. While these barriers may exist, districts and schools can overcome or tackle these issues in order to implement a successful system by making plans in advance. Carta et al. (2015), in work on tiered levels of support for language and literacy instruction in preschool, discussed, “When greater numbers of children are identified for a Tier 2 and 3 early literacy intervention, more resources in terms of staff, materials, time, and cost will be required to appropriately serve them” (p. 282). In addition to these factors, other topics to consider include limited teacher knowledge on

instruction of math concepts, the need for ongoing professional development and coaching for early childhood staff, and the best ways to provide instruction along with the availability of materials for interventions. While these factors may seem overwhelming, research has been done to show ways to overcome obstacles in order to successfully implement MTSS in preschool classrooms.

Unfortunately, not all early childhood educators are entering the profession equipped with the advanced knowledge of what quality mathematics instruction should look like in a preschool setting. Thus, in turn, their confidence in teaching these concepts deteriorates. According to Mason et al. (2019) one of the barriers identified by teachers is the lack of adequate training (as previously stated by Castro-Villarreal, Rodriguez, & Moore, 2014). Litkowski et al. (2020) also share, “Once in the classroom, teachers may tend to feel less prepared and less confident that they have the necessary skills to present mathematics content (Stevens & Wenner, 1996), thereby offering fewer opportunities for learning” (p.5, Early et al., 2010; Piasta et al., 2014). In addition, work done by Whittaker et al. (2015) supports similar beliefs: “Unfortunately few current teachers possess the necessary content and knowledge and pedagogical skills in these domains (p. 3, as previously stated by Copley, 2004, Garbett, 2003; National Mathematics Advisory Panel, 2008). Many teachers feel nervous and unprepared to teach mathematics (Rodenfeld, et al., 2019 as previously stated by Ginsbur et al., 2008; National Research Council 2009). It is also important to note that Hofer et al. (2013) discussed that in a survey (Copley, 2004) teachers shared that they know little about the standards. While feelings of inadequacy may arise when it comes to teaching math skills, research has shown that teachers can increase their knowledge and confidence by using interventions. For example, Rosenfeld et al. (2019)

share that by using a PBS Kids intervention teachers can improve their attitudes and beliefs about their own mathematical knowledge along with increasing their confidence and comfortability in teaching math skills to young children as a result of implementing interventions.

While implementing interventions may be a start to improving preschool teacher confidence in teaching math skills, research has shown that there is also a need for continued professional development (PD) opportunities, specifically when new curricula are being introduced but also ongoing PD to stay current on best math instructional practices. The results of Rosenfeld et al. (2019) show that PD can help teachers foster children's early math learning. "Furthermore, the benefits curricula can provide for improvement of teachers' instructional practice may be greatest when teachers also receive professional development (PD) support on how to engage in interactions that promote children's skill development" (Whittaker, et al., 2015, p. 2, as previously stated by e.g., Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Wasik, Bond, & Hindman, 2006). Kaminski et al. (2015), in work being done on Tier 3 early literacy skill interventions, stresses that PD may be even more important for teachers of at-risk students due to high turnover levels (as previously stated by Ball & Trammell, 2011; DeBaryshe & Gorecki, 2007; Jackson et al., 2009).

Similar findings uncovered by Clements et al. (2011) agree that teachers using the Building Blocks curriculum for math instruction for young children should have ongoing professional development opportunities to gain experience about selecting developmentally appropriate instructional tasks for the class and individual students based on students' developmental levels. In addition, the research done by Dumas et al. (2019) shares these same

thoughts again citing the need to provide PD to increase teacher knowledge, discuss high-quality student-teacher interactions, and equity in instruction for all students. McCoy et al. (2019) take it one step further to share that PD on behavior management could also be beneficial in improving executive function skills needed to make interventions at the early childhood level successful.

Ongoing research also suggests that providing professional development opportunities to improve teacher understanding and student success may not be enough. “Based on the extant literature and their professional experiences, Joyce and Showers (2002) estimated that when peer coaching is coupled with high-quality professional development, 95 percent of participants will increase their knowledge and skills, and will implement the desired changes (Mason et al., 2019, p. 209). In addition, Mason et al. (2019) suggest that districts should be selective in who they select to fulfill the role of the coach as coaches should be experts in their content area and be able to provide immediate feedback to teachers. Coaching opportunities allow teachers to receive assistance with implementing and conducting math instruction and interventions along with receiving feedback on the delivery. “In a review of 44 studies focusing on coaching in early childhood classrooms, Isner et al. (2011) found substantial benefit for PD coaching, with 27 out of 31 (87%) studies showing improvements in observed teaching quality as a result of coaching” (Whittaker, 2015, p. 13).

According to the work done by Abbott et al. (2017) coaches can help teachers set goals, assist in PD, observe classroom practices, provide feedback, and help teachers reflect on the work being done. Clements et al. (2011) also support the use of mentors learning alongside coaches as well as receiving additional PD themselves. Dumas et al. (2019) also discuss the use of formative assessments to support decisions about differentiating instruction (as previously

stated by Clements et al., 2013; Sarama et al., 2012). However, while many districts are utilizing coaches, research is still needed on the length of coaching needed to produce positive long-term effects, according to Rosenfeld et al. (2019).

An additional component to consider in order to implement a MTSS for mathematics instruction in preschool classrooms is finding developmentally appropriate instructional strategies. While this is not an easy task, research on this topic has provided districts with some helpful ideas. Hardy and Hemmeter (2019) discuss the use of modeling, prompting, directives, providing information about the skill, and discussion. Whittaker (2015) also suggests the use of asking open ended questions as students develop math skills. According to findings by Kong et al. (2021) in work done on a pre-kindergarten vocabulary intervention, some students may benefit from pre-teaching done in a one-on-one format with increased opportunities to respond, individual prompting and scaffolding, and corrective feedback, all of which are strategies that could be applied to math interventions.

Work done by Kaminski et al. (2015) in developing Tier 3 early literacy interventions discussed the use of games, songs, and finger plays to promote engagement. Similar findings from such as Hardy and Hemmeter (2019) (as previously stated by Ramani & Siegler, 2008, 2011; Ramani, Siegler, & Hitti, 2012; Siegler & Ramani, 2008, 2009) and Wang et al (2016) support the use of board games in systematic instruction of math skills for preschoolers. Rosenfeld et al. (2019) take it one step further through the study conducted using PBS kids for an early math intervention sharing that digital resources can support improved math teaching and learning. However, educators should be mindful that they engage in guiding and scaffolding student's experiences as they engage in digital resources (Rosenfeld, et al., 2019).

Another activity to consider when providing instruction to preschoolers is the use of books to teach math skills. In work done on effectiveness of early mathematics interventions, Wang et al. (2016) found that one of the strongest effect sizes was from the use of books to generate success with numeracy skills (as previously stated by Young-Loverage, 2004). These findings were mirrored by Hojnoski et al. (2016): “Strategically selecting books with a mathematical focus for shared book reading may offer a means of integrating mathematics into a literacy routine common to many early education classrooms” (p. 679). Thus, incorporating the learning of math skills with an already present daily routine not only increases math learning but also embodies the teaching of literacy skills. Furthermore, having guides to the books readily available or read-alouds intentionally planned by teachers can assist teachers in discussion using math-talk where they discuss key concepts, vocabulary, and ask questions during the shared reading activity (Hojnoski et al., 2016). The National Council of Teachers of Mathematics also supports math-talk, but more work needs to be done to understand if this plays a role in a young child’s development (Hofer et al., 2013). While research still needs to be collected as to if simply exposing students to math talk during a read-aloud may in itself change a child’s skill, it is important that teachers extend math talk throughout daily experiences (Hojnoski et al., 2016).

“While instructional strategies are important, teachers want something that they can take back to their classrooms and execute immediately” (Mason et al., 2019, p.212). As preschool teachers share concerns in planning for a multitude of experiences in several content areas, the need for efficiency becomes key. Kaminski et al. (2015) share the importance of having materials that are organized and can easily be pulled out for instruction. In addition, having a materials list and steps for implementing the intervention such as: introducing the activity,

practicing the skill, reviewing a previous skill, introducing and teaching a new skill, practicing the skill via a game, contextualizing the skill, and a checkout, is one such strategy shared by Kaminski et al. (2015) when designing a Tier 3 intervention to teach early literacy skills.

As a MTSS of support for mathematics instruction are implemented in preschool classrooms, districts should remain mindful of the fact that young children most often learn through play. While planned large and small group instruction can be planned around the teaching and learning of mathematical concepts, it is important to note that opportunities exist outside these times of direct instruction for students to engage in math experiences. Clements et al. (2011) discuss extending math learning into everyday activities such as block building to art to puzzles. Similarly, Whittaker et al. (2015) share the importance of using center time to revisit math and science activities with smaller groups of students and embedding the teaching of math skills throughout the day. In addition, districts must plan for resources to be allocated for math interventions as some schools may not have the necessary funding to do so (Mason, et al., 2019).

Ongoing Research

Research is ongoing in the area of a preschool MTSS for mathematics, reinforcing the need for districts to stay current on practices related to this area. Work in this field takes time. It is important to note that "...over the last 10 years the Institute of Education Sciences funded over 46 reading and writing projects in special education, and only 23 in mathematics" (Mason et al., 2019, p. 207). Similar research by Wang et al. (2016) found only 29 studies in the past 15 years related to outcomes of early mathematics programs. This shows not only the need to take time to develop MTSS for preschool math instruction but also the idea that this work is new. Finally,

research is also being done to see what other factors such as the acquisition of language or social emotional skills play a role in preschoolers' development of math skills.

It is important for districts to consider phased stages of implementation of a MTSS instead of trying to implement Tiers 1, 2, and 3 all at once. Mason et al. (2019) discuss this approach using the Fixsen et al. (2005) stages of implementation. Step one allows schools a year to make plans as far as their schedule, professional development, interventions, teams, and systems that need to be put into place before implementation occurs. "It also unburdens administrators and teachers from attempting to simultaneously create and implement a tiered intervention system" (Mason et al., 2019, p. 212). In setting up a MTSS of support it is important that school administration and teachers are on board. Research done by Mason et al. (2019) in developing a MTSS for math instruction shares that this buy-in can be created by aligning a MTSS to the school mission, creating a culture of feedback among teachers and administrators (Borman, Carter, Aladjem, and LeFloch, 2004), and increasing professional development opportunities (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009), all of which take time to nurture and create.

The results of research by Kong et al. (2021) in the areas of pre-kindergarten vocabulary intervention show that a MTSS must include evidence-based practices and individualized instruction so that all students can be successful. Therefore, districts need to pay particular attention to math curricula that can be a part of not only Tier 1 instruction but also curricula that can either be supplemented or purchased in addition for Tier 2 and Tier 3 instruction. As mentioned previously, curriculum such as Building Blocks, has been successfully utilized for interventions (Clements et al., 2011), yet continued work needs to be done to find other

evidenced-based curricula, especially for Tier 3 mathematics instruction in preschool settings. Similar findings uncovered by Hindman (2013) share this notion that "...effective mathematics curricula for preschool are not widely available" (as previously stated by PCERC, 2008). Wang et al. (2016) also mirrored these findings, urging researchers to continue studies to find developmentally appropriate and highly effective early math programs.

Remaining informed on how instruction in other areas could help students succeed in developing math skills is another area that districts need to be aware of. Hindman (2013) discusses the idea that high-quality vocabulary and language skills instruction could indirectly promote math skill development (as previously stated by Mix, Huttenlocher, & Levine, 2002). Hindman (2013) goes on to share that future research may be needed to see the role social competence plays in the development of math skills. Work done by Gersten (2016) also echoes these thoughts by questioning if persistence, self-control, and curiosity could be developed during math instruction in preschool and kindergarten. Therefore, school districts will need to pay close attention to research done in relation to math and advancement of other skill areas.

While much of the research and discussion shared has been in support of a MTSS for mathematics instruction at the preschool level, one must pay particular attention to aligning this work to developmentally appropriate practices. To point this out, Wang et al (2016) states that too much exposure to academics could become taxing and cause a negative effect if implementation occurs in a non-child centered, non-playful program (as previously stated by Fisher, Hirsh-Paske, Newcombe, & Golinkoff, 2013). Hofer et al. (2013) mirror these findings stating that preschool children do not need to spend more time in formal mathematics instruction in order to increase achievement. School leadership teams therefore must do their due diligence

to stay current on research related to best practices for young children as they take steps to implement a MTSS for mathematics in preschool settings.

School Profile

Student Performance

According to the website Iowa.gov, for the 2021 report year, Sioux City Community School District (SCCSD) had an enrollment of 14,238 students in grades kindergarten through twelfth. There were three high schools, three middle schools, and 13 elementary schools included in this data. Of the total number of students, 51% were male and 49% female. 44.1% of the students were white, 8.2% were Black/African American, 35.1% were Hispanic, 1.2% were Hawaiian/Pacific Islander, 2.8% were Native American, 2.8% were Asian, and 5.8% were multi-Racial. Special education students comprised 14% of the total percentage of students and 86% of the students were general education students. 56% of the students were proficient in mathematics and 59% were proficient in language arts.

Student and Community Characteristics

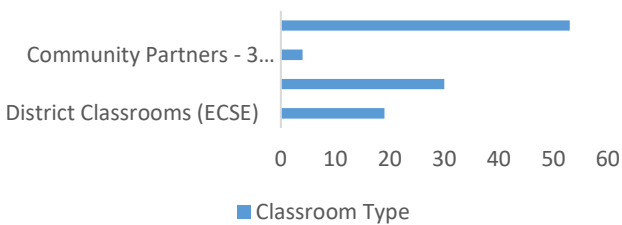
This school improvement plan will focus on an additional section of the Sioux City Community School District that currently includes 716 preschool students. The SCCSD has 19 Early Childhood Special Education (ECSE) classrooms in 10 out of 12 elementary school buildings throughout the city. According to the district's preschool website, the ECSE classrooms are taught by an Early Childhood Special Education Teacher with support from two to three para-educators. ECSE classrooms have up to 20 students including general education students and special education students. According to the SCCSD's preschool website, this

integrated approach allows students with and without disabilities to play and learn alongside each other.

In addition, the SCCSD Preschool Initiative Program includes community partners with 34 additional preschool classrooms in 23 different locations in Sioux City thus bringing the total count to 53 classrooms (Figure 1). It is important to note that of the 34-community site

Figure 1

Classroom Type



locations, four are three-year old classrooms that have special education students only who are included in the classroom count. Therefore, there are 49 SCCSD Preschool Initiative classrooms. Community partners include privately owned preschools along with preschools associated with the local Catholic school system and Head Start classrooms. This collaboration is part of the Iowa Department of Education’s Statewide Voluntary Preschool Program (SWVPP) for Four-Year-Old Children also referred to as the Preschool Initiative (PI). According to the Iowa Department of Education Website, “The purpose of Iowa's Statewide Voluntary Preschool Program (SWVPP) for Four-Year-Old Children is to provide an opportunity for all young children in the State of Iowa to enter school ready to learn by expanding voluntary access to quality preschool curricula for all four-year-old children.”

Community partners follow similar expectations and requirements as the Early Childhood Special Education district classrooms do. According to the Sioux City School District website, “While each preschool is operated independently, all preschools within the Preschool Initiative Program must follow and maintain the curriculum and staff certification requirements as set forth by the Preschool Initiative” (2023). Teachers in community site classrooms also need to be licensed to teach Early Childhood. Although community site teachers are not required to have a special education degree, they may have special education students who are provided specially designed instruction from qualified preschool coaches with early childhood special education degrees in the classroom. Para-educators for both community site classrooms need to meet similar requirements as those in district classrooms. Community partner locations and district classrooms must both maintain a ratio of 10 preschoolers:1 adult. According to the Iowa Department of Education (2020) *Fact Sheet Statewide Voluntary Preschool Program for Four-Year-Old Children*, other program requirements for SWVPP classrooms include a minimum of 10 hours per week of quality preschool instruction, community collaboration, a rigorous and relevant curriculum (based on the Iowa Early Learning Standards), and assessments.

School Characteristics

When ESCE classrooms are combined with the community partners, 716 total students are part of the Sioux City Preschool Initiative Classrooms (PI) for the 2022-2023 school year. It is important to note that according to the SCCSD’s website, students in the SWVPP, also known as PI classrooms, need to meet the following requirements: be a resident in the state of Iowa and be four years old by September 15 of that school year. It is important to note that some students

in the program who receive Special Education Funding may be three or five years old and still considered a part of the program.

Preschool student data comparing the number of males and female students in the program (Figure 2) shows that of the 716 students enrolled 370 are male and 346 are female. In addition, data on general and special education students (Figure 3) shares that 600 enrolled students are general education students, 13 students are special education students with speech only Individual Education Plans (IEP), and 103 are special education students on IEPs who need specially designed instruction (SDI). Preschool students in the PI classrooms come from a variety of races/ethnicities that include White, Black or African American, Hispanic/Latino, Native Hawaiian or Other Pacific Islander, American Indian or Alaskan Native, Asian, and some with two or more races. Figure 4 shows the breakup between Community Partners and ECSE classrooms. Program data, in total, shows that 293 students are white, 88 are Black or African America, 250 are Hispanic/Latino, 8 are Native Hawaiian or Other Pacific Islander, 10 are American Indian or Alaskan Native, 12 are Asian, and 55 have two or more races (A. Hannah, personal communication, March 2023).

Figure 2

Males Vs. Female Enrollment

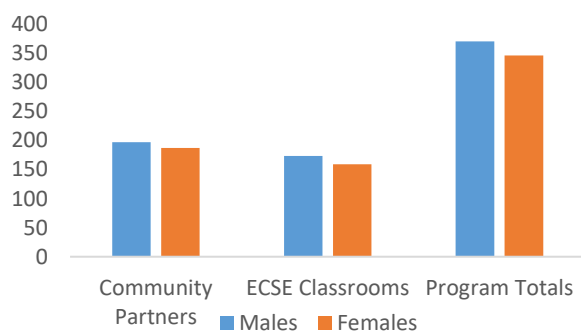


Figure 3

Type of Student

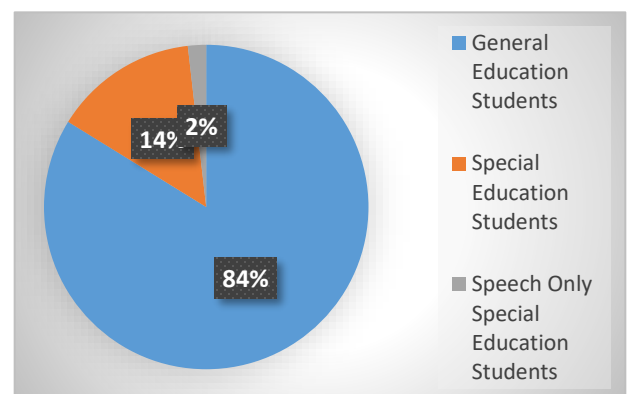
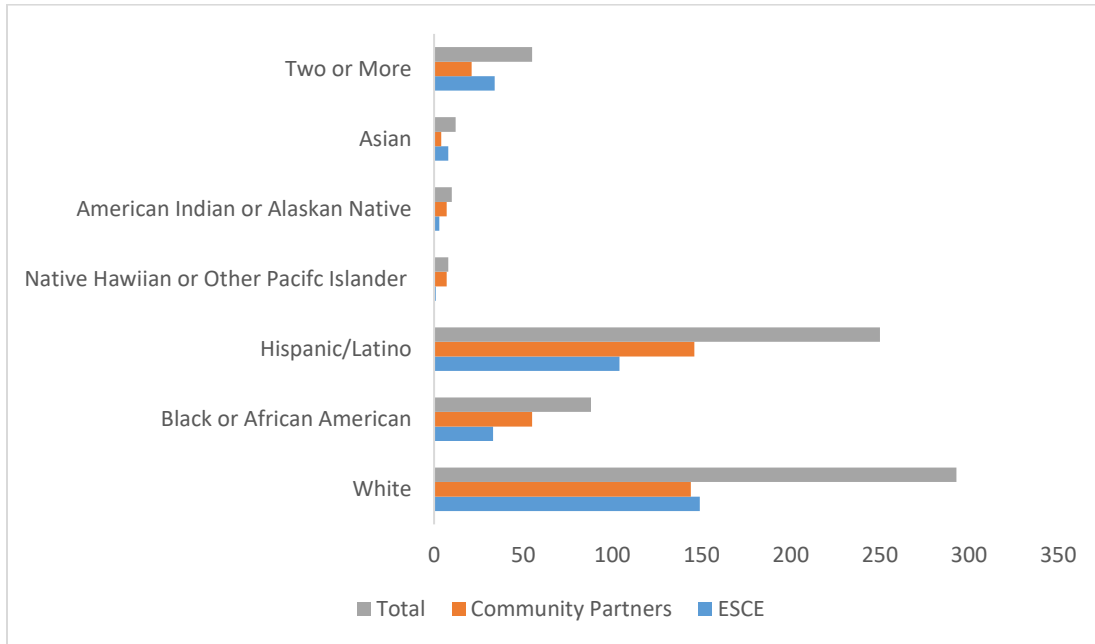


Figure 4

Race/Ethnicity



Parent Involvement

Unfortunately, due to the restraints COVID put on schools in recent years and the ability of parents to enter school buildings, parent involvement has been difficult for some classrooms. While activities and information can be sent home to parents, many programs are working to bring parents back into buildings to engage in parental involvement activities. A letter detailing progress on students Individualized Growth and Development Indicator (IGDI) screeners for math and literacy are sent home three times per year with activity ideas for parents to do with their children at home for each screening area on the back of the letter (see Appendix). In addition, some classrooms may send home newsletters with ideas for at-home activities. There are certain requirements that SWVPP classrooms need to adhere to regarding family involvement. According to the Iowa Department of Education’s document *Statewide Voluntary*

Preschool Program Frequently Asked Questions, family participation is vital and should include at least one home visit, one family night, and at least two conferences each year. Other areas of involvement could include volunteering in the classroom, orientations, parent education, or communications (2020). The SCCSD website also echoes the thoughts of the Iowa Department of Education in that it feels that parents play a vital role in their child's learning success, that active parent participation is welcomed, and that ongoing, open communication is key.

School Mission & Vision

The Sioux City Community School District as a whole and the Sioux City Community School District Preschool Initiative Program both have mission statements that are included here as both pertain to the work done in preschool classrooms throughout the program. The SCCSD's mission statement, found on the district's website, is as follows, "The Sioux City Community School District exists to educate students to believe in their talents and skills, achieve academic excellence and succeed in reaching their potential." The SCCSD PI Program mission statement says, "To strengthen, support and empower children and families through access to quality community services for preschool education for 4-year-olds." According to the Iowa Department of Education website's *Guiding Practices section for SWVPP*, all programs need to meet one of the following program standards: Head Start Program Performance Standards, National Association of Education of Young Children (NAEYC) Learning Program Accreditation Standards and Assessment Items, or Iowa Quality Preschool Program Standards (IQPPS). By ensuring that these standards are being met, all preschool classrooms part of the SWVPP can adhere to the missions set forth by the district.

Current Student Learning Goals

Program goals for the Sioux City Community School District's Preschool Initiative classrooms promote areas of growth in both literacy and math for all students. The math goal in particular reads as such, "Of the total number of students enrolled in the Sioux City Preschool Initiative Program, 50% of the students will score proficient (scoring in the green on 3 out of 4 math subtests) on the IGDIs mathematics assessment by the end of the 2022-2023 school year" (A. Hannah, personal communication, March 2023). It is important to note that only students aged four by September 15, 2022, and five-year olds on IEPs, are screened for IGDIs; therefore, in the winter 655 students were assessed. Data collected in the Fall of 2022 showed that 6% of these students were meeting these criteria while winter data showed 24% of students were passing 3 out of 4 subtests. In comparison, 11% of students were scoring in the green for 3 out of 5 subtests in literacy in the fall and 27% in the winter.

While growth is being made, 26% or approximately 170 additional students of the 655 students eligible for IGDIs screenings still need to score in the green for 3 out of 4 math sub tests which include Oral Counting, Number Naming, Quantity Comparison, and 1-to-1 Correspondence Counting, by May of 2023. Another additional goal to increase the use of interventions is also being worked on and is as follows: "Preschool teachers in the Sioux City Community School District will respond to student data through the use of interventions, 15% (3 general education students out of each district classroom) will have evidence of receiving an intervention from the preschool MTSS intervention menu throughout the 2022-2023 school year" (A. Hannah, personal communication, March 2023). Currently these interventions include small group skills-based instruction or individualized instruction using a resource such as an

Intentional Teaching Card or Mighty Minute from the state supported Tier 1 curriculum, Creative Curriculum.

Teacher Work, Curriculum, Instructional Strategies, and Assessment Practices

SWVPP classrooms follow a schedule that utilizes an evidence-based curriculum, Creative Curriculum, which looks at the whole child and includes teaching and assessing skills in the areas of: Social-Emotional, Physical, Language, Cognitive, Literacy, Math, Science and Technology, Social Studies, The Arts, and English Language Acquisition. Preschool Initiative classrooms, including all ESCE and most community partner classrooms follow a regular school day schedule five days a week. In addition, some community programs may provide half-day or a couple of days a week option. A minimum of 10 hours of instruction are provided with SWVPP funding so parents may opt to only have their child attend preschool only during PI hours as tuition is charged for additional hours outside of PI time. Creative Curriculum is utilized throughout the school day based on the Iowa Early Learning Standards and includes the use of the GOLD Assessment along with the IGDIs screeners for math and literacy. The Iowa Early Learning Standards instruct teachers on what to teach, Creative Curriculum models for teachers how to teach, and GOLD is the assessment piece used to see how students are progressing in their learning.

According to the Iowa Department of Education website, any classroom receiving SWVPP funding is required to use the GOLD online assessment system per Iowa Code. There are 38+ GOLD objectives that teachers must assess preschool students in during three different checkpoint periods throughout the year. The GOLD objectives assess the whole child and include not only academic skills but also social-emotional areas of development. Staff use

anecdotal notes, pictures, videos, and on-the-spot collections as they score students' abilities and collect this information using iPads, phone apps, or hand-written documentation. Those students meeting age-appropriate expectations are found within their corresponding color band, students exceeding expectations are found outside the color band, and those not meeting expectations are below their color band. Parent-friendly reports can be shared with parents at the completion of each checkpoint. In addition, teachers have the option to print off class or individual child reports to use for future planning of instruction and interventions.

The Sioux City Community School District website goes on to share that staff provide modifications and adaptations to the curriculum to ensure that all children are successful. In addition, play is encouraged as it is the most important process through which young children learn. In fact, at least one hour of uninterrupted free play occurs in learning centers each morning and at least 30 minutes of free play in the afternoon. In addition, students should be provided with two 30-minute opportunities for outdoor play to encourage the development of large motor skills. Teachers structure their environments to create inviting and engaging developmentally-appropriate activities for students, often incorporating the use of studies. In addition, time for small groups and large group activities is provided. Students needing additional tiers of support may be provided interventions throughout the school day.

In addition to the GOLD assessment mentioned above, the SSCSD preschool teachers utilize the Individual Growth and Development Indicator (IGDI) screenings for literacy and math. IGDIS are completed in the fall, winter, and spring. According to McConnell (2020), the early literacy measures include: Picture Naming, Rhyming, What One Doesn't Belong, Sound Identification, and Alliteration (winter and spring only), and the early math measures include:

Oral Counting, Number Naming, Quantity Comparison, and 1-to-1 Correspondence Counting. Paper math kits and scoring sheets are used to administer and score math screenings while iPads are utilized for literacy screenings. Students' scores appear in the green (meeting benchmark), orange (need of intervention to achieve kindergarten readiness), or red (at risk and may be struggling with core instruction) color bands (McConnell, 2020). In addition, every three weeks teachers may progress monitor students to see if planned interventions are improving students' scores. McConnell echoes these sentiments sharing, "Children who benefit from a great 'universal' program continue to progress, while those who need supplemental or more intensive supports receive them to accelerate their development" (2020).

Professional Development

Preschool Initiative teachers participate in professional development (PD) opportunities prior to the start of the school year, several Monday afternoons a month, and at least one additional day during the school year. Additional PD opportunities to ensure that ECSE teachers stay current on special education practices are also provided on some Mondays. According to the Iowa Department of Education's document, *Statewide Voluntary Preschool Program Frequently Asked Questions*, districts that are part of the SWVPP should provide a minimum of 15 hours per year in staff development (2020). Professional development offered during the 2022-2023 school year has consisted of opportunities to learn more about bottom-tier practices, special education sessions, along with some PD on math and literacy practices and the foundational pieces of MTSS.

Needs Assessment

The time is now for the Sioux City Community School District to implement MTSS for mathematics instruction in all preschool classrooms. Data is showing us that not all students are responding to a generalized math curriculum and that some students need additional tiers of support to learn early math skills. Currently students are provided Tier 1 interventions using small group skill-based instruction utilizing Creative Curriculum. Some may wonder why such a focused system of support for mathematics instruction should begin with children as young as four years old. According to Gersten, “Early intervention in pre-K and Kindergarten rests on the idea of helping to set the stage for student ability to benefit from classroom mathematics instruction during subsequent grades” (2016, p. 686). In short, early intervention is key for a student’s future learning.

While currently students in the SCCSD preschool classrooms and community partner locations are making progress from fall (6%) to winter (24%) on the math IGDI screeners, work still needs to be made to reach the programs goal of 50% of students proficient in 3 out of 4 math screeners. From fall to winter there was an 18% increase. Even if students would progress at that same rate from winter to spring screening points, that would only make for a total year end increase of 42%, not meeting the district goal of 50%. In addition, the district may in the future find that 50% of students meeting the program expectations is not enough. According to the Wayne RESA document (n.d.), *Quick Guide for Multi-Tiered System of Supports: The Classroom*, 80% of students in Tier 1 are expected to meet learning targets, 10-15% at the Tier 2 level will need targeted supplemental interventions and supports, and 1-5% at the Tier 3 level

will need intensive individualized interventions and supports. Therefore, the districts' goal of 50% may need to be increased to closer to the suggested 80%.

Implementing a MTSS for math instruction in Sioux City Community School District preschool program classrooms to its fullest capacity is also supported at the state level. According to the Iowa Department of Education website page entitled *Muti-Tiered Systems of Support*, "Many Iowa schools are successfully implementing components of MTSS. Together, we will move MTSS to consistent statewide implementation in every Iowa classroom." In addition, the Iowa Department of Education website specifically lays out a framework made up of five components including evidence-based curriculum and instruction for all, universal screening, evidence-based interventions at target and intensified levels, continued progress monitoring, and data-based decision making throughout, that the SCCSD utilizes in their implementation of a MTSS.

Therefore, in looking at the school profile information listed above, two areas coincide with one another and need to both be addressed to make improvements in students' mathematical learning and success. Those two areas in need of improvement are Curriculum & Instruction and Professional Development & Staff Capacity. Assuring that curriculum resources and instructional strategies are available for each tier of instruction is vital. In addition to implementing a MTSS for mathematics instruction, preschool teachers in the SCCSD Preschool Initiative classrooms will need to be properly trained on new or supplemental curriculum resources. Research also shows that teachers will also need to build their capacity and confidence in teaching math to young children, as many teachers do not feel equipped with the proper knowledge to do so. Litkowski et al. (2020) states "Anxiety and lower personal mathematics

teaching efficacy (Bates, Latham, & Kim, 2011; Gresham, 2007; Swars, Daane, & Giesen, 2006) likely stem from the minimal amount of mathematics training preservice teachers receive prior to entering the classroom—training that generally emphasizes learning ‘facts’ over acquiring a conceptual understanding” (p. 5, Garet, Porter, Desimone, Birman, & Yoon, 2001; Ginsburg, Lee, & Boyd, 2008; Sarama, DiBiase, Clements, & Spitler, 2004).

Data Analysis

Data Summary

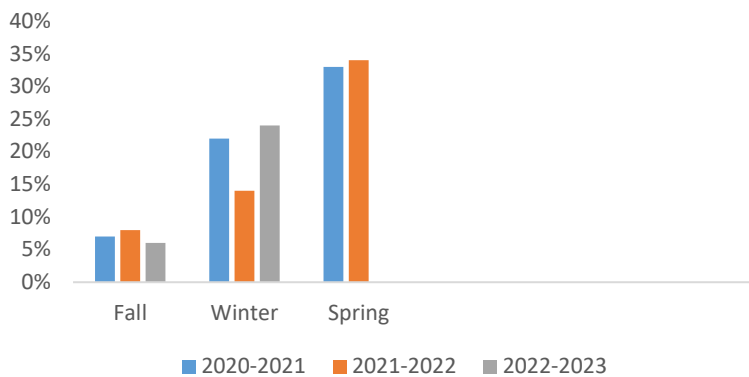
The Sioux City Community School District continues to place emphasis on math instruction even in the preschool setting. Goals are set by the administration to improve math scores from fall to spring. Three times per year, fall, winter, and spring, preschool students are screened in mathematics utilizing Individual Growth and Development Indicators (IGDIs). The preschool goal is based on the number of students who can score in the green (proficient) for three out of the 4 subtests. Once again, these subtests screened include Oral Counting, Number Naming, Quantity Comparison, and 1-to-1 Correspondence Counting.

Historically, preschool students in the SCCSD have shown growth from fall to spring as can be seen in Figure 5. During the 2020-2021 school year data showed that in the fall 7% of students were in the green for 3 or more subtests and in the spring 33% were for an increase of 26%. In the 2021-2022 school year, 8% were in the green for 3 or more subtests in the spring and 34% in the winter were for an increase once again of 26%. For the 2022-2023 school year, spring screenings have not yet taken place, yet the growth from fall to winter was 18%. Greenwood et al. share how the results of the screeners can be utilized: “This information enables parents and professionals to judge a child’s need for a change in intervention while receiving services, and

also the extent that intervention services as provided are increasing the probability of achieving desired short- and long-term outcomes” (2011, p. 258).

Figure 5

Percentage of Students Passing 3 or More Math Tests



While growth is being made, the real issue at hand is if enough growth is being made. If early intervention is key, is enough intervention being put in place to assure that all students can succeed? Is data guiding instruction and decision-making practices on an ongoing basis? Data showed us at the end of the last two school years that only 33% and 34% of the students were meeting in three out of the four math subtests. In addition, only 1% more of the students improved from one year to the next. This clearly shows that continued improvements could be made to provide multi-tiered layers of support for the preschool students in the SCCSD. Now is the time to focus not only on providing intervention but on continuing to assure that that intervention is working, and knowing when students need to move to the next tier of support.

School Strengths

The Sioux City Community School District is currently on the right path as they have invested time and resources into summer professional development opportunities and have

continued to provide time for Building Leadership Teams (BLT) to meet to focus on MTSSs for math, literacy, and behavior. What is even more beneficial is that they see the importance of including the preschool classrooms in this work. As mentioned above, scores are improving throughout each screening period. The preschool classrooms are also prioritizing time to progress monitor students and are slowly taking time to analyze data.

Creative Curriculum is used as the Tier 1 instruction for all students who are a part of the SCCSD Preschool Initiative classrooms and includes opportunities throughout the day to promote learning of mathematical concepts. Small group instruction focused on using Intentional Teaching Cards provides opportunities to work on math objectives that are encouraged throughout the week. In addition, Mighty Minute cards with math games and activities can be utilized by teachers as they transition from one activity to the next. Large group time provides opportunities for students to work on math skills as they discuss the question of the day, count students, and engaged in reading math-related stories and books.

School Challenges

While value and importance are placed on quality math instruction in the preschool classrooms for all students, some challenges do exist. Those challenges include having enough time to implement additional layers of support into the school day. Another challenge is staffing issues. Finding money to allocate towards resources and training for additional curriculum necessary for Tier 2 and Tier 3 instruction also accounts for challenges when it comes to implementing a MTSS in preschool classrooms. A deeper understanding of a MTSS and the ability along with the confidence to provide instruction at all three levels is also a challenge for some staff. IGDI math screeners include four subtests, and some students may struggle in more

than one math content area, thus putting pressure on the teacher to determine which area to begin providing additional layers of support. Finally, monitoring fidelity of implementation of curriculum and interventions at each level and also assuring that quality data driven decisions are being made may be one of the biggest challenges for the SCCSD.

Assessment Options

When it comes to assessing preschool students, IGDI math screenings do suffice. IGDI's provide opportunities to screen children in the fall, winter, and spring. In addition, three weeks after each screening, those students who need additional support can be progress monitored every three weeks. The importance of play in the preschool setting needs to be valued to avoid over-testing of students. Along with the IGDI screening, teachers can collect additional math data on students using GOLD, the assessment piece that aligns with Creative Curriculum and assesses the preschool students in several math areas. GOLD checkpoints are also three times a year and do not always align with the IGDI screening windows, therefore they are able to provide an additional piece of data.

One assessment opportunity, however, may be overlooked. This assessment does not involve the students but rather the classroom teachers and staff. Assessing classroom implementation of Tier 1 curriculum and resources may be a point of contention in some of the SCCSD classrooms. If we are providing Tier 2 intervention for more than half of our students, something at the Tier 1 level of instruction may be missing. Are teachers using the Creative Curriculum math components with fidelity? Are opportunities for math instruction embedded in daily routines? Are students provided hands on materials during center time to practice math skills? Are books related to math concepts read during read-aloud times? The best Tier 2 is a

strong Tier 1. Therefore, a universal screener for classroom Tier 1 practices may be one of the best assessments to implement.

Action Plan

Purposed Improvement Plan

For this action plan to be successful, a team of leaders among the preschool programs must be created. “The best laid plans for systems change will not be successful without teachers and administrators who are committed to altering current practices and learning new approaches” (Mason et al., 2019, p. 208, as previously stated by Aladjem & Borman 2006). Therefore, the district will want to begin by ensuring that current members of the Building Leadership Team (BLT), SCCSD Preschool Initiative administrator, preschool instructional coaches, and classroom teachers in the preschool ESCE classroom and community programs, with consultation from the Early Childhood Consultant assigned to the district from the Northwest Area Education Agency (AEA) as needed, are still committed to being a part of the team. In order to promote teacher buy-in, Mason et al. (2019) share that the BLT will want to look at the school mission, create a culture of feedback, leverage accomplishments within the building (Borman, Carter Aladjem, & LeFloch, 2004), and increase professional development opportunities (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009).

After reviewing current data and relevant research along with establishing a BLT, multiple themes were identified in support of this plan for establishing MTSS for math instruction within the Sioux City Community School District Preschool Initiative classrooms. These themes include establishing Tier 1, 2, and 3 systems of support, providing professional development and support to classroom teachers and staff, and developing a system for ongoing

review of data. A clear understanding of what each tier of support should look like is key so that teachers can plan for instruction at each level. In addition, providing math instruction may be an area where teachers need ongoing professional development opportunities and support such as coaching. Finally, without utilizing ongoing assessment and review of data, teachers will not be able to see if students are making progress at the individualized level they deserve. By devoting time and resources to mathematics instruction, preschoolers leaving the SCCSD Preschool Initiative classrooms will have a solid math foundation to prepare them for future learning.

Tier 1 mathematics instruction is intended for all students. Currently the SCCSD has a general education curriculum, Creative Curriculum, which could continue to be used at the Tier 1 level. Creative Curriculum Intentional Teaching Cards will be used to provide small group instruction along with Mighty Minutes related to math concepts to be utilized during transitions. However, moving forward, teachers will need to be more intentional about planning for these small groups and transition activities by providing at least one opportunity a day for planned math teaching. In addition, components such as providing developmentally appropriate and engaging math materials throughout learning centers and expanding math talk during read-alouds could be utilized to strengthen Tier 1 instruction. The SCCSD Preschool Initiative Classrooms have already implemented small group skills-based instruction at the Tier 1 level to provide students who do not respond to whole group or small group instruction an additional opportunity to strengthen math skills.

At the Tier 2 level, teachers will need to move beyond current practices and utilize curriculum beyond Creative Curriculum to reach students not responding to general education instruction. McGraw Hill has a curriculum resource that the district will need to purchase to

provide additional tiers of instruction for students. That curriculum resource backed by research gathered for this action plan is Building Blocks. According to the McGraw Hill website, “*Building Blocks*™ embeds mathematical learning in PreK students’ daily activities—from designated math activities to circle and story time—to relate informal math knowledge to formal concepts.” Teachers and staff will utilize Building Blocks to provide small group instruction at the Tier 2 level to students by embedding instruction into already-established parts of the day such as center time.

Tier 3 instruction is reserved for the top 5-10% of students who have not responded to Tier 2 instruction. While work in MTSS math instruction is new, Tier 3 is an area that continues to be studied and researched. Research done on Tier 3 curriculum to teach early literacy skills states, “Most discussions of Tier 3 support for young children, in fact, simply propose using best practice guidelines to develop additional activities to supplement currently available Tier 1 and Tier 2 curricula” (Kaminski et al., 2015, p. 314, as previously stated by Ball & Trammell, 2011; Barnett, VanDerHeyden, & Witt, 2007). Therefore, the Building Blocks curriculum will also be used at the Tier 3 level. However, students at this level will receive instruction in a one-on-one setting with a staff member and at a higher rate of instruction than students at the Tier 2 level, to promote engagement and focused attention. Research done by Kong et al. (2021) on a supplemental pre-kindergarten vocabulary intervention suggests that students may also benefit from pre-teaching, increased opportunities to respond, individual promoting and scaffolding, and corrective, response-contingent feedback. These same concepts could be applied to preschool math instruction at the Tier 3 level. It should also be noted that as research continues to evolve, the district may find other resources to utilize at the Tier 3 level.

In a PBS News Hour segment, *Counting the benefits of teaching math to 3-year-olds*, the idea of teacher buy-in and teacher understanding of math concepts was addressed. The segment shared that it is important for preschool teachers to not only understand math topics but also how children learn about those topics (2016). Therefore, ongoing professional development opportunities will need to be provided to the SCCSD Preschool Initiative Teachers and Staff. Professional development opportunities around teaching mathematics skills to preschoolers should be provided at least monthly during the Monday early-out professional development times. Professional development on utilizing Creative Curriculum at the Tier 1 level, to include providing math materials throughout learning centers, will need to occur. In addition, at the Tier 1 level, PD will include instruction for teachers on how to incorporate math talk during shared reading experiences which are already naturally occurring in preschool classrooms. The resource *Finding Great Math in Great Books* and the *Math Talk Reader's Guide*, both listed in the Appendix, will be shared with teachers to help support utilizing more math talk. Teachers will also need to be provided with training on implementing Building Blocks curriculum at the Tier 2 and Tier 3 levels. Professional development on Building Blocks will "...enhance teachers' knowledge of the instructional activities designed to teach children the content and process defining the level of thinking in the developmental progressions and to inform teachers of the rationale for the instructional design of each activity" (Clements et al., 2020, p. 306).

While ongoing professional development will be essential to establishing a MTSS for mathematics instruction at the preschool level, staff may need additional support. Thus, each classroom will be provided coaching as needed to improve their Tier 1, Tier 2, and Tier 3 instruction. Coaches will begin by helping teachers take inventory of current math materials

using the Preschool Classroom Math Materials Inventory listed in the Appendix. In addition, coaches will utilize the mathematics section for Teacher-Child Interactions math section on pg. 28 and the Physical Environment indicator 3h – pg. 16 of *The Fidelity Tool Teacher Checklist* from Teaching Strategies at least once a semester and more often for teachers not meeting 6/7 of these indicators. This will allow for a baseline on how the curriculum is being implemented at a Tier 1 level and will include observing what math-related center materials are currently available throughout the classroom. Once coaching around bottom Tier 1 practices are in place, coaching can move to a Tier 2 and later Tier 3 focus. Ongoing coaching in the form of modeling, observing, and providing feedback will be provided throughout the year as requested by the teacher and administration.

The overarching theme around providing a MTSS in the area of early mathematics is that decisions on instruction will be based on data. Therefore, in addition to receiving professional development opportunities on providing quality math instruction at all levels, teachers will receive ongoing professional development and coaching centered around how to utilize data to drive instruction. It is important to note that currently teachers do take time to assess children but often it is more of a checklist item. The missing piece is often taking time to look at that data and using that data to make informed decisions on what each child needs in order to be successful. Therefore, teachers and coaches will work together monthly to fill out the Data Review Form included in the Appendix. In addition, teachers will need to learn to progress monitor students receiving interventions in a timely manner so that ongoing changes can be made in the delivery of instruction.

Alignment to Research

Wang et al. share “The early childhood years are critical in developing early mathematics skills, but the opportunities one has to learn mathematics tend to be limited, preventing the development of significant mathematics learning” (2016, p. 692). In addition, research shows that funding for math instruction has been historically disproportionate to that of reading (Mason et al, 2019, as previously stated by Bishop, 2010). Therefore, the SCCSD currently has a unique opportunity to go against the traditional norms by providing opportunities for students of all learning levels and abilities to engage in early math instruction in order to prepare them for future mathematical learning.

Implementation of School Improvement Plan

Introduction

In order for the SCCSD to follow the school improvement plan of providing a MTSS for mathematics in their Preschool Initiative classrooms, a timeline will need to be implemented for successful integration. The timeline shared below will be presented first to the administration for approval and then shared with teachers and staff. Buy-in will first need to be created, especially for those in second-order change. Next, the themes, including establishing Tier 1, 2, and 3 systems of support, providing professional development and support to classroom teachers and staff, and developing a system for ongoing review of data will need to be shared. All the while, the school district must continue to remain vigilant in keeping up with current research and development, especially in the area of Tier 3 mathematics instruction for young learners.

Timeline, Role Clarifications and Assignments, Progress Monitoring

Month	Activity	Person Responsible
August	Tier Focus: Tier 1	
	<p>Professional Development Focus: Review of Creative Curriculum teaching practices to include embedding math materials into centers-during a half day PD prior to school starting</p>	<p>Lead by professionals from Teaching Strategies-arranged by administration. Administration, teachers, and coaches to attend</p>
	<p>Overview of the MTSS for math instruction in preschool-during a half day PD prior to school starting</p>	<p>Building Leadership Team (BLT) – comprised of administrator, teachers from district ECSE and community site classrooms, and coaches; Administration, teachers, and coaches to attend</p>
	<p>IGDIs email sent – Directions on how to enter students into the system and instructional videos for teachers to watch on how to administer math screenings</p>	<p>Sent by administrator</p>
	<p>Coaching Support: Visit classrooms to help with room arrangement of centers and assist with taking inventory of current math materials using the Preschool Classroom Math Materials Inventory (see Appendix) and utilize the Physical Environment Section of <i>The Fidelity Tool Teacher Checklist</i> for Creative Curriculum from Teaching Strategies pgs. 12-18</p>	<p>Coach and teacher</p>
	<p>Create a list of any math related items from the Preschool Classroom Math Materials Inventory that they do not have</p>	<p>Teachers</p>
	<p>Compile a list from all classroom teachers they coach and give to administrator</p>	<p>Coaches</p>
	<p>Order placed for missing math resources</p>	<p>Administrator</p>

	<p>Data Review: Create a data review template for teachers to use throughout the school year (such as the Data Review form in Appendix)</p> <p>Assure that IGDIs math assessment kits and data sheets are ordered</p>	<p>BLT</p> <p>Administrator</p>
	<p>Resources: Preschool Classroom Math Materials Inventory, <i>The Fidelity Tool Teacher Checklist</i>, <i>The Creative Curriculum for Preschool Volume 4 Mathematics book</i>, IGDIs math kit and scoring sheets</p>	<p>Administrator to share with staff and order necessary materials</p>
<p>September</p>	<p>Tier Focus: Tier 1 & Tier 2</p>	
	<p>Professional Development: How to utilize math talk during shared reading experiences- incorporate how to fill out Math Talk Reader’s Guide (see Appendix)-during a half day PD prior to school starting</p> <p>How to incorporate small group skill-based instruction at the Tier 1 level-during a half day PD prior to school starting</p> <p>Make and take for math talk shared reading activities during-during a Monday PD time slot</p> <p>Email reminder to share screening results and helpful at home activities for parents to do with their child</p>	<p>Lead by preschool instructional coaches and administrator; Administrator, teachers, and coaches to attend</p> <p>AEA Early Childhood Consultant</p> <p>BLT to select books from resource Finding Great Math in Great Books (see Appendix), and create activities, and visuals for teachers to make</p> <p>Administrator</p>
	<p>Coaching Support: Classroom observation to complete <i>The Fidelity Tool Teacher Checklist</i> from Teaching Strategies for Teacher-Child Interactions math section pg. 28 and Physical Environment indicator 3h – pg. 16</p>	<p>Coach and classroom staff</p>

	<p>Coaching session to review completed <i>The Fidelity Tool Teacher Checklist</i> and create a coaching goal around implementation of Tier 1 for those meeting less than 6/7 areas</p> <p>Classroom observation on math talk utilized during a read-aloud using Math Talk Observation Tool (see Appendix)</p> <p>Coaching session on observation review of math talk during the read-aloud and create possible goals – Math Talk Observation Tool (see Appendix)</p> <p>Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs</p>	<p>Coach and classroom staff</p> <p>Coach</p> <p>Coach and teacher</p> <p>Administrator & coaches</p>
	<p>Data Review: Teachers administer the fall screening of all four math IGDIS screeners</p> <p>Data review of baseline information using Data Review Form–Select one IGDIS math subtest area for any students not in green for 3/4 subtests and place student in at Tier 1 small group skill-based instruction group–plan for first progress monitoring date</p> <p>Share with parents results of fall IGDIs math screeners via IGDIs parent letter (see Appendix)</p>	<p>Teachers and staff</p> <p>Coach and teacher</p> <p>Teacher</p>
	<p>Resources: Books from resource Finding Great Math in Great Books, materials to go along with math talk read-alouds, Math Talk Readers Guide (see Appendix), <i>The Fidelity Tool Teacher Checklist</i>, IGDIs math kit & scoring sheets, parent letter with IGDIs results (see Appendix), Data Review Form</p>	<p>Administrator & BLT</p> <p>Coach Teacher</p>

October	Tier Focus: Tier 1 & 2	
	Professional Development: How to use data to drive instruction and sharing data with families-during a Monday PD time slot	Lead by Representative from Renaissance (myIGDIs)- arranged by administration; Administrator, teachers, and coaches to attend
	How to implement Building Blocks focusing on Tier 2 part 1-during a full day PD on the last Friday of the month	Lead by professionals from McGraw Hill- arranged by administrator; Administrator, teachers, and coaches to attend
	Teacher to plan a family involvement activity based around math	Teacher
	Coaching Support: Monthly meeting to review student data and progress monitoring results	Coach and teacher
	Observation on Tier 1 CC <i>The Fidelity Tool Teacher Checklist</i> goal	Coach
	Coaching session to review observation and set additional goals	Coach and Teacher
	Support from coach as needed to help plan family involvement activity	Coach and teacher
	Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs	Administrator & coaches
	Data Review: First round of progress monitoring – for one IGDIS math subtest area for any students not in green for 3/4 subtests-three weeks after fall screening	Teacher
	Review progress monitoring results–make changes to Tier 1 intervention for students not responding to Tier 1 small group skills-based instruction after first round of progress	Coach and teacher

	monitoring using the Data Review Form	
	<p>Resources: Building Blocks curriculum kit, CC <i>The Fidelity Tool Teacher Checklist</i>, IGDIs math kit & scoring sheets for progress monitoring, family involvement activities and resources, Data Review Form</p>	Administrator Coach Teacher
November	Tier Focus: Tier 1 & Tier 2	
	<p>Professional Development: Planning for Tier 2 interventions- during one Monday PD time slot</p>	Led by BLT; Administrator, teachers, and coaches to attend
	<p>Coaching Support: Observation of teachers implementing Tier 1 interventions utilizing the Intervention Fidelity Resource (see Appendix)</p>	Coach
	Coaching session to review Tier 1 intervention fidelity observation and set possible goals	Coach & teacher
	Classroom visit and/or observation on additional goal based on <i>The Fidelity Tool Teacher Checklist</i> for those teachers needing additional support	Coach & teacher
<p>Data Review: Progress Monitoring students participating in Tier 1 interventions – three weeks after initial round of progress monitoring</p>	Teacher	
Review progress monitoring results– plan Tier 2 intervention in one subtest area for students not responding to Tier 1 small group skills-based instruction using Data Review Form Review Winter GOLD math data	Coach and teacher	
Share with parents results of Fall GOLD checkpoint data	Teacher	

	<p>Resources: <i>CC The Fidelity Tool Teacher Checklist</i> goal, Intervention Fidelity Resource, IGDIs math kit & scoring sheets for progress monitoring, Building Blocks curriculum kit, Data Review Form</p>	<p>Coach Teacher</p>
December	<p>Tier Focus: Tier 1 & Tier 2</p>	
	<p>Professional Development: Review implementation of Tier 1 instruction (Creative Curriculum, Small group skill-based instruction, utilizing math materials at centers, and embedded math talk during read-alouds); what’s working and what is not working-during one Monday PD time slot</p>	<p>Lead by administrator; Administrator, teachers, and coaches to attend</p>
	<p>Coaching Support: Observation of teachers implementing Tier 2 interventions utilizing the Intervention Fidelity Resource</p>	<p>Coach</p>
	<p>Coaching session to review Tier 2 intervention fidelity observation and set possible goals</p>	<p>Coach and teacher</p>
	<p>Highlighting teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs</p>	<p>Administrator and coaches</p>
<p>Data Review: Data review of progress monitoring results - data review sheet (see Appendix)</p>	<p>Coach and teacher</p>	
<p>Resources: <i>The Fidelity Tool Teacher Checklist</i>, Math Talk Observation Tool, IGDIs math kits & scoring sheets for progress monitoring, Preschool Classroom Math Materials Inventory, <i>The Creative Curriculum for Preschool Volume 4 Mathematics book</i>, IGDIs math kit and scoring sheets, Data Review Form</p>	<p>Coach Teacher</p>	

January	<p>Tier Focus: Tier 1, 2, 3</p>	
	<p>Professional Development: How to implement Building Blocks part 2 focusing on Tier 2 in the morning and Tier 3 instruction in the afternoon-during one all day PD on the third Friday of the month</p>	<p>Lead by professionals from McGraw Hill- arranged by administrator. Administrator, teachers, and coaches to attend</p>
	<p>Email reminder to share screening results and helpful at home activities for parents to do with their child</p>	<p>Administrator</p>
	<p>Coaching Support: Second round of classroom observation to complete <i>The Fidelity Tool Teacher Checklist</i> Teacher-Child Interactions math section pgs. 28 and Physical Environment indicator 3h – pg. 16 for those who did not meeting 6/7 indicators in the fall</p>	<p>Coach</p>
	<p>Coaching session to review completed <i>The Fidelity Tool Teacher Checklist</i> and create any additional goals around implementation of Tier 1</p> <p>Classroom observation on math talk utilized during a read-aloud using Math Talk Observation Tool</p> <p>Coaching session on observation review of math talk and create possible goals – Math Talk Observation Tool</p> <p>Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs</p>	<p>Coach and teacher</p> <p>Coach</p> <p>Coach and teacher</p> <p>Administrator and coaches</p>
<p>Data Review: Teachers administer the winter screening of all four math IGDIS screeners</p>	<p>Teacher</p>	

	Data review of winter screening- select one IGDIS math subtest area for any students not in green for 3/4 subtests and plan for Tier 2 using the Data Review Form - plan for first progress monitoring date	Coach and teacher
	Share with parents results of winter IGDIs math screeners via IGDIs parent letter	Teacher
	Resources: CC <i>The Fidelity Tool Teacher Checklist</i> goal, IGDIs math kit & scoring sheets for winter screening, Building Blocks curriculum kit, IGDIs parent letter, Data Review Form	Coach Teacher
February	Tier Focus: Tier 1, 2, 3	
	Professional Development: How to plan for Tier 3 interventions- during one Monday PD time slot	Led by BLT; Administrator, teachers, and coaches to attend
	Teacher to plan a family involvement activity based around math	Teacher
	Coaching Support: Classroom observation of <i>The Fidelity Tool Teacher Checklist</i> or math talk goals	Coach
	Coaching session to review observation	Coach and teacher
	Observation of teachers implementing Tier 2 interventions utilizing the Intervention Fidelity Resource	Coach
	Coaching session to review Tier 2 intervention fidelity observation and set possible goals	Coach and teacher
	Support from coach as needed to help plan family involvement activity	Coach

	Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs	Administrator and coaches
	<p>Data Review: First round of progress monitoring-for one IGDIS math subtest area for any students not in green for 3/4 subtests-three weeks after winter screening</p> <p>Review progress monitoring results–make changes to Tier 2 intervention for students not responding to Tier 2 intervention after first round of progress monitoring using the Data Review Form Review Winter GOLD math data</p> <p>Share with parents results of Winter GOLD checkpoint data</p>	<p>Teachers</p> <p>Coach and teacher</p> <p>Teacher</p>
	<p>Resources: IGDIs math kit & scoring sheets for progress monitoring, Building Blocks curriculum kit, family involvement activities and resources, Data Review Form</p>	Teacher
March	Tier Focus: Tier 1, 2, 3	
	<p>Professional Development: Optional (for extra pay) Book Study – <i>Big Ideas of Early Mathematics</i> Day 1</p> <p>How to continue to look at data to plan for Tier 2 & Tier 3 Interventions-during one Monday PD time slot</p>	<p>Led by BLT; Administrator, teachers, and coaches to who choose to attend</p> <p>Representative from Renaissance (myIGDIs)-arranged by administration</p>
	<p>Coaching Support: Classroom observation of fidelity of Tier 2 & 3 using Intervention Fidelity Resource</p> <p>Coaching session to review intervention fidelity observation and set possible goals</p>	<p>Coach</p> <p>Coach and Teacher</p>

	Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs	Administrator and coaches
	<p>Data Review: Progress Monitor of students receiving Tier 2 interventions</p> <p>Review data and move to Tier 3 interventions for students not responding to Tier 2 interventions in one subtest; if students moved to the green in one subtest, an additional Tier 2 intervention could be planned for another subtest area student is not in the green using Data Review Form</p>	<p>Teacher</p> <p>Coach and Teacher</p>
	<p>Resources: Intervention Fidelity Resource, IGDIs math kit & scoring sheets for progress monitoring, Building Blocks curriculum kit, book - <i>Big Ideas of Early Mathematics</i>, Data Review Form</p>	<p>Coach</p> <p>Teacher</p>
April	Tier Focus: Tier 1, 2, 3	
	<p>Professional Development: Optional (for extra pay) Book Study - <i>Big Ideas of Early Mathematics Day 2</i></p> <p>Providing quality instructional strategies to include modeling, prompting, directives, providing information about the skill, and discussion (Hardy and Hemmeter, 2019) part 1-during one Monday PD time slot</p>	<p>Led by BLT; Administrator, teachers, and coaches to who choose to attend</p> <p>Lead by representative from the Erickson Institute-arranged by administration; Administrator, teachers, and coaches to attend</p>
	<p>Coaching Support: Classroom observation of fidelity of Tier 2 & 3 using Intervention Fidelity Resource</p> <p>Coaching session to review intervention fidelity observation and set possible goals</p>	<p>Coach</p> <p>Coach and teacher</p>

	<p>Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs</p>	<p>Administrator and coaches</p>
	<p>Data Review: Progress Monitor students receiving Tier 2 & 3 interventions</p> <p>Review data and move to Tier 3 interventions for students not responding to Tier 2 interventions in one subtest; if students moved to the green in one subtest, an additional Tier 2 intervention could be planned for another subtest area student is not in the green using Data Review Form</p>	<p>Teacher</p> <p>Coach and Teacher</p>
	<p>Resources Intervention Fidelity Resource, IGDIs math kit & scoring sheets for progress monitoring, Building Blocks curriculum kit, book - <i>Big Ideas of Early Mathematics</i>, Data Review Form</p>	<p>Coach Teacher</p>
May	<p>Tier Focus: Tier 1, 2, 3</p>	
	<p>Professional Development: Optional (for extra pay) Book Study - <i>Big Ideas of Early Mathematics</i> Day 3</p> <p>Providing quality instructional strategies part 2-during one Monday PD time slot</p> <p>Teachers to fill out year-end reflection form via Google Forms</p> <p>Teacher to share activities parents can do with students at home during the summer around continued learning of math concepts</p>	<p>Led by BLT; Administrator, teachers, and coaches to who choose to attend</p> <p>Lead by representative from the Erickson Institute-arranged by administration; Administrator, teachers, and coaches to attend</p> <p>Created and reviewed by BLT; filled out by teachers</p> <p>Teachers</p>
	<p>Coaching Support: Coaching session to review what went well, what questions we still have, and possible PD topics for next year</p>	<p>Coach and teacher</p>

	Support from coach as needed to help with finding quality math activities to share with parents	Coach
	Highlight teacher accomplishments in the area of MTSS for math via email correspondence and newsletter shout outs	Administrator and coaches
	<p>Data Review: Teachers administer the spring screening of all four math IGDIs screeners</p> <p>Review yearly data</p> <p>Share with parents results of spring IGDIs math screeners via IGDIs parent letter and GOLD checkpoint data</p>	<p>Teacher</p> <p>Coach and teacher</p> <p>Teacher</p>
	<p>Resources: End of the year reflection form via Google Forms, IGDIs math kit & scoring sheets for spring screening, book - <i>Big Ideas of Early Mathematics</i>, IGDIs parent letter, activity ideas to share with parents, yearly data (GOLD & IGDIs), Data Review Form</p>	<p>BLT Teacher</p>

Limitations

Continued research is being conducted as to what quality instructional strategies are most successful when teaching early math skills to preschoolers. In addition, work is being done to determine what skills and concepts need to be taught to these early learners. Litkowski, et al. (2020) shares, "... much less empirical work exists on which specific mathematics skills children are demonstrating—and are capable of acquiring—during the preschool years, leaving researchers and teachers with ambiguous guidelines regarding how to support children’s mathematics development” (p. 2). McCoy et al. (2019) echoes these thoughts sharing that

“...additional work is needed to identify the best target skills for early intervention, as well as specific strategies, programs, and policies that might serve to sustain these skills over time” (p. 1551). The Sioux City Community School District’s Preschool Initiative’s BLT must be prepared to conduct ongoing research on a regular basis on how to best provide instruction at all three levels.

As a MTSS for mathematics instruction is rolled out in SCCSD’s Preschool Initiative classrooms, the Building Leadership will need to continue to find creative ways to build teachers’ capacities for teaching math skills to young learners, along with providing the time and resources to do so. Preschool teachers not only teach math skills but also instruct students in a variety of other content areas including social-emotional, physical, language, cognitive, literacy, science, social studies, and the arts. Therefore, the BLT will need to be strategic in rolling out this new initiative so that teachers do not simply think one more thing is being added to their plates.

Conclusion

According to an interview with Doug Clements on PBS News Hour, *Counting the Benefits of Teaching Math to 3-Year-Olds*, “Early math is cognitively fundamental. It’s not just about numbers and shapes. There’s reasoning and thinking embedded in what we do in early mathematics that forms the foundation for years to come” (2016). Therefore, by implementing a Multi-Tiered System of Support (MTSS) for math instruction in preschool, students can be provided with this foundation to prepare them for future learning success. On going screening and progress monitoring to make data-based decisions will assure that students will continue to be provided instruction at the appropriate tiered level of support, and changes to instruction will

be provided as needed. Evidence-based teaching strategies and developmentally appropriate materials for each tier of instruction will also enhance student learning for our youngest of learners. The time is now, and research suggests that early education may be the most important period in which to invest resources (Clements et al., 2011).

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Appendix

Preschool Classroom Math Materials Inventory

Toys & Games and Intervention Materials	
<input type="checkbox"/> Attribute Blocks (set of 60)	<input type="checkbox"/> Measuring cups 1 set 4 dry
<input type="checkbox"/> Balance Scale	<input type="checkbox"/> Measuring cups 1 set 3 liquid
<input type="checkbox"/> Bingo or lotto games	<input type="checkbox"/> Meter Sticks, Dual Scale (10)
<input type="checkbox"/> Collectibles (e.g., buttons, keys, natural materials)	<input type="checkbox"/> Numeral cards or number strips
<input type="checkbox"/> Connecting Cubes (pkg. of 100) - Connecting cubes 200	<input type="checkbox"/> Panda Bear Counters (set of 80)
<input type="checkbox"/> Connecting links	<input type="checkbox"/> Pattern Blocks (set of 250)
<input type="checkbox"/> Containers for sorting (e.g., trays, bowls, hoops, muffin tins, or clean egg cartons)	<input type="checkbox"/> Tangrams, pattern cards
<input type="checkbox"/> Counter chips (two sided) 450	<input type="checkbox"/> Rubber Bands (pkg. of 400)
<input type="checkbox"/> Counting Sticks (pkg. of 1000)	<input type="checkbox"/> Rulers, 6 inch/15 centimeter (2 pkgs. of 10)
<input type="checkbox"/> Cup Set, Standard (set of 4)	<input type="checkbox"/> Sequencing materials
<input type="checkbox"/> Dice, Blank (pkg. of 16)	<input type="checkbox"/> Shape templates for tracing
<input type="checkbox"/> Dice, Dot (pkg. of 12) – 24 total	<input type="checkbox"/> Spinners 1 pack (5 total)
<input type="checkbox"/> Dominoes, Double-9 (2 sets of 55) – 6/6 colors (2 sets 336)	<input type="checkbox"/> Storyboards
<input type="checkbox"/> Geoboards, Two-Sided, 7” x 7” (2)	<input type="checkbox"/> String beads and pattern cards
<input type="checkbox"/> Geometric solids (cube, sphere, cone, etc.)	<input type="checkbox"/> Tape Measure, 30 meters/100 feet
<input type="checkbox"/> Inch Cubes, Wood (4 pkgs. of 10) - 100	<input type="checkbox"/> Thermometer, Classroom
<input type="checkbox"/> Large foam dice (1 pair)	<input type="checkbox"/> Timer
<input type="checkbox"/> Magnetic and/or felt numbers and shapes	<input type="checkbox"/> Writing materials – paper and pencils
<input type="checkbox"/> Matching games (number and shapes)	<input type="checkbox"/> Measuring cups 1 set 4 dry

Block Area	
<input type="checkbox"/> Geometric solids	<input type="checkbox"/> Floor tiles, carpet pieces
<input type="checkbox"/> Cans, pipes, boxes, traffic cones	<input type="checkbox"/> Large pieces of cardboard
<input type="checkbox"/> Maps	<input type="checkbox"/> Measuring tools
<input type="checkbox"/> Photos of buildings and other structures illustrating shapes and patterns	<input type="checkbox"/> Writing and drawing materials
<input type="checkbox"/> Photos of children’s block constructions, their neighborhoods, and places the class has visited	<input type="checkbox"/> Floor tiles, carpet pieces

Dramatic Play	
<input type="checkbox"/> Calendar	<input type="checkbox"/> Muffin Tins and egg cartons
<input type="checkbox"/> Clock	<input type="checkbox"/> Clothes and accessories of varying sizes (e.g., socks, shoes, hats)
<input type="checkbox"/> Timer	<input type="checkbox"/> Wallets and purses
<input type="checkbox"/> Writing Material	<input type="checkbox"/> Play money
<input type="checkbox"/> Recipes	<input type="checkbox"/> Newspaper advertisements
<input type="checkbox"/> Cookbook	<input type="checkbox"/> Cash register
<input type="checkbox"/> List of emergency phone numbers	<input type="checkbox"/> Empty food containers
<input type="checkbox"/> Bowls, pots and pans, and wooden spoons of varying sizes	<input type="checkbox"/> Balance Scale

Art Area	
<input type="checkbox"/> Templates or stencils of geometric shapes	<input type="checkbox"/> Shape and numeral cookie cutters
<input type="checkbox"/> Shape sponges	<input type="checkbox"/> Printmaking materials (e.g., corks, spools, sponges, stamp pads)
<input type="checkbox"/> Wallpaper and fabric samples	<input type="checkbox"/> Modeling materials and tools
<input type="checkbox"/> Easel paper cut into a variety of shapes	<input type="checkbox"/> Collage and construction materials (e.g., Styrofoam packing sheets, pom poms, toilet paper and paper towel rolls of various sizes)
<input type="checkbox"/> Rulers	<input type="checkbox"/> Geometric solids
<input type="checkbox"/> Pipe cleaners	<input type="checkbox"/> Everyday materials in the shape of geometric solids (e.g., spools, boxes, cardboard tubes, cone-shaped cups)
<input type="checkbox"/> Brushes and/or rollers in two or more widths	

Library Area	
<input type="checkbox"/> Felt props for recalling counting or number stories or rhymes	<input type="checkbox"/> Story tapes or CDs that help children understand mathematical concepts
<input type="checkbox"/> Props for dramatizing or retelling stories that address mathematical concepts	<input type="checkbox"/> Charts of counting/number rhymes or changes
<input type="checkbox"/> Paper and writing/drawing tools so that children can make their own representation of a story or make number/counting books	<input type="checkbox"/> Class-made books (e.g., counting books, books of patterns children have created)

Discovery Area	
<input type="checkbox"/> Collections of natural materials for sorting (e.g., shells, leaves, seeds, soil, rocks)	<input type="checkbox"/> Non standardized measuring tools (e.g., string, paper clips, craft sticks)
<input type="checkbox"/> Sorting trays, bowls, or other containers (e.g., muffin tins, ice cube trays, clean egg cartons)	<input type="checkbox"/> Writing materials to record observations and data
<input type="checkbox"/> Standardized measuring tools (e.g., rulers, tape measures, liquid and dry measuring cups, balance scales, timers, calendar)	<input type="checkbox"/> Graphs and charts, including sequencing charts

Sand and Water	
<input type="checkbox"/> Rakes and large combs for creating patterns	<input type="checkbox"/> Containers of various dimensions (e.g., tall, short, narrow, wide)
<input type="checkbox"/> Collections for sorting, counting, weighing (e.g., shells, rocks, other natural materials)	<input type="checkbox"/> Containers with holes punched in sides and/or bottom
<input type="checkbox"/> Sorting and counting trays (e.g., muffin tins, ice cube trays, or clean egg cartons)	<input type="checkbox"/> Clear plastic liquid measuring cups
<input type="checkbox"/> Standard and non-standardized measuring tools (e.g., craft sticks, links)	<input type="checkbox"/> Boats or small trays that will serve as boats
<input type="checkbox"/> Molds of various shapes and sizes (e.g., cube, cone, cylinder)	<input type="checkbox"/> Collections of objects (e.g., plastic animals or people and materials such as corks for exploring the concepts of sinking and floating)
<input type="checkbox"/> Cookie Cutters (e.g., numeral and shape)	<input type="checkbox"/> Tubing and funnels, cooking baster
<input type="checkbox"/> Balance Scale	<input type="checkbox"/> Strainers of various sizes
<input type="checkbox"/> Props related to current topic of study	<input type="checkbox"/> Vinyl graph

Outdoors	
<input type="checkbox"/> Equipment of varying sizes (e.g., small, medium, large balls; streamers or ribbons of various lengths)	<input type="checkbox"/> Windsock or weathervane
<input type="checkbox"/> Magnifying glasses and binoculars for observing things near and far	<input type="checkbox"/> Sundial
<input type="checkbox"/> Materials to create an obstacle course or equipment that invites children to go over, under, around, and through	<input type="checkbox"/> Materials for outdoor sand and water mathematical explorations
<input type="checkbox"/> Standard and non-standardized measuring tools (e.g., rules, yardstick/meter stick, measuring tapes, craft sticks, connecting cubes, and plastic links)	<input type="checkbox"/> Muffin tins, egg cartons, or ice cube trays for sorting collections
<input type="checkbox"/> Nature guides (plant and animal identification books)	<input type="checkbox"/> Traffic signs related to direction, speed, and right-of-way (e.g., one way, U-turn, stop, speed limit, and yield)
<input type="checkbox"/> Rain gauge	<input type="checkbox"/> Clipboards, paper, and writing materials (for creating representations and drawings from a variety of perspectives)

Materials listed above came from the following resources:

- *The Creative Curriculum for Preschool Sixth Edition Volume 4 Mathematics* - Copley, J., Jones, C., Dighe, J., Bickart, T., Heroman, C., & Baker, H. (2016)
- McGraw Hill *Everyday Mathematics, Grade Pre-K, Basic Classroom Manipulative Kit* - <https://www.mheducation.com/prek-12/product/everyday-mathematics-grade-pre-k-basic-classroom-manipulative-kit/9780076003174.html>

Finding Great Math in Great Books

Books list created from the Finding Great Math in Great Books section of *Big Ideas of Early Mathematics*

Using Attributes to Make Collections

- *Five Creatures* by Emily Jenkins
- *Shoes, Shoes, Shoes* by Ann Moris
- *Is it Larger? Is it Smaller?* and *Shapes, Shapes, Shapes* by Tana Hoban
- *Goldilocks and the Three Bears* by Jan Brett
- *The Three Little Pigs* by Barbara McClintock
- *Are You Mother?* by P.D. Eastman
- *A Mother for Choco* by Keiko Kaza
- *Is Your Mana a Llama?* by Deborah Guarino
- “A Lost Button” from *Frog and Toad Are Friends* by Arnold Lobel

Number Sense

- *Anno’s Counting Book* by Mitsuno Anno
- *Ten Black Dots* by Donald Crews
- *Count and See* by Tana Hoban
- *Splash* by Ann Jonas

Counting

- *One Gorilla* by A. Morozumi
- *Fish Eyes* by Lois Ehlert
- *One Duck Stuck* by Phyllis Root
- *A Frog in the Bog* by Karma Wilson
- *Over in the Meadow*
- *This Jazz Man* by Karen Ehrdhard
- *Ten in a Bed* by Penny Dale
- *Five Little Monkeys* by Eileen Christelow
- *Ten, Nine, Eight* by Molly Bang
- *10 Minutes till Bedtime* by Peggy Rathman

Number Operations

- *One is a Snail, Ten is a Crab* by April Pulley Sayre
- *Over in the Meadow*
- *Hippos Go Berserk* by Sandra Boynton
- *More, Fewer, Less* by Tana Hoban
- *Five Creatures* by Emily Jenkins

Pattern

- *Lots and Lots of Zebra Stripes: Patterns in Nature* by Stephen R. Swinburne
- *Brown Bear, Brown Bear, What Do You See?* by Bill Martin Jr.
- *I Went Walking* by Sue Williams

- *Roosters Off to See the World* by Eric Carle
- *The Napping House* by Audrey Wood
- *Pattern Bugs* by Trudy Harris

Measurement

- *The Growing Story* and *Carrot Seed* both by Ruth Krauss
- *Tall* and *Where's My Teddy* both by Jez Alborough
- *Tikki Tikki Tembo* by Arlene Mosel
- *Next to an Ant* by Mara Rockliff
- *Actual Size* and *Prehistoric Actual Size* by Steve Jenkins

Data Analysis

- *Shoes, Shoes, Shoes* by Ann Morris
- *Whose Shoes? A Shoe for Every Job* by Stephen Swinburne
- *Whose Shoes Are These? A Look at Workers Footwear-Slippers, Sneakers, and Boots* by Laura Salas
- *Pete the Cat* books by Eric Litwin
- *Which Would You Rather Be?* by William Steig
- *The Best Part of Me: Children Talk about Their Bodies in Pictures and Words* by Wendy Ewald
- *Apples* by Gail Gibbons

Spatial Relationships

- *Rosie's Walk* and *Changes, Changes* by Pat Hutchins
- *Skip Across the Ocean* collected by Floella Benjamin
- *Acka Backa Book* collected by Opal Dunn
- *Going on a Bear Hunt*
- *Block City* by Daniel Kirk
- *Building a House* by Byron Barton
- *Houses and Homes* by Ann Morris
- *The Village of Round Houses and Square Houses* by Anna Grifalcone
- *Me on a Map* by Joan Sweeney
- *From Here to There* by Maria Cuyler
- *Where Do I Live?* By Neil Chesnow

Shape

- *Shapes, Shapes, Shapes* and *I Read Signs* by Tana Hoban
- *When a Line Bends...A Shape Begins* by Rhonda Greene
- *Mouse Shapes* by Ellen Stoll Walsh
- *Round is a Mooncake: A Book of Shapes* by Roseanne Thong and Grace Lin
- *Color Farm* and *Color Zoo* by Lois Ehlert
- *Whooo? Whoo?* and *Woof Woof* by David Carter
- *Grandfather Tang's Story* by Ann Tompert
- *Tangram Tales* by Diane De Las Casas

Math Talk Reader's Guide

Title of Book - _____

Objectives - _____

Key Concepts - _____

Objectives and concepts state the mathematical skill and knowledge reflected in the story

Vocabulary Words - _____

Vocabulary - listed terms that used in the story or related to the concepts and skills

Recommended Questions

1. _____

2. _____

3. _____

4. _____

5. _____

Be sure to provide students with feedback after each question is answered.

Suggestions for components of the readers guide taken from Hojniski, et al. (2016)

Math Talk Observation Tool

Teacher's Name _____ Date: _____

Title of the Book: _____

Objectives Discussed? Yes or No If yes, what were they: _____

Concepts Discussed? Yes or No If yes, what were they: _____

Vocabulary Words Discussed? Yes or No If yes, what were they: _____

At least 5 questions asked throughout the story? Yes or No

Feedback provided to students after questions? Yes or No

Teacher feedback from coach: _____

Intervention Fidelity Resource

Intervention Information:

Student's Name: _____ Observation Date: _____

Time of instruction: _____ Frequency of Instruction: _____

Intervention Implementation Review

Curriculum resource utilized: Mighty Minute Intentional Teaching Card Other _____

Materials used: _____

Setting: Individual Small Group Other _____

Intervention Steps:

- Review previous skill
- Introduce new skill
- Demonstrate new skill
- Do it together
- Do guided practice in a game
- Contextualize the skills

Total: _____ /6

Adapted from Kaminski et al. (2014) Reading Ready Early Literacy Intervention (RRELI)

lessons

Does observed intervention match the description listed on the intervention sheet? Yes or No

Follow-up needed or suggestions to improve use of curriculum resource:

Data Review Form

Based on Tilly Model (Greenwood et al., 2011) structures decision-making inquiry & reflection:

1. Universal screening – Is there a problem?
2. Clinical review – What’s causing this problem? – ruling out clinical issues
3. Intervention selection – What intervention should be used?
4. Fidelity of implementation – Is the intervention being implemented?
5. Progress monitoring – Is the intervention working?

<p>Norms</p> <ul style="list-style-type: none"> Be on time and start on time Provide professional responses/feedback related to data Honor the growth/learning of colleagues Use data to drive instructional changes

Student Information	Round one Date:	Round two Date:	Round three Date:
Name: Baseline: Math Subtest Area of Concern: OC NN QC 1:1	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:
Name: Baseline: Math Subtest Area of Concern: OC NN QC 1:1	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:
Name: Baseline: Math Subtest Area of Concern: OC NN QC 1:1	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:
Name: Baseline: Math Subtest Area of Concern: OC NN QC 1:1	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:
Name: Baseline: Math Subtest Area of Concern: OC NN QC 1:1	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:	Score: Tier: 1 2 3 Intervention: Next Steps: Changes to document:

Math Subtest Area of Concern: OC = Oral Counting, NN = Number Naming, QC = Quantity Comparison, 1:1 = 1-to-1 Correspondence Counting

Parents,

Your child was recently screened with a progress monitoring tool called Individual Growth and Development Indicators, or as we know it, IGDI's.



This is a very important math screening that assesses your child's progress in the four critical areas of early childhood math development. The four early math measures include: Oral Counting, Quantity Comparison, Number Naming, and 1-to-1 Correspondence Counting.

It is important to understand that it is common for initial scores to appear low or appear as if they identify an area of concern, especially in the fall.

My Child's Scores:

	Fall	Winter	Spring
Oral Counting			
Quantity Comparison			
Number Naming			
1 to 1 Correspondence			

I will continue to monitor the progress of your child towards a solid foundation in these math practices and will provide you updates on this progress throughout the year.

The following developmentally appropriate strategies can be used at home to continue to support the growth and development of your child. Working together we will give your child a higher chance of successfully progressing forward in these developmental areas.

Oral Counting:

- Count steps as you walk to different places
- Count how many houses are on your way to school
- Count while waiting for something
- Nursery rhymes: 5 Little Monkey's jumping on the bed
- Count while your child takes a bath, count to 10 while washing their hair



Quantity Comparison

- Roll 2 dice, talk about which one has more

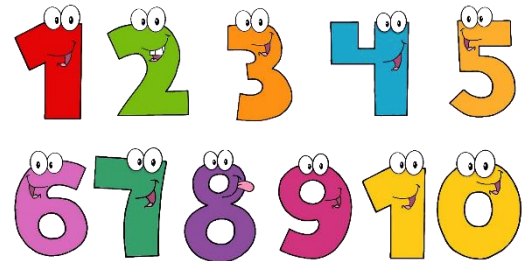
- Talk about who has more during a meal, more chips, less milk
- Build 2 towers and compare which one has more blocks
- Cook with your child, talk to your child about which ingredient has more / less
- Drop 10 pennies on the table, compare how many pennies are heads vs tails



Number Naming

- Point out numbers in environmental print
- Create a hopscotch with numbers and play
- Play card games, Ex: Play Go Fish, talk about the numbers as you play
- Look for numbers while out shopping, Ex: look for 1 while at Walmart
- Check out and read number books

- Chicka Chicka 1, 2, 3
- 10 Black Dots
- 10 on a Sled
- 5 Little Ducks
- 5 Little Monkey's Jumping on the bed
- How Do Dinosaurs Count to 10



1 to 1 Correspondence

- Count out dishes / food while setting table
- Play games and help child move their piece the correct amount of spaces
- Check out and read number books
- When reading stories, pick one object to count as you read, Ex: flowers
- Number exercises: Jump 5 times, Clap 10 times, do 7 sit ups

