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Strengthening Executive Function and Self-Regulation in Early Childhood Classroom

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Abstract

Executive function (EF) is an umbrella term used to describe the group of higher order thinking and regulatory processes. They are the brain functions that enable working memory, inhibitory control, and attentional or mental flexibility and there are many factors that impact the early development. Research confirms that EF skills are malleable and can be improved through preschool experiences. Early support and intervention are especially important for children who enter school with poorer executive function skills and are at risk because of social, economic, or other adverse childhood experiences. This project aims to provide a workshop and training handbook for the teachers at the Leelanau Children's Center focused on executive function skills, why they are important for school and life success, and the strategies found in the research to improve young learners' skills. The focal points are on improving teacher-child interactions, classroom climate, and using play as a central context for development. The ultimate purpose being that children gain the experiences that can strengthen executive function and improve self-regulation behavior to have a more successful entry into kindergarten.

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Chapter One: Introduction

Problem Statement

Many children in the U.S. begin kindergarten with challenges or delays related to executive function and self-regulation often leading to problems with attention, following directions, lack of self-control, and challenging social behavior (Wenz-Gross et al., 2018). The early years are an essential period for developing the foundational skills for learning and early gaps in these skill developments are likely to persist into later grades (Allee-Herndon & Roberts, 2019).

There are many factors that impact the critical period of growth related to building executive function and self-regulation in the early years. There is a strong association between adverse childhood experiences, stress, and brain development. Chronic early childhood stress negatively impacts the growth in the areas of the brain responsible for complex cognitive processes including planning, decision making, and moderating behavior (Vrantsidis et al., 2020). Another recognized risk factors for school readiness, closely related to chronic stress, is poverty. Fewer than half of children growing up in poverty are ready for school at age 5 as compared with 75% of children from moderate- or high-income household (Williams and Lerner, 2019). Another factor impacting the development of executive function is the lack of early learning experiences that promote the pathways for later executive function skills or addressing potential needs for early intervention. On average the early care and education settings attended by many young children provide quality at levels too low

to promote children's executive and social-emotional skills adequately (Freidman-Krauss et al., 2020).

Importance and Rationale of the Project

It is evident that early executive function and self-regulation skills are critical for learning and predictive of later school and life outcomes. While these skills are not fully developed in early childhood, the essential pathways are being developed. When children develop these skills early, they gain the social and emotional foundations necessary for school readiness including cooperating with others, handling stress, attending to and following directions, and problem-solving (Allee-Herndon & Roberts, 2019). Often referred to as the brain's "air traffic control system", executive functions generally include working memory, mental flexibility, and inhibitory control (Center on the Developing Child, 2011). Early support and intervention are especially important for children who enter school with poorer executive function skills and are at risk because of social, economic, or other disadvantages (Diamond, 2016). Recent research demonstrates that executive function skills are malleable and can be improved by preschool experiences and that the ability to control emotions, thoughts, and behaviors is critical for success in school and in life (Sasser et al., 2017).

Preschool is an ideal time to implement supportive environments, curriculum, and interventions because of the rapid development in the prefrontal cortex, an area associated with self-regulation and EF skills (McClelland et al., 2019). There is

evidence that social emotional skills such as self-regulation, prosocial behavior, and healthy executive function are equally if not more important in predicting school readiness and long-term positive school outcomes and reducing or eliminating the "readiness gap".

The early education field has been discussing the role of executive function skills for decades and a growing research base including children from both low- and higher-income families, has demonstrated the relationship between inhibitory control, cognitive flexibility, and/or working memory and both early and later academic skills. The National Institute of Child Health and Human Development study of Early Child Care and Youth Development data set found that children's behavior regulation, a construct related to EF, at 4.5 years and in kindergarten predicted their academic achievement in first grade (Ackerman, 2017). The current national picture of young children's progress towards school readiness skills and the competencies adopted by the U.S. Department of Education found that only 41.8% of three- to five-year-old children were estimated to be on track overall (Ghandour et al., 2019). Research has shown that the degree to which children exhibit various EF skills prior to kindergarten predicts their EF levels 2 years later (Cuevas et al., 2012). A report written for the U.S. Department of Education states that "kindergarteners with poorer EF skills and poorer social competence had more difficulty in reading and math, with growth curves indicating that this gap in performance widened until second grade and then persisted from third through sixth grade" (Zelazo et al., 2016).

The need for better understanding of this problem and finding systems of support for early educators is being recognized on a regional level in Northern Michigan. According to the 2019 Michigan Department of Education's Kindergarten Entry Observation data report, the Grand Traverse Bay region of Michigan indicated similar findings with only 42% of incoming kindergarten children at the demonstrating level on the State's readiness assessment in 2019, with the lowest scores in the domains most related to executive function skills such as concentrating, following direction, approaching new tasks, and expressing and responding to emotions. With the bulk of the research demonstrating that these skills and capacities are important for all learning and for school readiness, it is important to find how to support the development in our early childhood classrooms to lay the foundations for later success and to find potential solutions to address the readiness gap. Early childhood educators could be better equipped to understand and address behavioral and learning challenges if they can have professional training in the development of executive function skills. They are often the first to recognize problems with a child's ability to control impulses, focus attention, and follow instructions (Diamond, 2016).

Though there is a general call in the literature for more research on the subject, the relation between self-regulation and academic skills suggests that children's self-regulation specifically supports the development of other academic skills because it supports the management of attention, motivation, and stress in learning contexts (Lonigan et al., 2105). It is possible to positively impact this development in early childhood and lay the foundations for later social cognition and

executive function skills. Understanding the key features within early learning environments that facilitates this is essential to support more children's successful kindergarten entry and long-term success in school and life.

Background of the Project

There has been a growing interest in the relationships between executive function, school readiness and early adjustment to school over the past thirty years and expanded during after the1990s often referred to as the "decade of the brain". In the early 2000s researchers began to present evidence of the effects of early experiences, both positive and negative, on the brain and demonstrated the importance of healthy brain development in children ages 0-5 (Goldberg et al., 2014). These discoveries highlighted the strong association between early adverse childhood experiences and brain development (Vrantsidis et al., 2020). Chronic early childhood stress negatively impacts the growth in the areas of the brain responsible for complex cognitive processes including planning, decision making, and moderating behavior (Vrantsidis et al., 2020). Children exposed to a range of biological, psychological, and environmental stressors are shown to have high levels of cortisol, the hormone that regulate brain activity and can impact the neural connections responsible for developing executive function (Haft & Hoeft, 2017). Ongoing neuroscience discoveries shine a light on the complexity of the problem and continue to help early childhood professionals better understand the progression and important windows of opportunity for development, including building and strengthening the executive function pathways that lead to behavior and emotion regulation.

The connection between early executive function development and later school readiness and success has been increasingly examined and funding towards research into solutions expanded. Research by Willoughby et al. (2017) showed substantial evidence that individual differences in executive function in early childhood are distinctly predictive of children's academic readiness at school entry. Their study drew from a large representative sample of children and tested whether growth of EF across the early childhood period could be used to identify children who were at risk for academic impairment in kindergarten. Compared to children who exhibited typical trajectories of executive function, the delayed group exhibited substantial impairments in multiple indicators of academic readiness in kindergarten. Data was collected annually from children during the ages of 3, 4, and 5 using direct assessments that had been extensively evaluated along with teacher-rated assessments (Willoughby et al., 2017). As a result of evidence like what was found in this study suggesting that these skills are critical for academic success, there has been ongoing research attempting to determine the specific aspects of interventions that are most effective in supporting the early executive function skills in early childhood classrooms, especially those that may lead to a decrease in school readiness gaps. Some of the outcomes of the researched curriculum, activities, and interventions have been inconclusive, mixed, or shown to have no positive impact, while others showed some promising results.

One example of a curriculum-based intervention is the Research-based, Developmentally Informed program (Project REDI) focus on emotion regulation

through a program known as the Promoting Alternative Thinking Skills (PATHS) program. The study included social-emotional learning programs that specifically teach children how to identify and manage strong feelings, how to employ self-regulation strategies, and how to solve problems. Evaluation of REDI indicated that children that were randomly assigned to implement the program had higher vocabulary, emotional understanding, better social problem-solving skills, and engagement in learning. The REDI intervention had sustained benefits for children while the control-group children with low EF trajectories showed declining EF after kindergarten entry (Sasser et al, 2017). While social and emotional learning has been increasingly overshadowed by academic pushdown into preschool curriculum, this study demonstrates the potential positive impacts of emphasizing such programming. One problem with a program such as this and others is that it is difficult to pull out of this type of intervention the specific components that lead to the positive results.

Another curriculum intervention specific to addressing executive function researchers have examined over the past fifteen years is Tools of the Mind. The curriculum's central focus is that children "practice" executive function throughout the school day through tasks that require the use of self-regulation. Children use their natural interest in sociodramatic play to use working memory to plan play, shifting between roles, and inhibiting other responses. Studies have found small improvements to self-regulation skills in participating children, though the research outcomes have been mixed (Mattera et al., 2021). Another recent study from White et al. focused on pretend play in preschool classrooms, but not a prescriptive curriculum

approach. Researchers report that play, including pretend or make-believe play, provided young children with valuable opportunities to learn executive function skills (2021). The research advocates for supporting dramatic play in which teachers play alongside children to scaffold learning and encourage deeper thinking by using open-ended questions to extend children's thoughts and ideas (White et. al, 2021). The Tools of the Mind curriculum is mentioned frequently in the literature as a solution to addressing the gap in early executive function development, though researchers do not agree on the findings and implementing all curriculum components with fidelity is a challenge for early childhood programs. While there is extensive research not highlighted in this paper about the benefits of play, there are also appears to be an aspect of these play-based curriculum interventions that is specifically related building executive function skills. Exasperating the current problem, play is increasingly being pushed out of early childhood classroom routines and replaced with more "academic focused" direct instruction for preschoolers in hopes of improving school readiness (Nicolopoulou, 2010).

Red Light, Purple Light Circle Time Games is an example of a potentially effective intervention using games with preschool children. The series of music and movement games can increase children's abilities to self-regulate and the increasingly complex directions engage executive function skills through motivating social activities and focuses on improving three components of executive function: working memory, attentional shifting, and inhibitory control (McClelland et al., 2019). While circle time games alone are likely not the solution to the complex problem, it is a

developmentally appropriate, and easy to integrate intervention that early childhood teachers can add to their daily routines.

Helping young children with the skills necessary for self-regulation is an essential goal for early childhood educators. When asked about school readiness skills, many teachers say children who succeed in the early elementary grades know when and how to control their impulses. They can follow through when a task is difficult and listen to and follow directions and hold general social rules in mind. These skills are linked to self-control. We begin to help children gain the tools they will need to work on this challenging skill needed to learn in a structured group environment. After over twenty years in early childhood education, I can attest to what was found in the literature about kindergarten teachers, early childhood teachers, and parents agreeing that following directions and routine, being able to get along with others socially, regulate behavior, and the ability to express emotions appropriately are the most helpful to children when they start kindergarten. Without a strong base of these skills children are less available for learning and connecting with others in the classroom, often begin to struggle socially and academically and, unfortunately as a result may begin to disengage from school and learning.

While researchers have been trying to pinpoint effective models there is no evidence that one comprehensive curriculum method can stand alone in improving all executive function skills in preschool children. However, a few aspects of the researched approaches and interventions emerge that may be effectively integrated into existing early childhood curriculums. The paper by Mattera et al. (2021)

describes the “kernels” approach to curriculum and intervention as the “small, discrete teacher practices or packets of knowledge in the domain of EF that can be used without the need for a more complete EF curriculum” (Mattera et al., 2021). A hybrid approach that uses play-based games and activities in combination with other intervention strategies allows educators to start to take steps towards solving the problem while the research continues.

In my experience as an early childhood educator and supervising and coaching preschool and toddler teachers in, finding the most effective, respectful, and developmentally appropriate way to support young children as their brains and bodies develop the thinking and regulatory abilities associated with executive function is the most challenging part of the work. This can be especially true when helping children who have had adverse early experiences or have any challenges causing dysregulated executive function. While it is a challenge to meet the needs of all children in a large group setting, it can also be an opportunity and early intervention is critical to help those students who struggle to succeed.

Statement of Purpose

The purpose of this project is to create a handbook for early childhood teachers to increase their understanding of executive function and self-regulation and ways to strengthen development in preschool children. The focus of the handbook will be on specific aspects of the classroom environment, teacher-child interactions, and the introduction of developmentally appropriate games that promote executive

function and self-regulation. The handbook will focus on supporting individual children in the classroom by providing teachers with developmental information and strategies for supporting executive function skills. It is important that in this project that the evidence-based components shared with are those that can be easily implemented by teachers into their existing daily routines and play-based environments and are developmentally appropriate for young children. A successful outcome will be that teachers' understanding and competencies in executive function skill development in early childhood have increased and that they are able to integrate the information and activities into their classroom routines and environments with ease. The ultimate purpose being that children gain the experiences that will strengthen executive function and improve self-regulation behavior to have a more successful entry into kindergarten.

Objectives of the Project

The overall objective of this project will be to increase teacher's overall understanding of the importance of the early childhood years for building the pathways for healthy executive function and self-regulation. Teachers will be able to improve their observation skills, recognize, and discuss children's behavior in terms of executive function and self-regulation skills. They will gain competencies in creating optimal environments for supporting this development. They will better recognize how daily interactions during child-directed play can be an opportunity to strengthen children's skills. Teachers will be able to learn and immediately use new

activities that are shown to have a positive impact on executive function and self-regulation skills.

Definition of Terms

Adverse childhood experiences: Broadly defined as forms of abuse, neglect, and household dysfunction that occur during childhood (Lund et al., 2020).

Executive Function (EF): Executive function is an umbrella term used to describe a group of higher order thinking processes. They are the brain functions that enable children to focus, plan and organize behavior. The main processes include working memory, inhibitory control, and attentional or mental flexibility (White et al., 2021).

Executive Skills: The strategies that are activated and cued by executive functions. What EF looks like in action (McIntosh & Fox, 2019).

Inhibitory Control: The skills used to filter thoughts and impulses in order to resist temptations, distractions, and to pause and think before acting (Center on the Developing Child, 2011).

Mental Flexibility: The ability to adjust to various demands, priorities, perspectives, and to be able to adapt and respond to different rules for different settings (Neitzel, 2019).

Self-Regulation: is the ability to integrate the aspects of executive function into behavior (McClelland et al., 2019). It is the act of managing thoughts and feelings to enable goal-directed actions. For instance, finding ways to cope with strong feelings,

learning to focus and shift attention, and successfully controlling behaviors required to get along with others (Rosanbalm & Murray, 2017).

Working Memory: The system responsible for holding and processing new and already-stored information. It is an important process for reasoning, comprehension, learning and memory (Zelazo et al., 2016).

Scope of the Project

This project aims to teach early childhood educators about what executive function skills are, why they are important for school and life success, and to improve their abilities to build young learners' skills through classroom environment, routine, and activities. The project will include a handbook and training for the teachers at the Leelanau Children's Center, a private, non-profit, community-based early childhood program delivering services to children ages 2.5 to kindergarten entry. While other early childhood educators may benefit from this resource and it may be made available for educators outside of our program in the future, it will be designed with specific teachers in mind and will take into consideration their previous professional learning and the environment, culture, and demographics of the children they serve. The topic of executive function has many layers and devoting enough professional learning time to fully engage teachers in a meaningful workshop is a challenge. The solution is to devote several hours of in-service time that is already scheduled for professional development prior to a new school year. It may be a challenge to deliver the training to other early childhood professionals, though a recorded power point

presentation and pdf handbook could make the project digitally available and more accessible to others.

Chapter Two: Literature Review

Introduction

A growing body of research indicates that executive function abilities, including self-regulation, develop rapidly in early childhood and are important contributors to school readiness and early school success (Blair, 2017). Early childhood educators play an essential role in supporting the foundational development of these skills.

This literature review outlines the research and evaluation of key topics regarding executive function and self-regulation development in the early childhood years and the implications for intervention strategies in early childhood classrooms. The categories of literature that will be reviewed are 1) Importance of executive function and self-regulation development in early childhood, 2) Implications for school readiness, 3) Analysis and impacts of preschool curriculum models, 4) Importance of child-directed social play, 5) Teacher's role in supporting play and executive function development. Finally, a summary of the reviewed literature will be provided along with the conclusion.

Theory/Rationale

The framework for this literature review and project is supported by two theories. The first is founded on a neurobiological model that suggests executive function skills are malleable, are determined by experiences, and that there are sensitive periods of brain development in early childhood (Blair, 2002; Center for

Developing Child, 2011). The second is based in social constructivism theories suggesting that learning is largely a social process that occurs during interactions with others more knowledgeable (Vygotsky, 1978). Vygotsky's theories also recognize the enormous influence that social play and scaffolding have on young children's development of self-regulated behaviors (1978). These theories together support the argument for early intervention in environments where children can interact with peers with support from informed educators.

The idea that a young child's brain develops strictly based on maturation and genetically determined factors has changed based on research conducted over the past few decades. Over twenty years ago, the National Research Council released a landmark report by Shonkoff and Phillips (2000), *From Neurons to Neighborhoods: The Science of Early Childhood Development.* The study focused attention on several scientific conclusions that have become foundational and continue to inform early educators today. The study summarized that brain development begins before birth, is dependent on experiences, that behavior reflects brain function, and that the early years build the foundation for later functioning. The report also concludes that the "best enrichment for healthy growth comes from loving interactions with people who provide a rich variety of opportunities for exploration and discovery" (Shonkoff, 2003). Ongoing research over the past two decades by Shonkoff and others continues to confirm and expand on what the original paper inferred. The experience-dependent shaping of the brain has since become well established (Center for the Developing Child at Harvard University, 2011).

Development of executive function is linked with changes to the prefrontal cortex of the brain, the area responsible for helping children direct and plan their actions. Because the prefrontal cortex and the corresponding EF skills undergo rapid transformation from ages 3 to 6, this is a crucial time for acquiring the skills important for successful functioning in school settings (Blair, 2002, Diamond, 2016; Lonigan et al., 2017). Although the areas of the brain responsible for higher order thinking like executive function can be improved it can also be reduced by adverse experiences. For example, young children growing up in poverty typically experience more challenges and perform worse on tasks associated with executive function than their more affluent peers (Zelazo et al., 2016). Children with adverse backgrounds, including those with chronic stress due to poverty, show the greatest improvements from programs that include specific interventions to improve early executive functioning skills (Sasser et al., 2017). The brain science reveals that development is vulnerable to environment and early experiences and that the rapid development in the regions of the brain responsible for building foundational executive functioning happen in the years prior to kindergarten entry. With this knowledge, it is crucial that early childhood administrators and educators understand how to best provide supportive environments and practices.

This literature review offers research and analysis on several interventions that have been shown to strengthen executive function and self-regulation in preschool children in classroom group settings. The social and play-based nature of the instruction and curriculum approaches examined is supported by Vygotsky's

conception in which thinking skills are socially constructed through interactions and social play is used as the primary platform to aid in memory and attention (Vygotsky, 1978). Through interactions in a social environment young children develop higher mental functions according to Vygotsky;

> The influence of play on a child's development is enormous. Play continually creates demands on the child to act against immediate impulse. At every step the child is faced with a conflict between the rules of the game and what he would do if he could suddenly act spontaneously. A child's greatest self-control occurs in play (Vygotsky, 1978).

The framework for this literature review is grounded in the understanding that the early childhood years present an essential window of time for executive function development and that those foundational skills can be improved through the social interactions with peers and teacher's intentional guidance during play in early childhood classroom settings.

Research/Evaluation

The literature refers to executive function (EF) as the cognitive processes that support children's ability to regulate behavior. Self-regulation refers to the ability to modify behavior, thoughts or attention automatically or intentionally (Ackerman & Friedman-Krauss, 2017). These processes, which begin to develop in the early childhood years, are composed of working memory (the ability to retain information and use it), cognitive flexibility (shifting attention) and inhibitory control (the ability to control impulses) (Center on the Developing Child at Harvard University, 2011). The growth of these skills relies on the development of the prefrontal cortex and are

sometimes described as neurocognitive skills. Although the development of EF continues into the adolescent and early adult years, a substantial research base suggests that the early childhood period may represent the most rapid growth in EF skills (Center on the Developing Child at Harvard University, 2011).

Executive Function and School Readiness

In 2002 Clancy Blair proposed a neurobiological model of self-regulation development and the implications for school readiness. The constructivist approach lens suggests that the development of the prefrontal cortex executive thinking skills is determined by experiences. In contrast the maturational view suggests that readiness comes through gradual development of abilities that allow behaviors such as being able to follow multiple-step instructions, avoid distractions and impulsive responses, and adjust when instructions change (Blair, 2002). Certainly, there is a maturational component to the view of readiness, but prior experience also has a large impact. For example, Zelazo et al. (2017) asserts that the strong association between childhood stress and lower levels of EF skill is reciprocal. Higher levels of stress in childhood negatively impact EF development, and impaired EF in turn leads to more failures and more stress. However, there is evidence that improved EF skills can protect against the risk of academic failure associated with poverty and adversity. Efforts targeting the improvement of EF skills in children from disadvantaged environments may lead to beneficial changes in many domains of activity, including social

relationships and these may lead, in turn, to further improvement in EF skill (Zelazo et al., 2017).

By age three most children can organize themselves to complete tasks with simple rules. They typically can demonstrate some inhibitory control by maintaining focus for short periods. In contrast to the three-year-old mind, the child ready to enter kindergarten is much more complex (Blair & Razza, 2007). Older preschoolers can demonstrate problem solving by shifting from one rule in a game to another and responding in appropriate ways to multi-step directions and requests from others (Center for the Developing Child, 2011). While these skills are still emerging, they enable children to acquire knowledge and to successfully participate in school as they enter kindergarten.

The consensus in the literature is that self-regulation skills underlie school readiness and executive function abilities are as important if not more so for early success in school than is general intelligence (Blair & Raver, 2015). These underlying skills are presumed to be critical for school readiness, both directly and indirectly. First, they support the self-regulatory skills necessary for learning, such as persisting during challenging tasks or resisting distraction. They also promote learning directly by facilitating children's capacity for information processing, problem solving, and complex reasoning (Blair & Raver, 2015). Children need to first develop cognitive executive functioning skills before they can integrate and apply them in context through regulated behaviors and emotions (Blair, 2016). Researchers are especially

invested in understanding the visible effects of young children's executive function in terms of their behavioral regulation and learning-related skills as well as the contribution to school readiness and later academic achievement.

A study by Finders et al. (2019) called attention to disparities in academic achievement reflected in executive function skills at kindergarten entry. Their research examined the connections between individual executive function abilities at school entry and the achievement gaps in kindergarten and third grade among children from economically disadvantaged families. The study used data from the Early Childhood Longitudinal Study Kindergarten cohort of 2010–2011 based on a nationally representative sample of approximately 18,170 kindergarten children collected during the 2010–2011 school year who were followed into the spring of third grade during the 2013–2014 school year. The assessed EF skills consistently explained kindergarten achievement gaps based on teacher and parent reports and direct assessments, and a significant portion of third grade achievement gaps (Finders et al., 2019). Results are significant because they highlight the contribution of classroom self-regulation and individual executive function skills for school readiness gaps in kindergarten among children from families with low socioeconomic status and suggest that improving executive function abilities prior to school entry could be effective for decreasing the initial achievement gaps.

Another significant study of pre-kindergarten children by Lonigan et al. (2017) indicated significant associations between lower levels of self-regulation in

preschool and higher levels of later externalizing problem behaviors in early elementary. The data for this study came from 815 children who were part of a larger study that evaluated the short-term impacts of preschool curriculum in preschools serving high proportions of children at risk for academic difficulties due to poverty or identified developmental delays (Lonigan et. al, 2017). The study examined how preschool children's self-regulation was related to children's externalizing behaviors two to four years later and the potential association between preschool children's language skills and later externalizing behaviors. Both teacher-reported and direct assessments of self-regulation in preschool were associated with children's externalizing behaviors when children were in first through third grades. Measures of self-regulation were related both to children's general externalizing behaviors and to variation in children's attentional problems in elementary school. Their study also found that children who scored lower on measures of language in preschool had higher levels of parent-reported behavior problems in early elementary school (Lonigan et. al, 2017). Their report argued that development of EF is dependent on children's ability to comprehend and integrate multiple sets of rules and that without adequate development of language skills, children are unable to use private speech to reflect on sets of rules and generate higher-order rules necessary for self-regulation (Lonigan et. al, 2017). These correlations are an important example of language development and early executive function skills impacting the behavior and learning related skills necessary for foundational learning in school.

Focusing on strengthening executive function skills in early education and prevention programs may play a key role in reducing gaps in school readiness and later achievement that separate disadvantaged children from their more advantaged peers (Bierman and Torres, 2016). Efforts to improve the achievement gap between low-income children and their more affluent peers has led to the development of classroom interventions and preschool curriculum. Early childhood classrooms include many shared learning experiences, where a child must engage with both teachers and peers. Executive function skills allow children to adapt to the classroom learning environments, engage in behaviors that facilitate academic achievement, and successfully participate in social interactions. For young children, these competencies are needed for successful participation in, and learning skills from, early education programs (Center on the Developing Child at Harvard University, 2011). Blair (2016) argues for improving executive function skills in the early childhood classrooms suggesting, "many experts consider the development of self-regulation skills to be the most important objective of high-quality preschool in order to help children focus attention, be emotionally expressive, not be impulsive, and to engage in purposeful and meaningful interactions with caregivers and other children" (Blair, 2016). Interventions during the preschool years appear to be especially beneficial because executive function skills promote school readiness and set the stage for the development of other behavior and cognitive processes. There are some approaches in the research literature that demonstrate significant success across multiple studies while others have failed to consistently lead to improved EF.

Preschool Interventions

There is evidence that programs designed to boost preschool executive functions have brought about some early achievement and lasting impacts. For example, analyses of the effectiveness of the historic High/Scope Perry Preschool Project, which focused on the promotion of active learning, planning, and executing tasks showed lasting improvements in educational achievement and positive life outcomes into adulthood (Fitzpatrick et al., 2013). These findings were based on a relatively small study in the 1960s that included three and four-year old African American children in Ypsilanti, Michigan who were deemed to be at risk of later school failure based on family socioeconomic status (Besharov et al., 2020). While the long-term benefits (such as participants being more likely to graduate from high school and less likely to serve time in jail) were ground-breaking and continue to offer lessons for early childhood practices today, the question that needs to be examined is whether similar approaches can be implemented in today's typical preschool program. The positive results from the program stemmed from having children attended 2.5-hour sessions for two years (ages 3 and 4) and taught by certified public school teachers with at least a bachelor's degree. The average child-teacher ratio was 6:1. The teachers also provided a weekly 1.5-hour home visit to each mother and child, designed to involve the mother in the educational process and help implement the preschool curriculum at home (Schweinhart et al., 1993). All of this requires an adequate professional staff and ample funding, both of which are consistently a challenge to obtain and sustain in early childhood education programs.

Another impressive intervention program targeting self-regulation and school readiness is the Chicago School Readiness Project (CSRP) which focused on children's social and emotional development and reduction of behavior problems. Raver et al. (2011) conducted research on whether preschool children's self-regulatory skills could be the means through which such an intervention would improve children's preacademic outcomes (Raver et. al., 2011). CSRP intervention trained teachers specifically in positive classroom-management skills and included ongoing classroom-based and child-focused consultation with a professional mental health consultant who supported teachers in the classrooms while they tried new techniques. Another unique component of the project was that consultants conducted stress reduction workshops throughout the school year to help teachers limit burnout. The study of CSRP's approach included 609 preschool children ages 3 and 4 in 35 Head Start classrooms. Children's self-regulatory and preacademic skills were collected individually from each child who was enrolled in the study in both September and May. Analyses indicated large effects on reductions in problem behavior and improved children's self-regulation (as indexed by attention, impulse control, and executive function) and academic skills with moderate to large effects. The findings of this study suggest that an emotionally and behaviorally oriented intervention can increase children's learning opportunities, as evidenced by participating children's improvements in language and math skills relative to children in the control group (Raver et al., 2011). The significant investment in the CSRP intervention components such as training, coaching, and mental health consultation

equaled improved school readiness for low-income children. While there is much to be learned from this comprehensive approach, there are limitations to replicating the resources made available to the classroom teachers especially for schools with few or no clinical resources, limited staff support, budget constraints, or all these limitations.

A current curriculum model called Tools of the Mind (Tools), designed to focus specifically on self-regulation and executive function in early childhood, has been adopted for widespread use in classrooms throughout the United States, Canada, and South America. Tools derives from Lev Vygotsky's theories claiming that children achieve their greatest self-control in play and that mature make-believe play helps them to use skills such as planning, negotiating, and assuming different roles (Bodrova & Leong, 2013). According to the curriculum developers, Tools is "inspired by the word of Lev Vygotsky and his students, and at the same time, is rooted in cutting edge neuropsychological research on the development of self-regulation/executive functions in children". Tools blends teacher-led support of early literacy, mathematics, and science curriculum activities through child-directed and "structured" sociodramatic play (Bodrova & Leong, 2019). Overall, Tools includes over 60 activities that both target students' self-regulation as well as their academic skills.

Although Tools' popularity in use has been consistently growing since inception over twenty years ago and the developers have repeatedly hypothesized gains for Tools students, the findings from evaluation studies are inconsistent (Baron

et al., 2017). Baron et al., looked at six carefully selected studies all using cluster randomized controlled trial designs. Results overall showed effect sizes in the positive direction for Tools students, although those effect sizes did not reach statistical significance across three out of the four outcomes. Assessor report-based ratings of children's self-regulation, task-based self-regulation indicators, and literacy skills all showed insignificant positive results. By contrast, small but statistically significant impacts were observed for improvements in math skill development (Baron et al., 2017).

A study conducted in 2019 by Baron et al. specifically tested the aspects of Tools focus on structured sociodramatic play that included analysis of the three discrete curriculum activities. The first step in the Tools curriculum "play block" is formal planning where teachers work with a small group of children to plan their play scenario. The next is teachers and children practicing the play scenario together with the teacher modeling appropriate role behavior in the target scenario from the play plan. The final step is acting out their play plans. If children deviate from their plan, the teacher refers them to their plans to help them recover focus (Baron et al., 2019). Their trial involved 1145 children in 80 classrooms in 59 schools in two chronologically sequenced cohorts. Self-regulation assessment data were collected at the beginning and end of the pre-K school year. Assessments then occurred in the spring of children's kindergarten and first-grade years. The play block unexpectedly exhibited non-significant associations with the executive function construct and the teacher-rated self-regulation for both cohorts. Tools not only failed to predict

improved executive function, but instead resulted in lower executive function for students in the second cohort (Baron et al., 2019). The authors offer one possible explanation for these results arguing that the highly structured nature and constant monitoring to make sure everyone follows the play rules does not foster self-regulation. Many early childhood classrooms support make-believe play, Tools attempts to formalize the play scenario to require children to write and adhere to plans about their play. Baron et al. emphasized that "it is important to consider that these findings do not pertain to the effectiveness of make-believe play in general but rather only to the frequency and fidelity of make-believe play implementation in this Tools curricular context" (Baron et al., 2019). The findings of these studies are significant because they continue to tease apart the early childhood curriculum approaches to find the aspects that may or may not produce meaningful improvements of self-regulation and executive function development. The highly structured Tools of the Mind approach may not be an affective play-based model but there is current research demonstrating how different types of play, especially social play, predict or improve executive function development.

Importance of Social Pretend Play

The research literature on the contribution of children's social pretend play to the development of executive function confirms a positive connection, particularly when that play is child-directed. Child-directed play happens when children spontaneously create groups and play according to their own interests without external interventions (Gmitrová & Gmitrov, 2003). Sociocultural theory recognizes

that play, especially pretend play involving imaginative or sociodramatic elements, naturally support children's learning and development and can help build executive function skills (Blair & Diamond, 2008). Young children begin to seek each other out for social play during the preschool years, many of them having their first experiences with cooperative and shared imaginative play with peers. As Bierman and Torres (2016) emphasized, it is through this play that young children learn self-control (e.g., taking turns and thinking before acting) and cognitive flexibility (e.g., role-playing and considering the perspective of the other child) (Bierman and Torres, 2016).

Eggum-Wilkens et al. (2014) developed a study to determine the effect of children's peer play on school readiness in relation to social and academic competence. They believed that children who began kindergarten with a higher level of social play skills would make the kindergarten transition more easily due to the competencies acquired through social play (Eggum-Wilkens et al., 2014). Participants included 264 Head Start preschoolers from 18 different classrooms in seven schools. Peer play was classified as play involving verbal or physical activity with another child or groups of children. The Interactive Peer Play Scale was used to assess children on play interactions, disruptive behaviors, and nonparticipation in social play. Children who exhibited higher levels of peer play in preschool were rated as more school-ready by their kindergarten teachers with assessments showing that they were better able to follow directions, self-regulate, and cooperate, and overall were better prepared for the academic aspects of kindergarten (Eggum-Wilkens et al., 2014).

White et al. (2021) suggests that pretend play could be a fundamental experience through which children develop EF abilities because it requires that children follow shared rules of play within a given scenario. They learn to control their impulses and cooperate to support the group goals (White et al., 2021). Like Eggum-Wilkens's study, White et al. (2021) investigated whether observations of social and solitary pretend play throughout one preschool year predicted growth in executive function in a low-income sample of preschoolers from 10 Head Start classrooms. Data was collected during the fall and spring semesters of preschool using multiple methods, including naturalistic observations of classroom behaviors and standardized assessments. They found only social pretend play to be positively associated with children's EF gains across the school year and solitary pretense was not associated with gains. According to the authors, children benefitted from the social influences inherent in social pretend play such as the need to cooperate with others to reach shared goals and to negotiate conflict (White et al., 2021). This study provides another recommendation that supporting this type of play in early childhood classrooms is beneficial.

Another recent study confirms the previous and goes on to correctly hypothesize that pretend play in preschool would be positively associated with EF in first grade and would even moderate a negative association between cumulative risk and EF abilities (Thibodeau-Nielsen et al., 2019). The longitudinal study included 191 children and were distributed across 21 classrooms in 6 Head Start preschools. Each preschool classroom included in the study utilized Creative Curriculum, a

widely used educational approach in preschool classrooms that emphasizes hands-on exploration of topics and materials largely inspired by childrens' interests (Dodge et al., 2016). The authors found that pretend play in preschool was positively associated with EF outcomes and that children who were reported to engage in more social pretend play = in preschool were likely to exhibit greater EF abilities two years later compared to their peers who were reported to engage in lower levels of pretend play in preschool. Another finding was that this type of play in preschool moderated the likely relationship between cumulative risk in preschool and EF in first grade (Thibodeau-Nielsen et al., 2019). The authors assert that their findings are in line with the Vygotskian theory that pretend play is especially important for the development of self-regulation in early childhood as "children inhibit the constraints of reality and suppress individual desires in favor of group goals in their play" (Vygotsky, 1978; Thibodeau-Nielsen et al., 2019).

The discussion about the importance of play in children's executive function development is an important one as the tension has increased with the emphasis on academic-focused versus play-based curriculum (Wasik & Jacobi-Vessels, 2016). While the benefit of this type of play is well documented, the pressure to get children "ready for school" is squeezing the time for child-directed social play out of many preschool classrooms. While several of the curriculum interventions mentioned earlier in this review had some positive results, they were costly, had prescribed activities, and required extensive teacher training and support. On the other hand, using social pretend play is an intervention approach that early childhood teachers can

incorporate easily within their routines. A line of inquiry that has emerged from the literature is whether there are small, discrete teacher practices in the domain of EF that can be used without the need for a more complete EF curriculum. What are some of the specific teacher strategies and practices that can be identified, in the absence of curriculum, that can directly improve children's EF (Mattera et al., 2021)?

The Teacher's Role

Understanding the importance of executive function development does not automatically translate into supportive practices in the classroom according to research by Moreno et al. (2017). In fact, connections to executive function in the preschool classroom are often lacking (Moreno et al., 2017). Classrooms that show the lowest scores on development of cognitive executive function skills are those that focus on rote learning, have few opportunities for students to engage in analysis of learning, and lack scaffolding (Moreno et al., 2017). Effective classrooms are those that support regulated thinking, extend topics into conversation, pose thought provoking questions, and make connections between new concepts and what a child has previously learned (Moreno et al., 2017).

Like many aspects of development, children must learn how to engage in more mature play from the adults or more capable peers. Dr. Sue Bredekamp, author of the highly influential publication *Developmentally Appropriate Practice in Early Childhood Programs* (2008), offers a basic framework asserting that teachers play three key roles in supporting children's sociodramatic play: observer, stage manager,

and co-player (Bredekamp, 2004). The teacher's role as the observer is to carefully assess whether to intervene and to think about whether the involvement will interrupt or support the play. The observer also recognizes and considers the individual children who may need additional support to enter play scenarios. As stage manager is important for creating the environment where the play can thrive. Teachers provide time, space, props and the positive climate that allows for sustained social play. As co-player, the teacher carefully involves themselves in the play, scaffolding language, and intervening to support and extend the play. The most helpful teacher role involves not directly instructing or explaining, but instead, modeling, demonstrating, guiding as well as expanding and extending children's language (Bredekamp, 2004).

Scaffolding Language Development

As a co-player, teachers have the important role of developing and extending children's language and content knowledge. This starts with what children know and supports learning of new ideas and ways to discover the world around them, also known as scaffolding (Wasik & Jacobi-Vessels 2017). In line with Vygotsky's theories, this type of social speech provides verbal guidance that advances a child's individual private speech that gradually becomes self-guiding inner speech. Self-guiding inner speech leads to the formation of directed higher mental functions, along with the neurological systems necessary for the executive functions (Smolucha & Smolucha, 2021).

Reilley & Downer (2019) studied the link between executive functioning and language skills to children's ability to regulate themselves in the preschool classroom. Data was collected as part of an observational study of children's experiences from preschool through kindergarten in 15 public preschools and Head Start centers. Their research is significant because although there is widespread evidence indicating that these skillsets each facilitate young children's regulation separately, this study illustrated how they might work together. (Reilley & Downer, 2019). The main finding was that not only is language directly related to the positive development of regulation during preschool, but it is likely a protective factor specifically for children who enter preschool with low executive functioning skills. The study also noted that where higher levels of observed instructional support children were found to have more gains in language development. Instructionally supportive strategies observed included providing children verbal feed-back, frequently modeling rich language, and using open-ended and follow-up questions to engage children's development of concepts (Reilley & Downer, 2019).

Wasik & Jocobi-Vessels' (2017) paper gives specific instructions to teachers for purposely supporting children's play with language scaffolding. They stress the importance of asking questions and providing meaningful feedback while participating alongside children's social play. This does not mean directing or making judgement but rather talking about what the child is doing in play and making connections between vocabulary and real-world applications (Wasik & Jocobi-Vessels, 2017). Introducing and defining new vocabulary and using wait time to

allow children the chance to make connections and express their thoughts are also important teacher practices. All of this while allowing the children to choose the direction of the play. These examples of scaffolding experiences help children develop language and as a result their complex thinking (Wasik & Jocobi-Vessels, 2017).

Supportive Play Environments

The role of teacher as "stage manager" (Bredekamp, 2004) requires creating environments and routines that allow executive function skills to develop. The study by Fuhs et al. (2013) examined associations between specific environmental characteristics and classroom processes with the gains in young children's executive function skills across a preschool year. They found that effective classroom management, along with teacher's emotional and instructional support, were all associated with better self-regulation and academic engagement (Fuhs et al., 2013). They focused on three sets of classroom processes: classroom emotional climate, the proportion of observed time spent in learning opportunities, and quality of instruction. The direct assessments and classroom observations collected data related to children's focus, working memory, and inhibitory control. The emotional climate of the classrooms was characterized by teacher's approving or disapproving behaviors, teachers listening to children, and the emotional "tone" of the teacher. There were positive associations between the classroom emotional climate and direct assessments of children's cognitive self-regulation. The results of this study support the idea that teachers who communicate positively with children, who show more warmth and less

often disapprove, create a classroom in which executive function skills are fostered (Fuhs et al., 2013). The authors also conclude that classroom management is an important factor. The amount teachers were able to focus on learning opportunities and children were focused on activities are indicators of classrooms that are better managed and organized. The positive findings suggest that teachers had activities well-enough managed so that they could devote more time to engaging children in learning and that the materials and activities in the classroom held children's interest and kept them engaged (Fuhs et al., 2013). The study illustrates that recognizing the specific behaviors and details of creating positive, well-managed classroom environments can help early childhood teachers better promote the development of executive function skills.

Another recent large-scale study confirms that specific aspects of learning environment support executive function development (Nietzel, 2018). Researchers evaluated the relationship between aspects of program quality and child outcomes, including preacademic skills and executive function. Classroom quality for children ages 3 to 5 years is typically measured with two primary instruments: the Early Childhood Environment Rating Scale-Revised (ECERS-3) and the Classroom Assessment Scoring System Pre-K (CLASS Pre-K) which focuses on teacher-child interactions (Nietzel, 2018). Both the ECERS-3 and CLASS Pre-K include items focused on providing opportunities for children to engage in open-ended play activities with peers. In this study, the ECERS-3 was administered in 944 classrooms and CLASS Pre-K data collected in a subsample of these classrooms. With the

ECERS-3, executive function growth was most closely related to the Learning Opportunities subsection of the rating scale. Noteworthy is that this section includes a dramatic play item that assesses the provision of open-ended play materials that allow for children to engage socially with one another as they negotiate roles and responsibilities within the context of play schemes (Nietzel, 2018). Within this item, the authors have also included indicators related to the ways in which teachers engage with young children and support the development of their play. All three domains of the CLASS Pre-K (emotional support, classroom organization, and instructional support) were associated with executive function growth. These findings offer insights into specific items within these assessment tools that can be targeted to improve specific skills, such as executive function. When instruction throughout the daily routine children have more opportunities to practice using executive function skills in different settings and activities. This study and the assessment tools used to measure quality can provide a lens for teachers to recognize specific interactions and environmental supports and set goals to improve practice.

Play-based games and activities

One final intervention approach widely discussed in the research literature is the use of developmentally appropriate play-based games and activities as a means for the "co-player" (Bredekamp, 2004) to provide an easy and fun way to help children develop executive function skills (Mclelland et al., 2019). While games are not a primary source of play and require the teacher to direct and monitor children's

involvement, they offer opportunity to practice some of the challenging aspects of executive function and can fit within the normally occurring routines of an early childhood classroom. One program that specifically targets the three behavioral aspects of executive function skills is the Red Light, Purple Light (RLPL) circle time games intervention. The intervention includes a series of music and movement games where children must listen to and remember instructions (i.e., working memory), attend to the group by watching the cues and switching from one rule to another (i.e., cognitive flexibility), and resist the inclination to engage inappropriately in an action (i.e., inhibitory control) (Mclelland et al., 2019). Several recent studies have demonstrated significant improvements in children's skills after participation in RLPL interventions. Schmitt et al. (2015) used a randomized control design to evaluate the program impact with a sample of 276 children enrolled in 14 Head Start classrooms and found that participation promoted stronger self-regulation skills (Schmitt et al., 2015). Teacher ratings of self-regulation as well as direct measures were used at the beginning and end of the preschool year. Duncan et al. (2018) found similar results with their study of the RLPL intervention integration into a summer kindergarten readiness program for children with no previous preschool experience (Duncan et al., 2018). Their measurements demonstrated a significant effect on children's self-regulation skills at the end of the three-week intervention period along with broader improvements in school readiness skills, including early math and literacy skills compared with a control group participating in the summer readiness program without the RLPL intervention (Duncan et al., 2018). While more research is

needed, these initial studies highlight the potential for using circle time music and movement games to practice executive function skills with an intervention that is cost-effective, requiring minimal teacher training, and can be flexibly added to preschool classroom routines (Mclelland et al., 2019).

Summary

Executive function refers to higher order cognitive skills that allow children to control their behaviors, thoughts, and emotions. These skills develop rapidly between 3 and 6 years of age (Blair, 2017). Neurobiological models suggest that executive function skills are malleable, are determined by experiences, and that there are sensitive periods of brain development in early childhood (Blair, 2002; Center for Developing Child, 2011). There is increasing awareness of the importance of executive function skills for school-readiness, classroom behavior, and academic success. Children who begin school with less developed skills are at risk of struggling socially and academically (Diamond, 2016). There is growing evidence that this important skill set is responsive to intervention, therefore, can be improved. Questions remain about effective and sustainable approaches to curriculum intervention and the specific teacher practices that support EF skill improvement (Mattera et al., 2019). Research recognizes that high-quality early childhood programs have the potential to provide the basis and support for developing essential skills prior to kindergarten entry.

A promising approach with positive outcomes is achieved through the teacher's intentional support of play. Social play helps children use and practice key skills that support executive function development. This is in line with Vygotsky's theories recognize the enormous influence that social play and scaffolding have on young children's development of self-regulated behaviors (1978). Early childhood teachers are observers, stage-managers, and co-players (Bredekamp, 2004). They strengthen children's executive function skills by listening carefully, entering play thoughtfully, scaffolding children's language and problem-solving, creating supportive play environments, and providing developmentally appropriate activities to practice challenging self-regulation skills that fit within the normally occurring routines of an early childhood classroom.

Conclusion

Although some of the interventions reviewed in the literature showed significant positive effects, they required extensive time and money and may not be easily replicated without those same resources. Also, many of the larger comprehensive programs did not specifically target executive function making it challenging to untangle which components relate directly to the outcomes. Some of the curriculum approaches did not demonstrate consistent improvements for participating children and even had negative long-term results. The need for more research specific to early childhood education practices is apparent.

Most importantly educators should become aware that executive functions control self-regulated behavior, and that by first understanding those functions can help young children strengthen those skills. Learning about how to effectively support children's social play through interactions, routines, and environment are also key to creating classrooms that foster this development.

Chapter Three: Project Description

Introduction

Executive function refers to the specialized cognitive skills working together to help children regulate, recall, plan actions and are a predictor of school readiness. Many young children begin kindergarten with challenges related to these skills often leading to challenging behavior, difficulties sustaining attention, and problems with following directions (Wenz-Gross et al., 2018). Early childhood educators can strengthen these foundational skills during the critical period of brain development responsible for executive function and self-regulation. Research demonstrates that when children develop these skills early, they gain the foundations necessary for school readiness including cooperating with others, handling stress, attending to and following directions, and problem-solving (Allee-Herndon & Roberts, 2019).

Preschool is an ideal time to implement supportive environments, curriculum, and interventions. Research demonstrates that strategies and key features within early learning environments in these early years can help facilitate children's successful kindergarten entry and long-term success in school (Lonigan et al., 2105). Preschool teachers can become better equipped to do this if they can have the professional training and resources necessary to increase awareness and build capacity.

This chapter includes the details of the project components including a description of the local context of the Leelanau Children's Center, the rationale for the project and the steps leading to the conception. The section dedicated to the

elements of the project will describe the items in the appendices including the contents of the handbook, the workshop outline, and the tools for evaluation. Next will be the details of the project evaluation and the chapter will finish with the conclusions and the plans for implementation.

Project Components

Description of local context: This project is specifically designed for the preschool teachers at the Leelanau Children's Center (LCC) in Leland, Michigan. The center is a community based organization located in a small town in rural, northern Michigan. It is a private, non-profit center-based preschool and childcare program that has been in operation since 1976. While some families live in the town of Leland, the Leelanau Children's Center serves children from throughout the county. Some children are transported by local school district bussing, which includes a large rural area in Leelanau County. Some children are transported by their families from outside of the school district. The demographics for each school year vary slightly, but typically in line with the countywide percentages. According to Kids Count (2020), the Leelanau County population is constituted by 80% white, 10% Hispanic, 5% American Indian, 3% Black and 2% other ethnicity backgrounds. The poverty rate for Leelanau County was 33% in 2018. The program is funded through private pay tuition, public donations, and the Michigan Department of Education's Great Start Readiness Program (GSRP). Fifty per cent of the 4-year-old children in the program qualify for GSRP based on income and an additional 25% qualify based on qualifying

life factors. These children attend tuition-free for 4 full days per week. The Leelanau Children's Center is a play-based educational program, and the classrooms are multi-aged with children ages 30 months up to kindergarten entry. The Creative Curriculum along with the Teaching Strategies GOLD for child assessment help guide the planning for children. The handbook for this project is designed to be a supplement to accompany these models.

Each classroom is taught by a team of two teachers with a ratio of 1 adult for every 7 children. All teachers have early childhood education credentials; 15% with early childhood master's degrees, 30% with bachelor's degrees in early childhood education, 30% with K-8 teaching certification with early childhood endorsement, and 25% with a child development associates.

Objectives: The handbook designed for this project provides a resource for preschool teachers to learn about the importance of executive function and classroom strategies and activities to strengthen the associated skill development. As the pressure for more academics in preschool mounts, it is increasingly more important for teachers to understand and preserve play-based learning environments and the nuanced skills necessary to support children's development through play. The practices and strategies that are selected for the handbook can be used by teachers in the regularly occurring curriculum, routines, and environments. The follow up observations and evaluations with teachers will give continuing opportunities to reflect and improve their teaching skills.

Rationale: According to the 2019 Michigan Department of Education's Kindergarten Entry Observation data report only 42% of incoming kindergarten children in LCC's region were at the demonstrating level on the State's readiness assessment. The lowest scores were in the domains most related to executive function skills such as concentrating, following direction, approaching new tasks, and expressing and responding to emotions. How to address this deficit is an ongoing discussion amongst regional educators and leaders. The need for this project was first identified during an interview with the regional Intermediate School District's early childhood director. As we discussed the increasing focus on school readiness in the region and the threat that the underlying development needs of young children would not be recognized as essential, it became clear that more education for our preschool teachers on the topic was necessary. I continued the development of the project concept after discussions with local kindergarten teachers from surrounding school districts about the skills they find to be most beneficial for kindergarten entry. The preschool teachers at the Leelanau Children's Center also identified challenges with children in their classrooms related to executive function and self-regulation skills as well as the pressure to help develop school readiness skills and at the same time preserve a play-based approach to learning.

The interest to provide teachers developmentally appropriate strategies for was supported through the research for this project. Different curriculum approaches, assessment tools, and theories of development were examined in the research literature to select the contents of the project. The handbook design includes the

strategies found to improve EF and self-regulation development in a play-based context. The handbook also reviews quality assessment tools that can help set the stage and assess classroom environment and teacher-child interactions. While this project is designed with the LCC program teachers in mind, it is also meant to help address the needs of the greater early childhood education community. The rationale for this project is that building the capacities of teachers for strengthening executive function skills in preschool can have lasting impact.

Project elements: The project includes a workshop for teachers which introduces the topic, gives an overview of the handbook contents, and opens a dialogue with teachers on their observations and reflections. The handbook is found in appendix A and includes description of strategies to use during child-led play, activities for teacher-directed play, and details about child observation and assessment related to EF and self-regulation. Appendix B contains the presentation slides that outline the contents of the handbook and prompt discussion points for the workshop. The final items are the tools for the project evaluation including the dimensions of the observation-based assessment tool for teachers and the form to be completed with teachers during meeting times (Appendix C).

Project Evaluation

The effectiveness of the project will be evaluated using an individual child observational assessment tool, Teaching Strategies GOLD, to examine children's development in EF and self-regulation areas. The benefits of the project will be identified by watching the progression children make in these areas of development

throughout the year. Individual child assessments will be conducted and individual reports as well as whole classroom reports will be reviewed and discussed in October, February, and May. The project will be successful if 100% of the teachers are able to employ strategies to improve individual children's executive function skills. This will be indicated by each child in their classroom moving closer to or reaching the widely held expectations of their age group as shown in the color bands on the GOLD assessment. Teachers will also have CLASS (Classroom Assessment Scoring System) observations in their classrooms in the Fall and again in the Spring. This tool focuses on the effectiveness of classroom interactions among teachers and children. Quality daily interactions as outlined in the project can be measured through the initial scores on the CLASS with the goal of seeing improvement on the subsequent observation. I will meet with teachers after the first observation to review scores, support self-evaluation, provide a platform for goal setting, and look to the project handbook with them for supporting strategies. Scores on the CLASS will indicate success when teachers improve their scores either from the low to middle range or from the middle range to the high range on the second observation.

Project Conclusions

Research evidence indicates that skills such as self-regulation, prosocial behavior, and healthy executive function are equally if not more important than academic skills in predicting school readiness and long-term positive school outcomes. However, many young children begin school with greater than normal challenges with these foundational skills. Neurobiological models suggest that

executive function skills are malleable, are determined by experiences, and that there are sensitive periods of brain development in early childhood (Blair, 2002; Center for Developing Child, 2011). Early childhood teachers and classrooms can play an essential role in improving and strengthening executive function during this critical time. Vygotsky's theory also supports the enormous influence and importance of social play and teacher scaffolding for the development of self-regulated behavior (Vygotsky, 1978). These theories together support the argument for early intervention in environments where children can interact with peers with support from informed educators.

Studies do not indicate there is one successful comprehensive curriculum approach in addressing the need for improving executive function skills before kindergarten. Teachers and administrators therefore need to sort out and select the strategies and practices that have been effective in helping children. Informing teachers of the most beneficial strategies and practices gives them the power to improve the learning trajectory for the young children in their classrooms. Executive function and self-regulation skills can be most improved through having teachers who understand the why and how of supporting the development. Many of the strategies are meant to take place during child led play and potential challenges may exist for classrooms that have little time for this type of play or for teachers to fully engage as opportunities are presented. However, the kernels of information in handbook can be integrated into existing classroom curriculum.

Major areas identified in the research for this project include improving teacher-child interactions, improving classroom climates and environment, and using social play as a central context for learning. Research indicated that higher scores on all domains of the CLASS Pre-K, which focuses on both teacher-child interactions and classroom climate, were found to positively impact executive function and self-regulation (Nietzel, 2018). The CLASS Pre-K include items focused on providing opportunities for children to engage in open-ended play activities with peers and the teacher's role in fostering learning during interactions. The research on the contribution of children's social pretend play also confirms a positive connection, particularly when that play is child-directed and includes teacher's scaffolding and intentional support of children's language development (Mattera et al., 2021). Another recent highlight in the research that informed this project is the use of play-based movement games to introduce and practice executive function skills (Mclelland et al., 2019).

Researchers have been attempting to tease out the specific key specific aspects of interventions that are most effective in supporting the early executive function skills in early childhood classrooms, especially those that may lead to a decrease in school readiness gaps. However more research is necessary to help pinpoint which individual teaching behaviors and curriculum components that consistently work and how to effectively measure the EF and self-regulation of children in various preschool environments.

Plans for Implementation

The handbook will be useful for early childhood professionals working with groups of young children primarily in a classroom setting. The first plan for implementation is to conduct a workshop with teachers at the Leelanau Children's Center prior to the next school year during a preservice professional development day planned for November 2022. The workshop will be submitted to the Michigan training registry for approval prior to and teachers can receive official training hours. Teachers will receive the handbook as part of the workshop. Teachers will also receive classroom reports generated through Teaching Strategies GOLD, an observation-based child assessment tool, that will highlight the specific areas of development related to EF and self-regulation. Teachers complete assessment checkpoints three times per year at LCC, including the initial one in late October and the data will be available to look at. GOLD reports will be looked at and discussed with teaching teams after each checkpoint to look for progress and challenges in executive function development. The next step is to conduct observations in each of the classrooms at LCC using the CLASS during the months of November and December. The observations will be followed by meeting with each teaching team to discuss observations and potential for improvement. The observations and assessments will be repeated in the spring with team teacher meetings in between to reflect and set goals.

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Appendix A: Teacher Handbook

Strengthening Executive Function and Self-Regulation in Young Children

Teacher Handbook

What is Executive Function?

Executive Function (EF) refers to the specialized cognitive skills, primarily in the frontal lobe of the brain which work together to regulate, recall, and plan actions. These skills help a child remember and follow multiple-step instructions; avoid distractions and impulsive responses; adjust when rules or instructions change; keep trying after an initial failure.

Self-Regulation is the ability to integrate the aspects of executive function into behavior. It is the act of managing thoughts and feelings to enable goal-directed actions. For instance, finding ways to cope with strong feelings, learning to focus and shift attention, and successfully controlling behaviors required to get along with others.

Executive function and self-regulation skills depend on three types of brain function: working memory, mental flexibility, and inhibitory control. These functions are highly interrelated, and the successful application of executive function skills requires them to operate in coordination with each other.

Table 1. What Executive Function Looks Like in Early Childhood

Working Memory	Inhibitory Control	Cognitive Flexibility
• *Take the perspective of others* (e.g., understands why another child is upset when their toy is taken by a peer) • *Follow directions with multiple steps independently* (e.g., "After you throw your garbage away, you can go to the bathroom and get your coat to go outside.") • *Keep in mind what they have done and what needs to be done next* (e.g., hangs up coat then knows to go into the classroom and find something to do) • *Answers questions appropriately when asked* • *Stays on topic during a conversation* • *Has mastered routines throughout the day* (e.g., knows what to do after lunch is over, knows process of packing up at the end of the day) • *Gets back on task if interrupted*	• *Can delay gratification* (e.g., waiting for turn, raise hand to speak at circle rather than blurting out) • *Controls frustration* (e.g., manages emotions appropriately when block tower falls to the ground) • *Comply with demands even when they don't want to* (e.g., child doesn't want to go to small group, child wants different book read at group time) • *Demonstrates persistence with more challenging tasks*	• *Can shift actions according to changing rules* (e.g., in dramatic play when the play scheme shifts, adapts to peer wanting to build something else with blocks) • *Adjust behavior to the demands of different situations* (e.g., outside vs. circle, free play vs. small group)

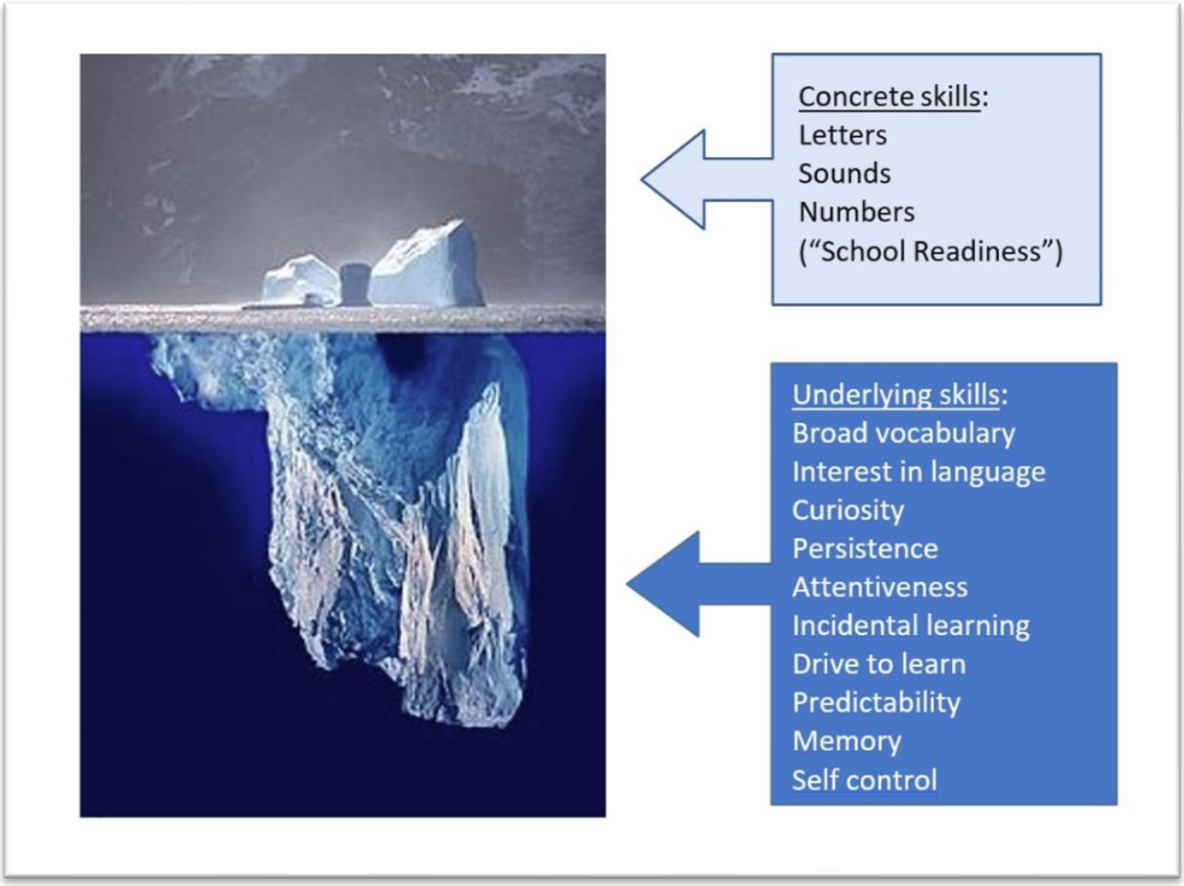
(Center on the Developing Child, 2014; Galinsky, 2010)

Just as an air traffic control system at a busy airport safely manages the arrivals and departures of many aircraft on multiple runways, the brain needs this skill set to filter distractions, prioritize tasks, set and achieve goals, and control impulses.

A great resource for more on defining EF:

Center for the Developing Child - Executive Function Key Concepts

Why is it important?



The "tip of the iceberg" theory from Dale Farran, Department of Teaching and Learning, Vanderbilt University

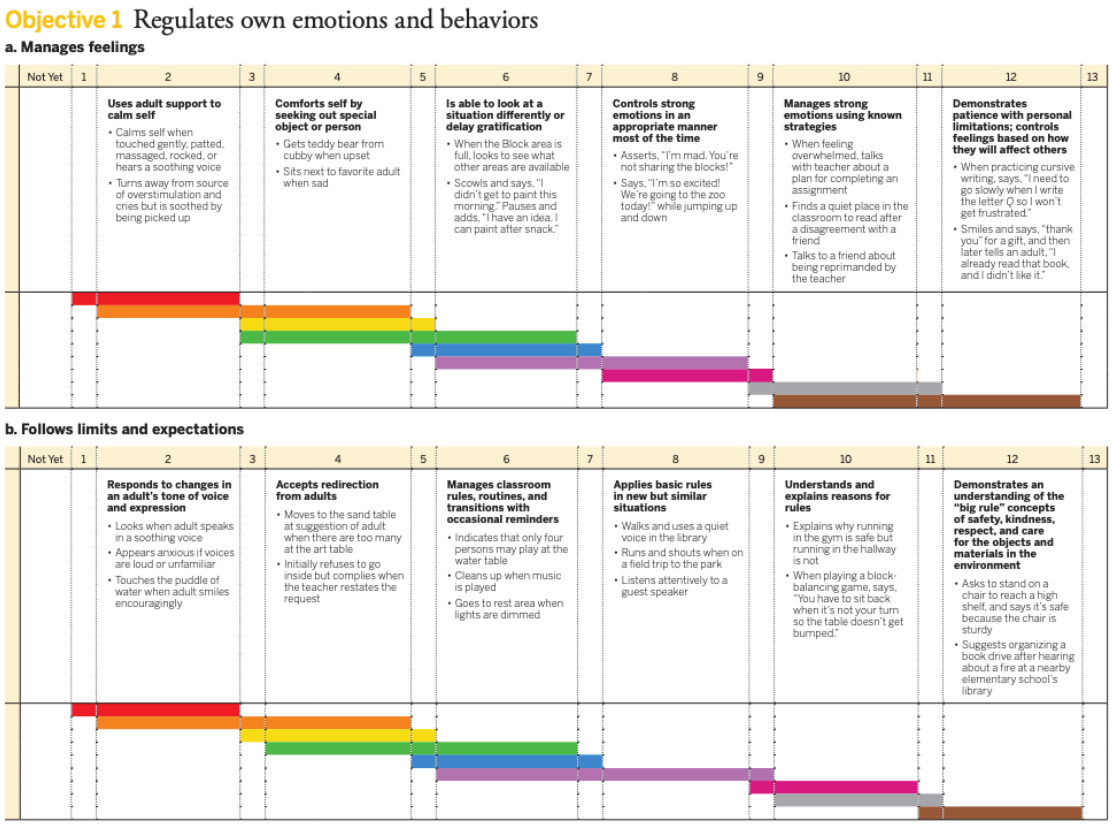
The handbook is divided into four categories based on teacher's role in children's play. The roles consist of the 1) teacher as the observer, 2) the stage manager, 3) the co-player, and 4) play leader.

Teacher as Observer

Teachers must observe carefully to determine whether, when, how, and with whom to intervene. Through observing children's play, teachers can gather information about children's interests, strengths, and challenges.

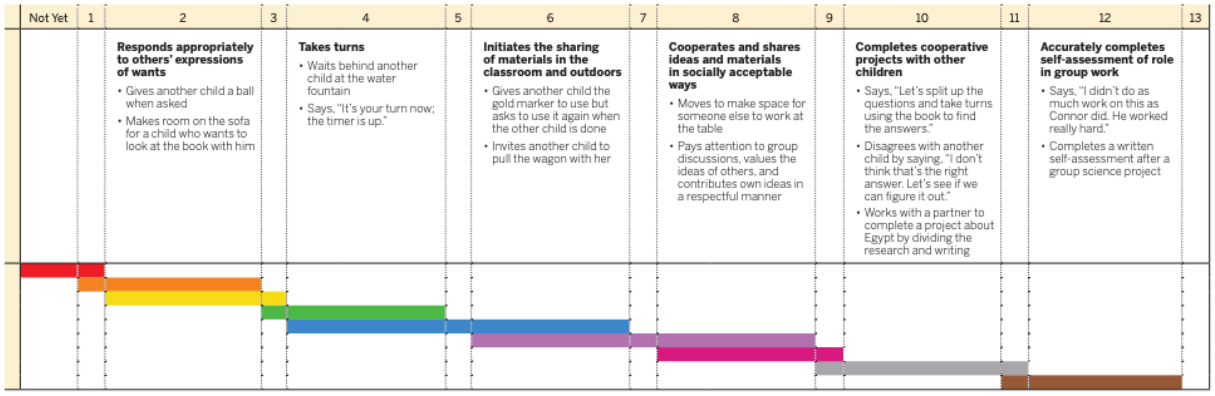
Using Teaching Strategies GOLD to carefully observe and assess individual children's development specific to the Executive Function and Self-Regulation domains. After each checkpoint it is important to create the reports for these areas to identify children who you may need to focus on and make individual plans of support

(Widely held expectation color bands =PreK age 3 – Green, PreK age 4 – Blue, Kindergarten – Purple)

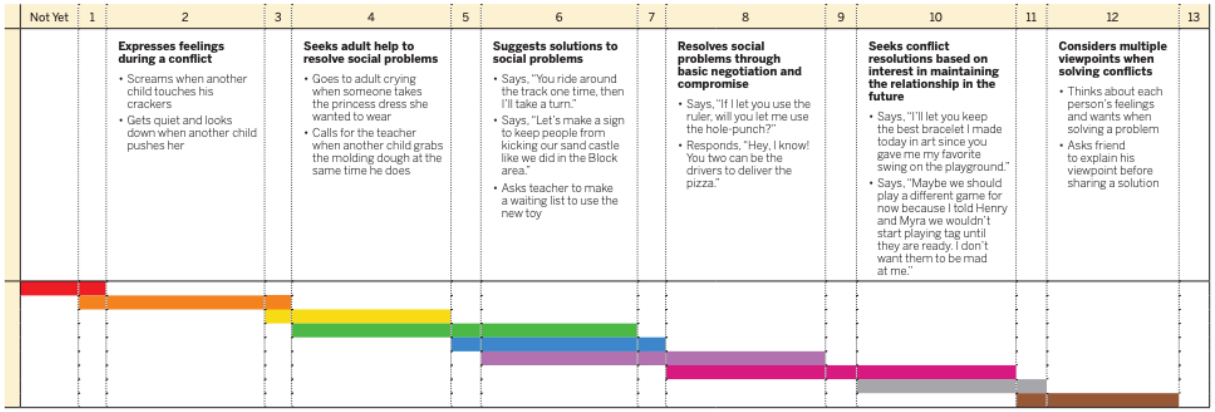


Objective 3 Participates cooperatively and constructively in group situations

a. Balances needs and rights of self and others

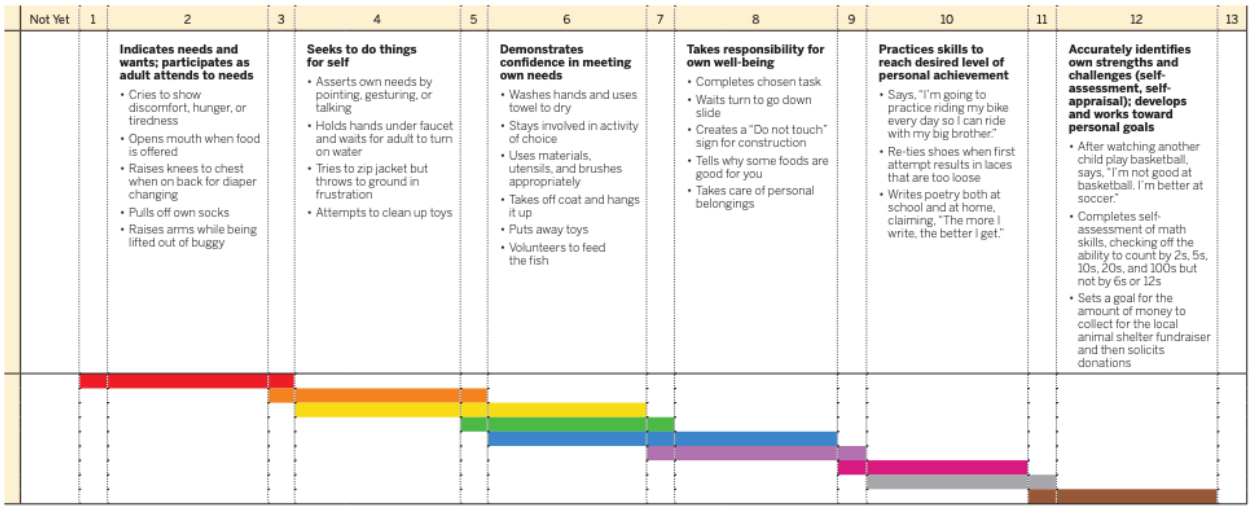


b. Solves social problems



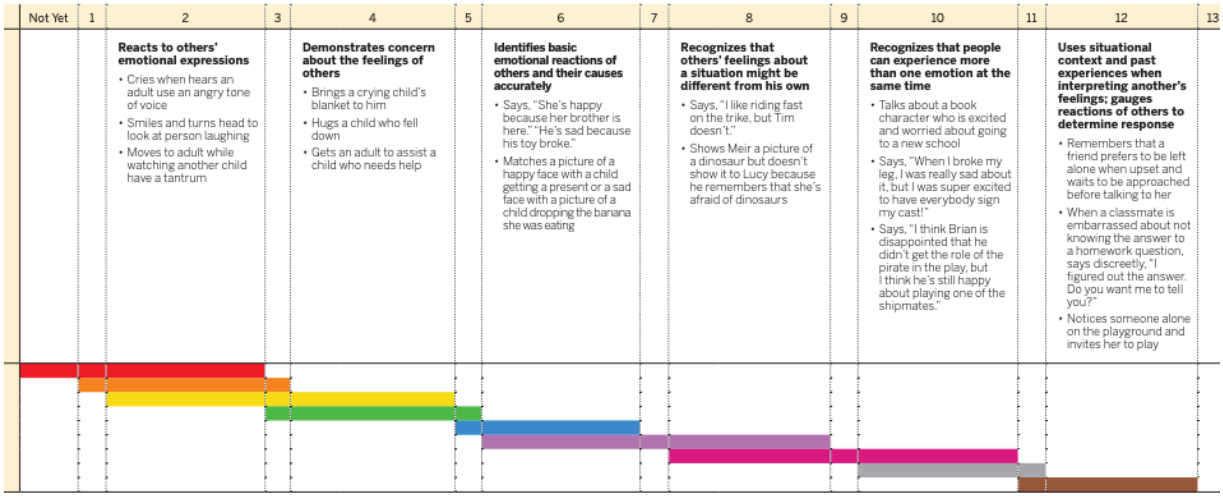
Objective 1 Regulates own emotions and behaviors

c. Takes care of own needs appropriately



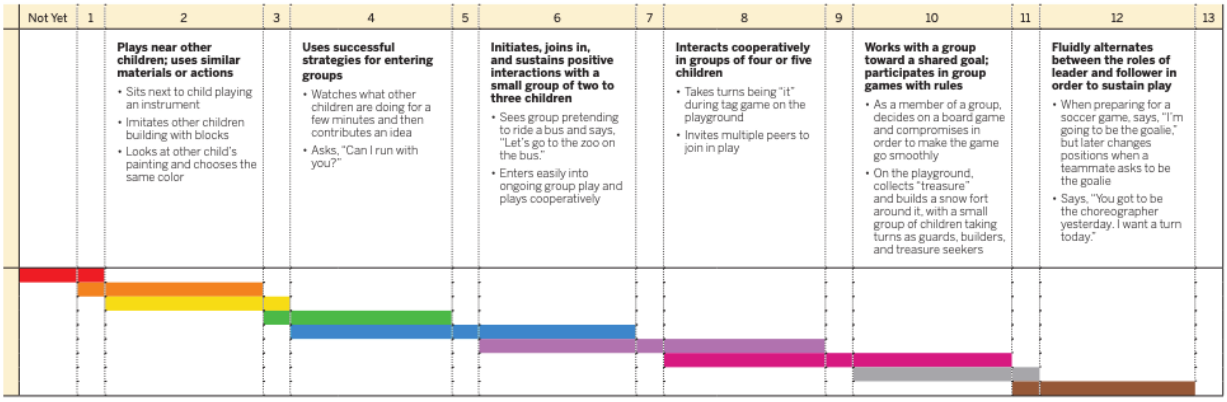
Objective 2 Establishes and sustains positive relationships

b. Responds to emotional cues



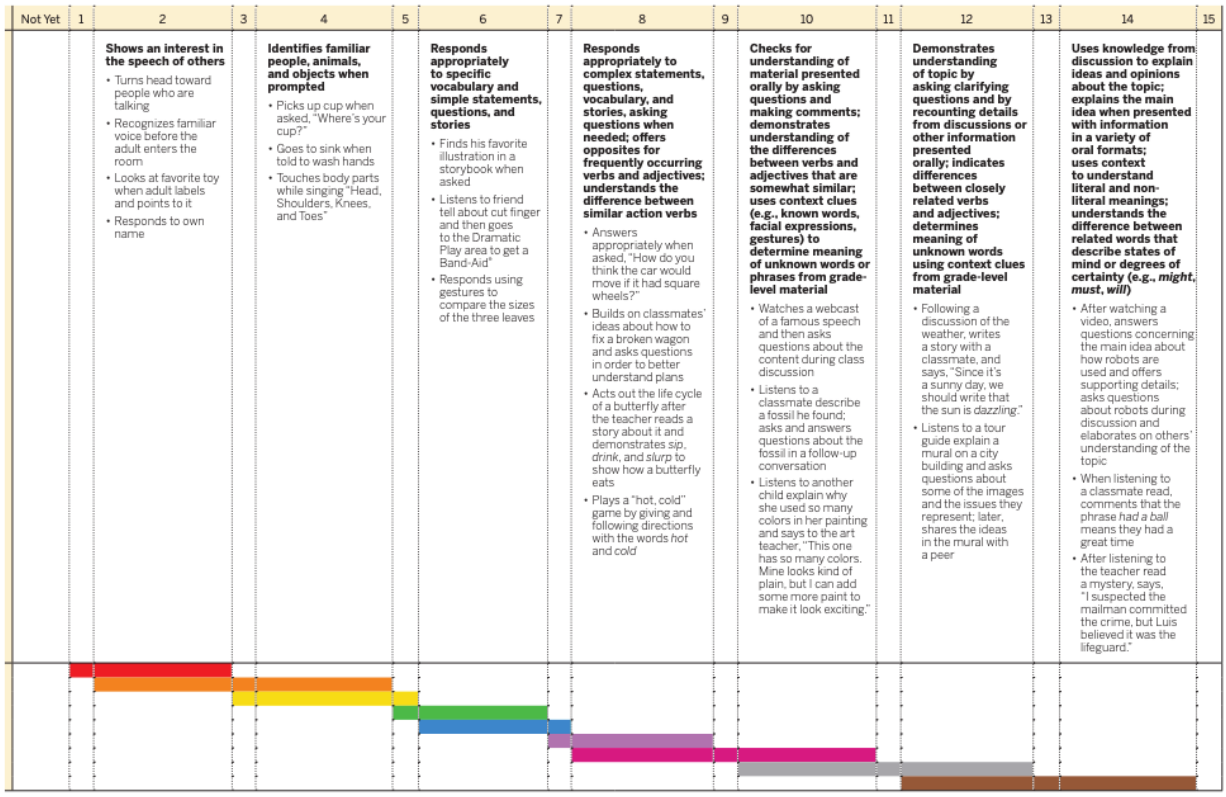
Objective 2 Establishes and sustains positive relationships

c. Interacts with peers



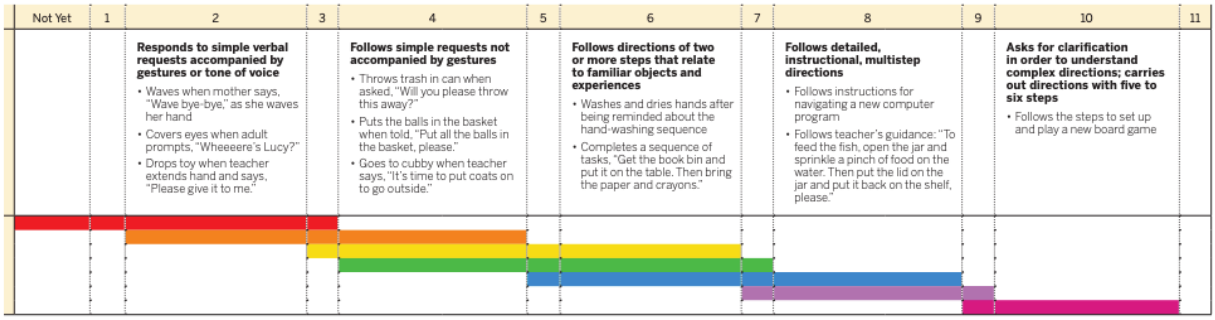
Objective 8 Listens to and understands increasingly complex language

a. Comprehends language



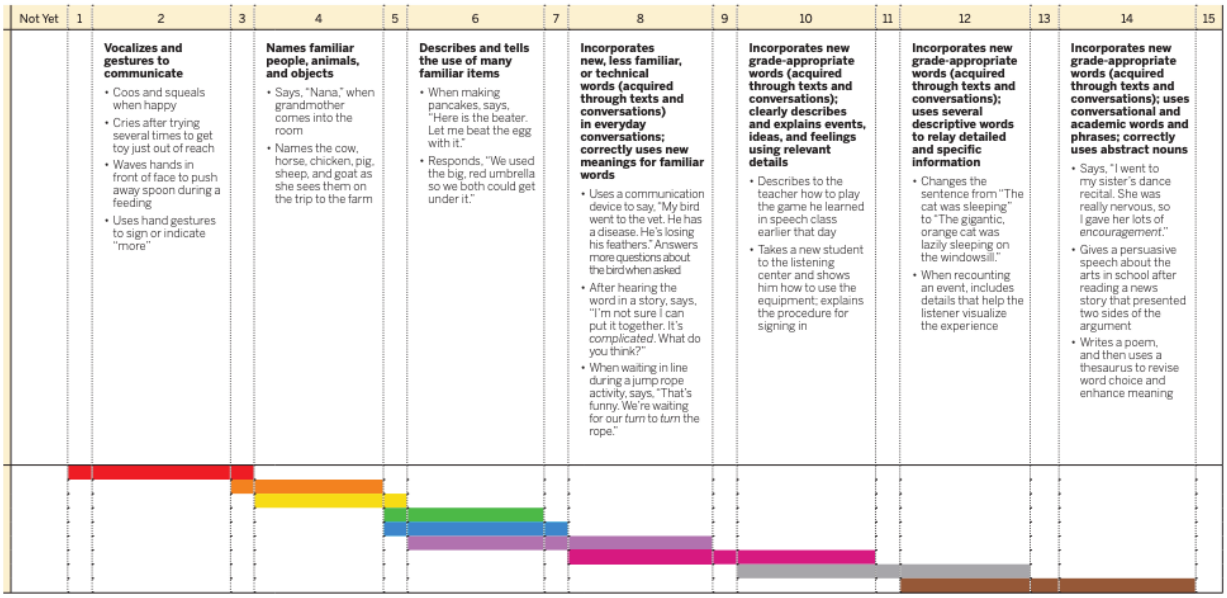
Objective 8 Listens to and understands increasingly complex language

b. Follows directions



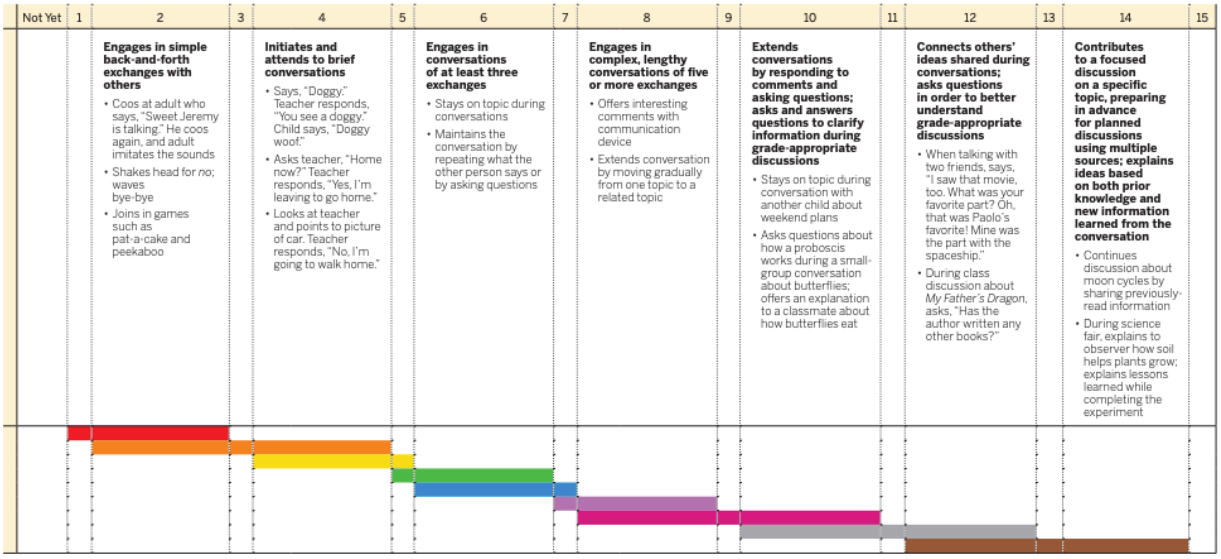
Objective 9 Uses language to express thoughts and needs

a. Uses an expanding expressive vocabulary



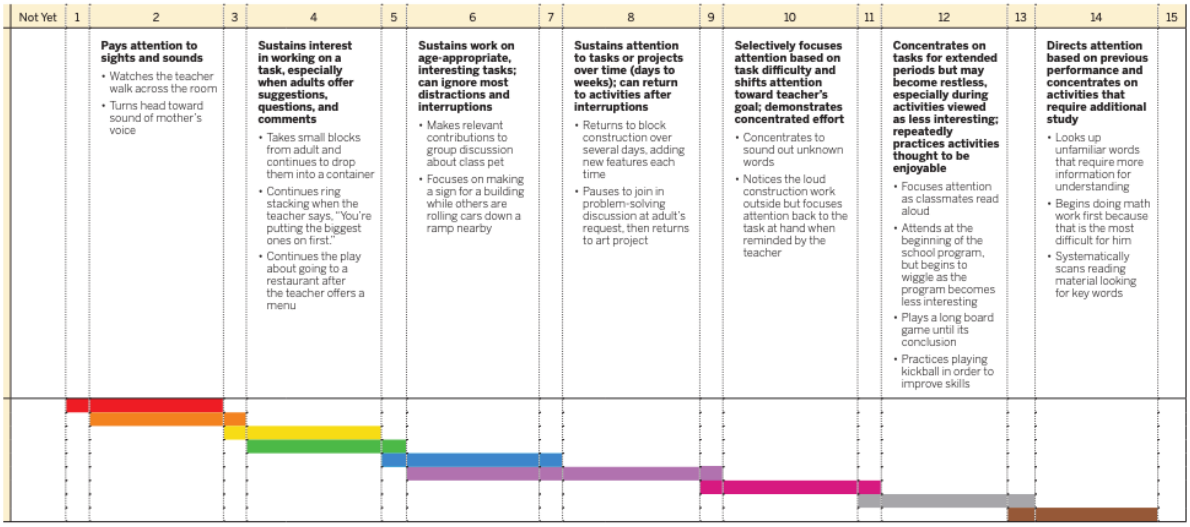
Objective 10 Uses appropriate conversational and other communication skills

a. Engages in conversations



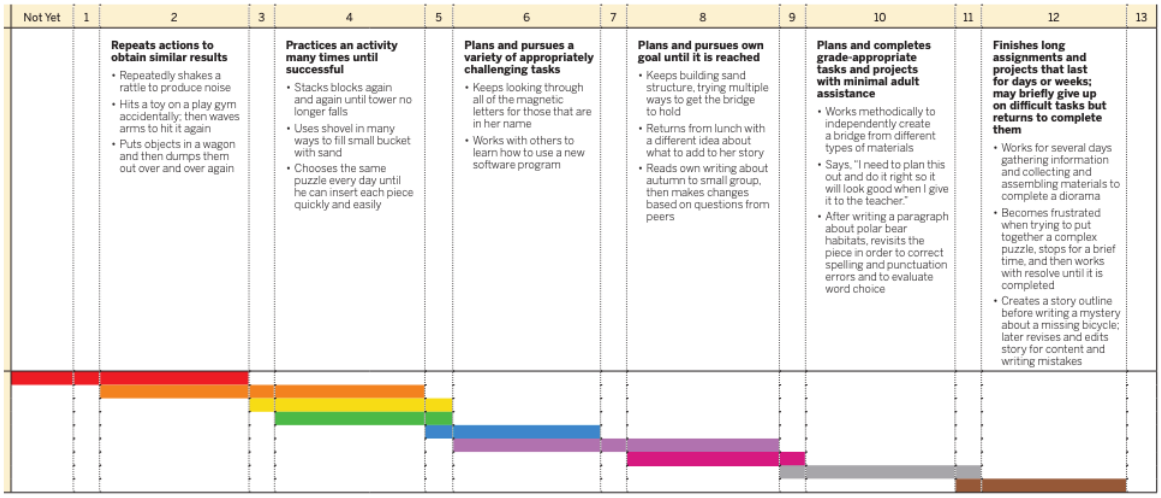
Objective 11 Demonstrates positive approaches to learning

a. Attends and engages



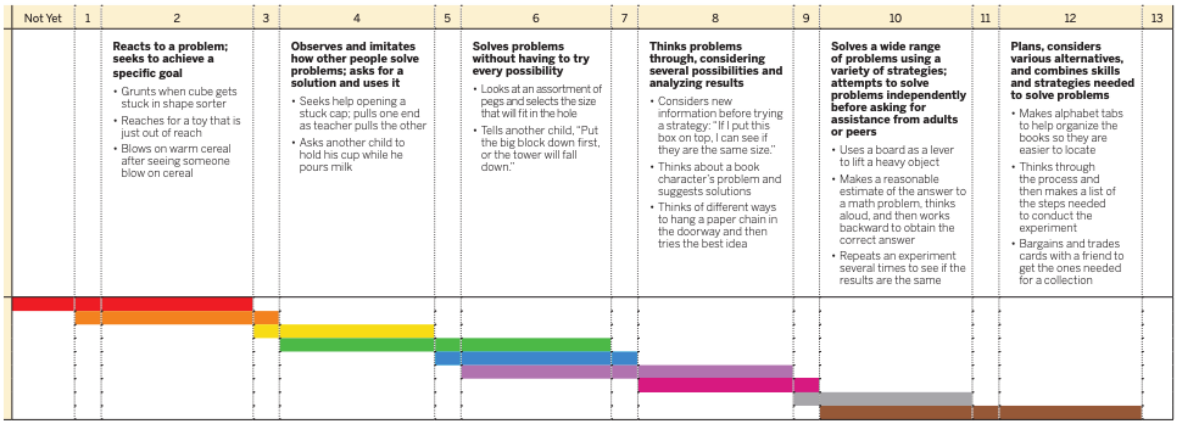
Objective 11 Demonstrates positive approaches to learning

b. Persists



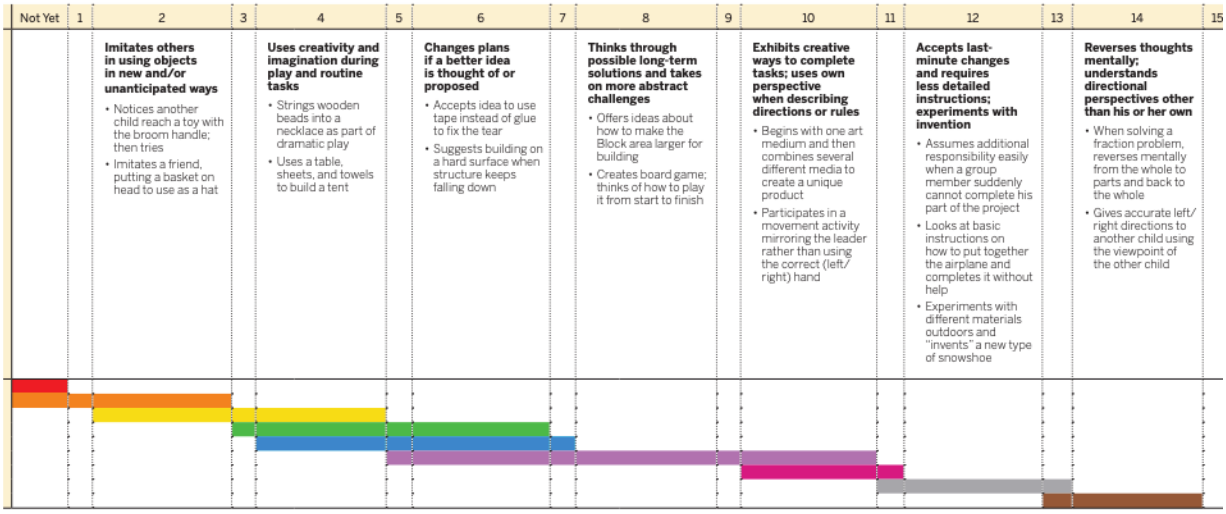
Objective 11 Demonstrates positive approaches to learning

c. Solves problems



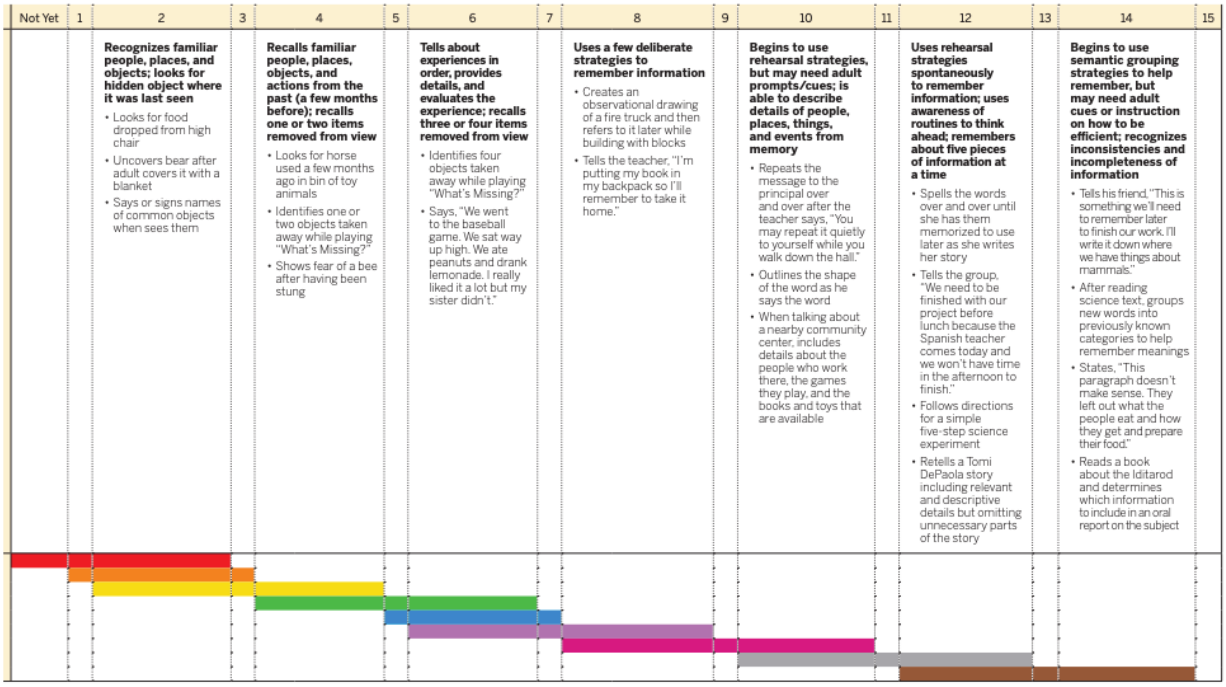
Objective 11 Demonstrates positive approaches to learning

e. Shows flexibility and inventiveness in thinking



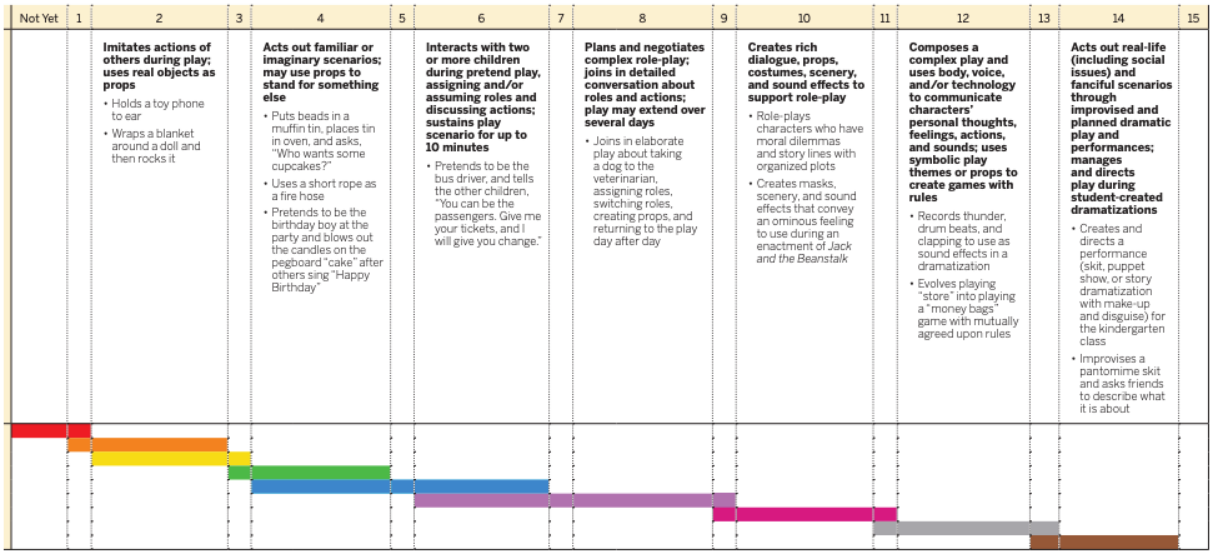
Objective 12 Remembers and connects experiences

a. Recognizes and recalls



Objective 14 Uses symbols and images to represent something not present

b. Engages in sociodramatic play



Teacher as Stage Manager

As stage manager, teachers should provide time, space, and props to enhance the play. Children need ample time in the daily routine to learn through play! Teachers should arrange a routine and schedule that allows children to plan and carry out play ideas. Especially during dramatic play and constructive play, children need more time to select players and negotiate roles, design objects and construct play props. How much is enough time? At least 1 hour of inside freeplay time and as much time for outside play during a morning routine. For an all-day program, double that time.

Supporting imaginary play in the classroom through the environment and routines is important. During intentional imaginary play, children develop rules to guide their actions in playing roles. They also hold complex ideas in mind and shape their actions to follow these rules, inhibiting impulses or actions that don't fit the "role." Players often take ideas from their own lives, such as going to the doctor's office. They might act "sick," be examined by the doctor, and receive a shot. The "doctor" talks and acts like a doctor (calm and reassuring), the "sick child" talks and acts like a sick child (sad and scared), and the child in the role of "parent" talks and acts like a concerned parent (worried and caring). While younger children tend to play alone or in parallel, children in this age range are learning to play cooperatively and often regulate each other's behavior—an important step in developing self-regulation.

Supporting Child-Directed Social Pretend Play

The research on the contribution of children's social pretend play to the development of executive function confirms a positive connection, particularly when that play is child-directed. Child-directed play happens when children spontaneously create groups and play according to their own interests without external interventions. Sociocultural theory recognizes that play, especially pretend play involving imaginative or sociodramatic elements, naturally support children's learning and development and can help build executive function skills.

Through this play that young children learn self-control (e.g., taking turns and thinking before acting) and cognitive flexibility (e.g., role-playing and considering the perspective of the other child). The discussion about the importance of play in children's executive function development is an important one as the tension has increased with the emphasis on academic-focused versus play-based curriculum. While the benefit of this type of play is well documented, the pressure to get children "ready for school" is squeezing the time for child-directed social play out of many preschool classrooms. **Teachers must allow for enough time for social pretend play in their classroom schedules!**

The NAEYC website has extensive resources and ideas for supporting this:

NAEYC Resources for Supporting Social Dramatic Play

Ways to support high-level thinking in social pretend play

Provide a varied set of props and toys
to encourage this type of play. Younger pre-schoolers may need more realistic props to get the play started (e.g., toy medical kits), while older children can re-purpose other things to turn them into play props (e.g., paper towel tube that is used as a cast for a "broken arm"). Reusing familiar objects in a new way also practices cognitive flexibility.

Allow children to make their own play props. Children must determine what is needed, hold this information in mind, and then follow through without getting distracted. They also exercise selective attention, working memory, and planning. If the original plans don't work out, children need to adjust their ideas and try again, challenging their cognitive flexibility.

Play plans can be a good way to organize play, Children decide who they are going to be and what they are going to do before they start playing, and then draw their plan on paper. Planning means that children think first and then act, thus practicing inhibitory control. Planning play in a group also encourages children to plan together, hold these plans in mind, and apply them during the activity. It encourages social problem solving, as well as oral language.

Using CLASS domains to improve interactions

CLASS measures the effectiveness of interactions among teachers and children in the classroom and provides a framework for continuous improvement efforts. According to research, preschoolers who experienced warm and responsive classroom interactions in the fall displayed more prosocial behaviors in the spring. Those with low impulse control showed gains in inhibitory control when they were in classrooms with higher levels of Emotional Support. Those with low self-regulation skills were more likely to engage in positive social interactions with peers when the classroom was higher on Emotional Support.

Effective teacher-child interactions in Instructional Support include promoting higher-order thinking skills such as analysis and reasoning, providing specific feedback in response to children, and supporting receptive and expressive language development. Children in classrooms with more effective Instructional Support showed greater ability to successfully regulate their behavior and manage their impulses. Children who began the year with lower levels of self-regulation demonstrated increased skills by the end of the school year in classrooms with higher Instructional Support scores. Preschool children who experienced classrooms with higher levels of Instructional Support demonstrated fewer problem behaviors, had closer relationships with teachers and performed better on executive function skills.

CLASS Dimensions and ways to improve support of executive function and self-regulation:

Positive Climate

- Enjoy time with children, make learning fun, show enthusiasm, make positive comments, engage in social conversation, facilitate positive peer interactions

Teacher Sensitivity

- Understand each child's development and individualize accordingly, tune in and be responsive to non-verbal cues, take time to listen to and respond to children, encourage children to see you as the source of comfort and support in the classroom, try taking children's perspective in challenging moments.

Regard for Student Perspective

- Actively seek out children's ideas and points of view, give children choices, provide plenty of time for child-initiated activities, provide children with real responsibilities in the classroom, encourage children to mentor others, allow for freedom of movement.

Productivity

- Be organized and efficient, plan ahead!, minimize time spent on managerial tasks, make the most of transitions.

Instructional Learning Formats

- Make interesting and relevant materials available for children, actively involve children, present information using a variety of modalities, share children's interest and enthusiasm, ask open-ended questions, when appropriate state the learning objective of an activity.

Concept Development

- Challenge children to think about the hows and whys of learning, focus on the process of solutions rather than correct answers, encourage analysis and reasoning skills, link concepts across activities, apply concepts to the real world, encourage children's creativity through open-ended materials

Quality of Feedback

- Focus on the process of learning, scaffold learning, provide specific information about why answers are correct or not, give specific feedback and take time to listen and respond, encourage children to persist in their activities.

Language Modeling

- Ask open-ended questions, promote child-initiated language, repeat and extend children's responses, use self-talk and parallel talk, use advanced language, encourage social language between peers.

Teacher as Co-Player

As co-player, the teacher carefully involves themselves in the play, scaffolding language, and intervening to support and extend the play. The most helpful teacher role involves not directly instructing or explaining, but instead, modeling, demonstrating, guiding as well as expanding and extending children's language**.**

As a co-player, the teacher participates in the children's play. They become a play partner and take on minor roles if invited in. During play, they model play skills, assist in problem-solving, use open-ended questions, scaffold to demonstrate language use, and expand children's vocabulary. Teacher may direct suggestions or an explicit demonstration of how to carry out a particular pretend act or type of social interaction.

Using open-ended questions

An important aspect of fostering high-quality classroom interactions is using open-ended questions. They prompt children to reason and reflect while encouraging their use of language. These are a few intentional ways to incorporate using open-ended questions into everyday interactions with children.

- Ask "How did you decide…? to encourage children to talk about something they are doing. Help them articulate their decision making process by following up with "what if you…?. or "how else could you…?
- Provide lots of opportunities for children to practice responding to these type of questions – and make sure you WAIT for them to answer. Not all children are used to open-ended conversations, and it may take theme time to get comfortable with responding in more complex ways.
- Before reading a book with children, prepare questions and statements you might use while reading, examples; "look at the cover, what do you think this will be about?, Why is the monkey throwing coconuts do you think? Tell me what you think will happen next?"
- Consider creating a question of the week to ask each child in your classroom and make the time for individualized back-and-forth conversations during your regular classroom routines. Take time to ask follow-up questions like "can you tell me more about that?" or "why do you think that?"
- Practice! Making open-ended questions a regular part of the teaching practice is so valuable!

Using storytelling to increase language development

Children love to tell stories. Their early stories tend to be a series of events, each one related to the one before, but lacking any larger structure. With practice, children develop more complex and organized plots. As the complexity of the

storytelling grows, children practice holding and manipulating information in working memory.

Ways to support children's storytelling:

- **Encourage children to tell stories** and write them down to read with the child. Children can also make pictures and create their own books. Revisiting the story, either by reviewing pictures or words, supports more intentional organization and greater elaboration.
- **Tell group stories.** One child starts the story, and each person in the group adds something to it. Children need to pay attention to each other, reflect on possible plot twists, and tailor their additions to fit the plot, thereby challenging their attention, working memory, and self-control.
- **Have children act out stories** they have written. The story provides a structure that guides children's actions and requires them to attend to the story and follow it, while inhibiting their impulse to create a new plot.
- **Bilingual families can tell stories in their home language.** Research indicates that bilingualism can benefit a variety of executive function skills in children of all ages, so fostering fluency in a second language is valuable.

Teacher as Play Leader

Playing games can help children learn the necessary skills to self-regulate while keeping it fun! The demands of songs and movement games support executive function because children must move to a specific rhythm and synchronize words to actions and the music. All these tasks contribute to inhibitory control and working memory. It is important that these songs and games become increasingly com- plex to interest and challenge children as they develop more self-regulation skills.

Circle time and transitions are good times to introduce and play these games and provide the opportunity for children to practice these skills as the teacher leads the play and children respond. Self-regulation skills help children to control emotions, thinking, behavior and motor actions in different situations. Throughout the day, children need the ability to tolerate sensations, situations and form appropriate responses. It requires that children control their impulses to stop doing something if needed and to participate in something even if the child does not want to do it.

Ready, Set, Wiggle – The leader calls out Ready...Set...Wiggle and everyone wiggles their bodies. The leader calls out Ready...Set...Watermelon. No one should move. Leader calls out Ready...Set...Wigs. No one moves. Leader calls out Ready...Set...Wiggle. Everyone wiggles again. You can change this to whatever wording you want. The purpose is to have the children waiting to move until a certain word is said out loud.

Body Part Mix Up – The leader will call out body parts for the children to touch. For example, the leader calls out "knees" and the children touch their knees. Create one rule to start. Each time the leader says "head" touch your toes instead of your head. This requires the children to stop and think about their actions and to not just react. The leader calls out "knees, head, elbow". The children should touch their knees, TOES and elbow. Continue practicing and adding other rules to change body parts.

Color Moves – Explain to the children that they will walk around the room. They are to move based on the color paper you are holding up. Green paper means walk fast, yellow paper means regular pace and blue paper means slow motion walking. Whenever you hold up a red paper they stop. Try different locomotor skills – running in place, marching, jumping, etc.

Red Light Purple Light: Show children red and green construction paper circles and let them know that when they see green, they "go" and when they see red, they "stop." Alternate holding up red and green circles as children use different actions: ex. Hop in place, Tiptoe. Next show children two new colored construction paper circles (e.g. purple and orange) and let them know when they see purple, they 'go' and when they see orange, they 'stop.' Alternate holding up red and green circles as children use different actions. If time allows, let a few children choose an action (e.g., clapping hands) and let the children who choose the action have a turn holding up the colored circles to lead their classmates. Make the game more complicated once children know the game well by reversing the "stop" and "go" colors

Sleeping Game: Tell children that their mat (or carpet square or any designated spot) is also their bed and the place they will go back to when it is time to sleep. Have children practice pretending to sleep. Let them know that whenever they hear the Sleeping Song, it is time to return to their mats and pretend to sleep. Sing the Sleeping Song: "Sleeping, Sleeping, All the children are sleeping. And when they woke up, they were... snakes, birds, choose any animals, ask kids to choose

Freeze Game - Children dance when the music plays and freeze when the music stops! Talk with children about the importance of keeping their bodies and their friends' bodies safe when dancing around the classroom. Play the Freeze Game: dance when the music plays, freeze when it stops dance quickly to fast music, dance slowly to slow music alternate between fast, slow, and freeze.

Conductor Game: Teacher is the conductor and children will be the orchestra. Tell children that an orchestra is a group of people who play their instruments together. A conductor uses a baton to let the orchestra know when to play and when to stop. Have children practice first by clapping or patting knees. Pass out instruments and play them together (baton waving = play; baton down = stop). Let a few children have a turn acting as the conductor by waving and stopping the baton. Make the game more complex by playing with opposite rules. Have children play when the baton stops and stop when the baton waves.

Action Dance: song by Kate Kuper. All songs on the Alphabeat recording (found for free on youtube or itunes) are great for circle time and transition activities for practicing EF and SR. Especially Action Dance, Imaginary Journey, and Drum Beat.

Tips for a Successful Circle Time

Here are some tips for a well-regulated circle time. Adapted from "Stop, Think, Act: Integrating Self-Regulation in Early Childhood Circle Times" by Megan M. McClelland and Shauna L. Tominey.When setting up and structuring your circle time, think about the following:

- **Consider timing**. If circle time is your first activity of the day, children may be anxious to move their bodies. Include activities that allow them to be active and release energy before activities that require children to sit still. Games and songs provide children with opportunities to engage in physical activities and actively transition to circle time.
- **Provide children with a home base.** Have mats or carpet squares for children to sit on during circle time. Mats give children a designated seat and a "home base" to return to following activities that allow them to move around the circle time space
- **Choose a quiet sign**. Choose a quiet sign to use when it is time to end an activity, calm down, or return to home base. Your quiet sign might simply be putting one hand up in the air, ringing a bell, or even singing a certain song.
- **Circle time welcome**. Use a transition song and/or welcome song that allows children to move their bodies. Having the opportunity to release some energy (especially if circle time is at the beginning of the day), may improve children's abilities to focus and pay attention to the quieter components of circle time.
- **Choose Activities that are Developmentally Appropriate for the Children in Your Class and Present Activities in Fun and Engaging Ways**
  Be sure that the activities that you choose are appropriate for the children in your class based on their individual and collective abilities. Developmentally appropriate curricula integrate multiple domains of development and use many different approaches (including play, activities, and games) to promote learning. If the majority of children in your class seem bored or have difficulty paying attention and staying on task during circle time, this may be an indication that the activity is not developmentally appropriate and is either too challenging (leading to feelings of frustration), not challenging enough (leading to feelings of boredom), or that the activity has lasted too long.
- **Use emotional expression to promote engagement**. Your own emotional expression plays an important part in how children will respond to the activities you present. Showing enthusiasm through your facial expressions and voice can help children feel that same enthusiasm for learning. A high level of enthusiasm all the time, however, can also be overwhelming so

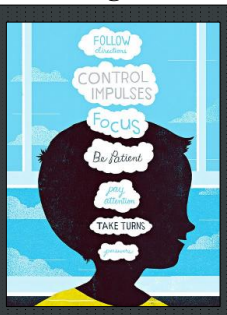
balancing enthusiasm with a range of emotional expressions is also important. Use a quiet expression and voice when reading a calm book or introducing an activity that requires a low level of energy. Model the emotions of book characters or puppets in your own facial expression, body, and voice when you read a story.

- **Model the Behavior that You Would Like to See** Children look to you to set an example for their behavior. During circle time and throughout the day, model the skills and behaviors you would like children to use (e.g., using words to express your feelings, taking a deep breath and remaining calm during challenging situations, listening attentively and responding appropriately).
- **Provide Opportunities for ALL Children to Participate and to Feel Successful** Activities should allow children to participate successfully whether they can accurately follow all rules of the activity or not. Games that are cooperative in nature offer opportunities for children to serve as leaders and models to their peers. By allowing children to participate at their own skill level, you can help children feel successful and capable. This approach facilitates participation and engagement, which will promote children's ability to follow increasingly complicated rules as children are developmentally ready.
- **Allow Children to Participate in a Way that is Supportive of Their Personality and Temperament** Children have varying levels of comfort in different situations. Inviting and encouraging a child to try a new activity, but also allowing a child to decline to participate in an activity if they are not comfortable doing so is part of being a supportive educator. Allowing children to engage in activities in ways that match their individual personality (e.g., watching, participating) and temperament will help them feel comfortable and make the most of the learning experience.
- **Work with Colleagues to Create a Self-Regulation Support Plan** Work together with your co-teacher(s) to come up with a plan to provide one-on-one support for children who need individual attention during circle time. This may mean having an assistant teacher available to sit next to a child who is likely to have difficulties or calling in additional support staff from the center.
- **Have a Back-Up Plan** As teachers, we have good days and bad days, great ideas, and ideas that flop. If a lesson "flops," materials that you need are unavailable for your lesson, or outdoor time needs to be brought indoors because of weather, have another activity ready to take its place.
- **Use Every Circle Time as a Learning Experience for the Children and YOU** After each circle time, reflect on your successes, why things went well, what challenges you experienced, and brainstorm ways to extend the positive aspects of circle time or restructure those aspects that are challenging. Every day brings a new opportunity to evolve as an educator and try again.
- **Have Fun and Maintain a Sense of Humor!!**

Appendix B

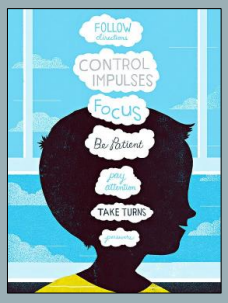
Preschool Teacher Workshop Presentation Slides

Strengthening Executive Function and Self-Regulation in Young Children



Workshop presented by Molly Grosvenor

Leelanau Children's Center



- **Executive function and self-regulation skills depend on three types of brain function: working memory, mental flexibility, and inhibitory control.** These functions are highly interrelated, and the successful application of executive function skills requires them to operate in coordination with each other.
- Executive function is already present in the child at birth but require experiences and guidance to fully develop.
- Executive capacity lives in the frontal lobe of the brain where young children experience rapid development between the ages of 3-5
- Executive Functioning skills, including self-regulation, stress management, and focus are strongly associated with healthy social-emotional development.

What does it look like in action?

Attentional/cognitive flexibility

- Paying attention
- Listening to and following directions
- Switching focus from one task to another
- Ignoring distractions

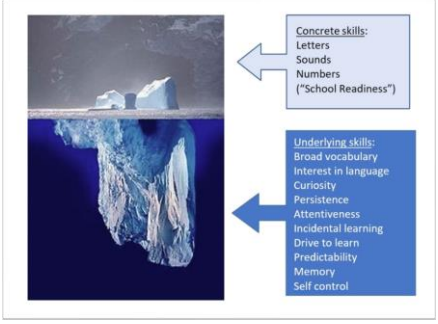
Working memory

- Using short-term memory
- Remembering single and multi-step directions
- Recalling and recognizing facts, lessons, or instructions

Inhibitory control

- Controlling impulses
- Stopping one behavior and choosing another more appropriate action
- Calming down when upset
- Taking turns
- Waiting/delaying gratification

WHY IS IT IMPORTANT



The "tip of the iceberg" theory from Dale Farran, Department of Teaching and Learning, Vanderbilt University

CURRENT RESEARCH ON EARLY EF INTERVENTION

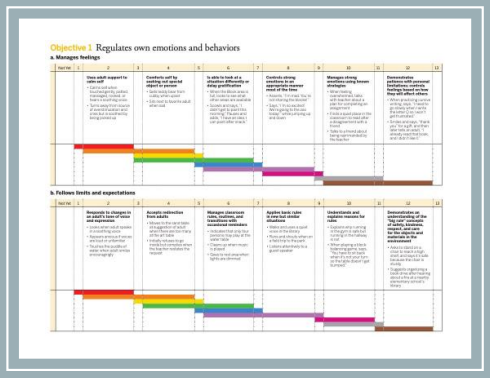
Research confirms that EF skills are malleable and can be improved through preschool experiences. Early support and intervention are especially important for children who enter school with poorer executive function skills and are at risk because of social, economic, or other adverse childhood experiences

3 major areas identified in the research for supporting early EF development:

- Improving teacher-child interactions and classroom climates
- Using play as a central context for development
- Supporting social-emotional learning

Teachers must observe carefully to determine whether, when, how, and with whom to intervene. Through observing children's play, teachers can gather information about children's interests, strengths, and challenges.

USING TEACHING STRATEGIES GOLD TO CAREFULLY OBSERVE AND ASSESS CHILDREN'S EF SKILLS AND BEHAVIORS



TEACHER AS STAGE MANAGER

As stage manager, teachers should provide time, space, and props to enhance the play. Children need ample time in the daily routine to learn through play! Teachers should arrange a routine and schedule that allows children to plan and carry out play ideas

USING QUALITY MEASUREMENT TOOLS TO ASSESS ENVIRONMENT AND INTERACTIONS

Table 2. Items within ECERS-3 and CLASS Pre-K Subscales Related to Executive Function

ECERS-3		CLASS Pre-K		
Learning Opportunities		Emotional Support	Classroom Organization	Instructional Support
Item #		• Have positive relationships with children • Foster positive peer relationships • Recognize and label children's emotions • Respond to children's ideas and interests	• Effective management of children's time, behavior, and attention • Clear and well-established behavior guidelines • Consistent routines • Engagement	• Help children solve problems, reason, and think • Use feedback to expand and deepen skills • Help children develop more complex language skills
4	Space for privacy			
15	Encouraging children's use of books			
17	Fine motor			
18	Art			
19	Music and movement			
20	Blocks			
21	Dramatic play			
22	Nature/ Science			
26	Promoting acceptance of diversity			
29	Individualized teaching and learning			
34	Free play			

Importance of Child-Directed Social Pretend Play

The research on the contribution of children's social pretend play to the development of executive function confirms a positive connection, particularly when that play is **child-directed**. Child-directed play happens when children spontaneously create groups and play according to their own interests without external interventions. Sociocultural theory recognizes that play, especially **pretend play** involving imaginative or sociodramatic elements, naturally support children's learning and development and can help build EF skills.

Through this play that young children learn **self-control** (e.g., taking turns and thinking before acting) and **cognitive flexibility** (e.g., role-playing and considering the perspective of the other child).

The discussion about the importance of play in children's EF development is an important one as the tension has increased with the emphasis on academic-focused versus play-based curriculum. While the benefit of this type of play is well documented, the pressure to get children "ready for school" is squeezing the time for child-directed social play out of many preschool classrooms. **Teachers must allow for enough time for social pretend play in their classroom schedules!**

Provide a varied set of props and toys
to encourage this type of play. Younger pre-schoolers may need more realistic props to get the play started (e.g., toy medical kits), while older children can re-purpose other things to turn them into play props (e.g., paper towel tube that is used as a cast for a "broken arm"). Reusing familiar objects in a new way also practices cognitive flexibility.

Allow children to make their own play props. Children must determine what is needed, hold this information in mind, and then follow through without getting distracted. They also exercise selective attention, working memory, and planning. If the original plans don't work out, children need to adjust their ideas and try again, challenging their cognitive flexibility.

Play plans can be a good way to organize play, Children decide who they are going to be and what they are going to do before they start playing, and then draw their plan on paper. Planning means that children think first and then act, thus practicing inhibitory control. Planning play in a group also encourages children to plan together, hold these plans in mind, and apply them during the activity. It encourages social problem solving, as well as oral language.

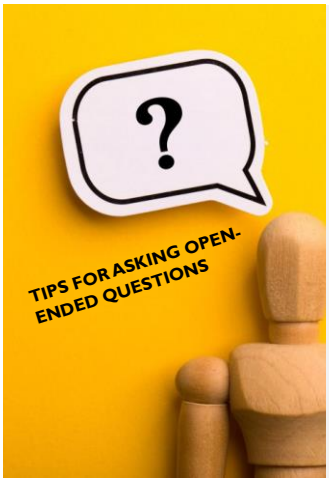
Provide ample TIME for child directed social pretend play!!

TEACHER AS CO-PLAYER

*As co-player, the teacher carefully involves themselves in the play, scaffolding language, and intervening to support and extend the play. The most helpful teacher role involves not directly instructing or explaining, but instead, modeling, demonstrating, guiding as well as expanding and extending children's language.

*As a co-player, the teacher participates in the children's play. They become a play partner and take on minor roles if invited in. During play, they model play skills, assist in problem-solving, use open-ended questions, scaffold to demonstrate language use, and expand children's vocabulary.

An important aspect of fostering high-quality classroom interactions is using open-ended questions. They prompt children to reason and reflect while encouraging their use of language. These are a few intentional ways to incorporate using open-ended questions into everyday interactions with children.



- Ask "How did you decide…? to encourage children to talk about something they are doing. Help them articulate their decision making process by following up with "what if you…?. or "how else could you…?
- Provide lots of opportunities for children to practice responding to these type of questions – and make sure you **WAIT** for them to answer. Not all children are used to open-ended conversations, and it may take theme time to get comfortable with responding in more complex ways.
- Before reading a book with children, prepare questions and statements you might use while reading, examples; "look at the cover, what do you think this will be about?, Why is the monkey throwing coconuts do you think? Tell me what you think will happen next?"
- Consider creating a question of the week to ask each child in your classroom and make the time for individualized back-and-forth converstation during your regular classroom routines. Take time to ask follow-up questions like "can you tell me more about that?" or "why do you think that?"
- Practice! Making open-ended questions a regular part of the teaching practice is so valuable!

Using Storytelling

Children love to tell stories. Their early stories tend to be a series of events, each one related to the one before, but lacking any larger structure. With practice, children develop more complex and organized plots. As the complexity of the storytelling grows, children practice holding and manipulating information in working memory.

Ways to support children's storytelling:

- **Encourage children to tell you stories** and write them down to read with the child. Children can also make pictures and create their own books. Revisiting the story, either by reviewing pictures or words, supports more intentional organization and greater elaboration.
- **Tell group stories.** One child starts the story, and each person in the group adds something to it. Children need to pay attention to each other, reflect on possible plot twists, and tailor their additions to fit the plot, thereby challenging their attention, working memory, and self-control.
- **Have children act out stories** they have written. The story provides a structure that guides children's actions and requires them to attend to the story and follow it, while inhibiting their impulse to create a new plot.
- **Bilingual families can tell stories in their home language.** Research indicates that bilingualism can benefit a variety of executive function skills in children of all ages, so fostering fluency in a second language is valuable.

Incorporating novel words takes intentionality:

- Select words that are important for comprehension and useful in everyday interactions.
- Allow for spontaneous conversations with children and use novel words in these conversations.
- Model rich vocabulary in responses to children.
- Be aware of the words a child already understands and add novel words that build on familiar concepts.
- Expose children to novel words and have conversations with children during any activity during the day like: meal time, circle time, story time, free play experience, and dramatic play.

TEACHER AS PLAY LEADER

Research shows that playing games can help children learn the necessary skills to self-regulate while keeping it fun! The demands of songs and movement games support executive function because children must move to a specific rhythm and synchronize words to actions and the music. All these tasks contribute to inhibitory control and working memory. Circle time and transitions are good times to introduce and play these games and provide the opportunity for children to practice these skills as the teacher leads the play and children respond.

THIS IS WHERE WE GET TO HAVE SOME FUN!

Ready, Set, Wiggle

Body Part Mix Up

Color Moves

Red Light Purple Light

Sleeping Game

Freeze Game

Conductor Game

Action Dance

And tips for a successful circle time gathering!

Appendix C

Evaluation Documents

Teacher Reflection and Goal Setting

CLASS domains to improve teacher/child interactions

- **Emotional Support**:
  - Promote warm, supportive relationships with teachers and peers
  - Help children find enjoyment of and excitement about learning
  - Help children feel comfortable in the classroom
  - Allow children to experience appropriate levels of independence and autonomy
- **Classroom Organization**:
  - Develop children's skills to regulate their own behavior
  - Manage the day to make the most of learning opportunities
  - Plan activities that are engaging and meaningful
- **Instructional Support**:
  - Help children learn to solve problems, reason, and think
  - Provide individualized feedback to children so they expand and deepen their skills and knowledge
  - Help children develop more complex language skills

Dimension to focus on: • Indicator • Behavior:	
Part of Day	
Action Plan to improve interactions?	

Dimension to focus on: • Indicator • Behavior:	
Part of Day	
Action Plan to improve interactions?	

Additional observations and notes:

Positive Climate

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Relationships • Physical proximity • Shared activities • Peer assistance • Matched affect • Social conversation	There are few, if any, indications that the teacher and students enjoy warm, supportive relationships with one another.	There are some indications that the teacher and students enjoy warm, supportive relationships with one another.	There are many indications that the teacher and students enjoy warm, supportive relationships with one another.
Positive Affect • Smiling • Laughter • Enthusiasm	There are no or few displays of positive affect by the teacher and/or students.	There are sometimes displays of positive affect by the teacher and/or students.	There are frequent displays of positive affect by the teacher and/or students.
Positive Communication • Verbal affection • Physical affection • Positive expectations	There are rarely positive communications, verbal or physical, among teachers and students.	There are sometimes positive communications, verbal or physical, among teachers and students.	There are frequently positive communications, verbal or physical, among teachers and students.
Respect • Eye contact • Warm, calm voice • Respectful language • Cooperation and/or sharing	The teacher and students rarely, if ever, demonstrate respect for one another.	The teacher and students sometimes demonstrate respect for one another.	The teacher and students consistently demonstrate respect for one another.

Negative Climate

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Negative Affect • Irritability • Anger • Harsh voice • Peer aggression • Disconnected or escalating negativity	The teacher and students do not display strong negative affect and only rarely, if ever, display mild negativity.	The classroom is characterized by mild displays of irritability, anger, or other negative affect by the teacher and/or the students.	The classroom is characterized by consistent irritability, anger, or other negative affect by the teacher and/or the students.
Punitive Control • Yelling • Threats • Physical control • Harsh punishment	The teacher does not yell or make threats to establish control.	The teacher occasionally uses expressed negativity such as threats or yelling to establish control.	The teacher repeatedly yells at students or makes threats to establish control.
Sarcasm/Disrespect • Sarcastic voice/statement • Teasing • Humiliation	The teacher and students are not sarcastic or disrespectful.	The teacher and/or students are occasionally sarcastic or disrespectful.	The teacher and/or students are repeatedly sarcastic or disrespectful.
Severe Negativity • Victimization • Bullying • Physical punishment	There are no instances of severe negativity between the teacher and students.	There are no instances of severe negativity between the teacher and students.	There are instances of severe negativity between the teacher and students or among the students.

Teacher Sensitivity

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Awareness • Anticipates problems and plans appropriately • Notices lack of understanding and/or difficulties	The teacher consistently fails to be aware of students who need extra support, assistance, or attention.	The teacher is sometimes aware of students who need extra support, assistance, or attention.	The teacher is consistently aware of students who need extra support, assistance, or attention.
Responsiveness • Acknowledges emotions • Provides comfort and assistance • Provides individualized support	The teacher is unresponsive to or dismissive of students and provides the same level of assistance to all students, regardless of their individual needs.	The teacher is responsive to students sometimes but at other times is more dismissive or unresponsive, matching her support to the needs and abilities of some students but not others.	The teacher is consistently responsive to students and matches her support to their needs and abilities.
Addresses Problems • Helps in an effective and timely manner • Helps resolve problems	The teacher is ineffective at addressing students' problems and concerns.	The teacher is sometimes effective at addressing students' problems and concerns.	The teacher is consistently effective at addressing students' problems and concerns.
Student Comfort • Seeks support and guidance • Freely participates • Takes risks	The students rarely seek support, share their ideas with, or respond to questions from the teacher.	The students sometimes seek support from, share their ideas with, or respond to questions from the teacher.	The students appear comfortable seeking support from, sharing their ideas with, and responding freely to the teacher.

Regard for Student Perspectives

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Flexibility and Student Focus • Shows flexibility • Incorporates student's ideas • Follows lead	The teacher is rigid, inflexible, and controlling in his plans and/or rarely goes along with students' ideas; most classroom activities are teacher-driven.	The teacher may follow the students' lead during some periods and be more controlling during others.	The teacher is flexible in his plans, goes along with students' ideas, and organizes instruction around students' interests.
Support for Autonomy and Leadership • Allows choice • Allows students to lead lessons • Gives students responsibilities	The teacher does not support student autonomy and leadership.	The teacher sometimes provides support for student autonomy and leadership but at other times fails to do so.	The teacher provides consistent support for student autonomy and leadership.
Student Expression • Encourages student talk • Elicits ideas and/or perspectives	There are few opportunities for student talk and expression.	There are periods during which there is a lot of student talk and expression but other times when teacher talk predominates.	There are many opportunities for student talk and expression.
Restriction of Movement • Allows movement • Is not rigid	The teacher is highly controlling of students' movement and placement during activities.	The teacher is somewhat controlling of students' movement and placement during activities.	Students have freedom of movement and placement during activities.

Instructional Learning Formats

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Effective Facilitation • Teacher involvement • Effective questioning • Expanding children's involvement	The teacher does not actively facilitate activities and lessons to encourage students' interest and expanded involvement.	At times, the teacher actively facilitates activities and lessons to encourage interest and expanded involvement, but at other times she merely provides activities for the students.	The teacher actively facilitates students' engagement in activities and lessons to encourage participation and expanded involvement.
Variety of Modalities and Materials • Range of auditory, visual, and movement opportunities • Interesting and creative materials • Hands-on opportunities	The teacher does not use a variety of modalities or materials to gain students' interest and participation during activities and lessons.	The teacher is inconsistent in her use of a variety of modalities and materials to gain students' interest and participation during activities and lessons.	The teacher uses a variety of modalities including auditory, visual, and movement and uses a variety of materials to effectively interest students and gain their participation during activities and lessons.
Student Interest • Active participation • Listening • Focused attention	The students do not appear interested and/or involved in the lesson or activities.	Students may be engaged and/or interested for periods of time, but at other times their interest wanes and they are not involved the activity or lesson.	Students are consistently interested and involved in activities and lessons.
Clarity of Learning Objectives • Advanced organizers • Summaries • Reorientation statements	The teacher makes no attempt to or is unsuccessful at orienting and guiding students toward learning objectives.	The teacher orients students somewhat to learning objectives, or the learning objectives may be clear during some periods but less so during others.	The teacher effectively focuses students' attention toward learning objectives and/or the purpose of the lesson.

Concept Development

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Analysis and Reasoning • Why and/or how questions • Problem solving • Prediction/experimentation • Classification/comparison • Evaluation	The teacher rarely uses discussions and activities that encourage analysis and reasoning.	The teacher occasionally uses discussions and activities that encourage analysis and reasoning.	The teacher often uses discussions and activities that encourage analysis and reasoning.
Creating • Brainstorming • Planning • Producing	The teacher rarely provides opportunities for students to be creative and/or generate their own ideas and products.	The teacher sometimes provides opportunities for students to be creative and/or generate their own ideas and products.	The teacher often provides opportunities for students to be creative and/or generate their own ideas and products.
Integration • Connect concepts • Integrates with previous knowledge	Concepts and activities are presented independent of one another, and students are not asked to apply previous learning.	The teacher sometimes links concepts and activities to one another and to previous learning.	The teacher consistently links concepts and activities to one another and to previous learning.
Connections to the Real World • Real-world applications • Related to students' lives	The teacher does not relate concepts to the students' actual lives.	The teacher makes some attempts to relate concepts to the students' actual lives.	The teacher consistently relates concepts to the students' actual lives.

Quality of Feedback

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Scaffolding • Hints • Assistance	The teacher rarely provides scaffolding to students but rather dismisses responses or actions as incorrect or ignores problems in understanding.	The teacher occasionally provides scaffolding to students but at other times simply dismisses responses as incorrect or ignores problems in students' understanding.	The teacher often scaffolds for students who are having a hard time understanding a concept, answering a question, or completing an activity.
Feedback Loops • Back-and-forth exchanges • Persistence by teacher • Follow-up questions	The teacher gives only perfunctory feedback to students.	There are occasional feedback loops—back-and-forth exchanges—between the teacher and students; other times, however, feedback is more perfunctory.	There are frequent feedback loops—back-and-forth exchanges—between the teacher and students.
Prompting Thought Processes • Asks students to explain thinking • Queries responses and actions	The teacher rarely queries the students or prompts students to explain their thinking and rationale for responses and actions.	The teacher occasionally queries the students or prompts students to explain their thinking and rationale for responses and actions.	The teacher often queries the students or prompts students to explain their thinking and rationale for responses and actions.
Providing Information • Expansion • Clarification • Specific feedback	The teacher rarely provides additional information to expand on the students' understanding or actions.	The teacher occasionally provides additional information to expand on the students' understanding or actions.	The teacher often provides additional information to expand on students' understanding or actions.
Encouragement and Affirmation • Recognition • Reinforcement • Student persistence	The teacher rarely offers encouragement of students' efforts that increases students' involvement and persistence.	The teacher occasionally offers encouragement of students' efforts that increases students' involvement and persistence.	The teacher often offers encouragement of students' efforts that increases students' involvement and persistence.

Language Modeling

	Low (1, 2)	Middle (3, 4, 5)	High (6, 7)
Frequent Conversations • Back-and-forth exchanges • Contingent responding • Peer conversations	There are few if any conversations in the classroom.	There are limited conversations in the classroom..	There are frequent conversations in the classroom.
Open-Ended Questions • Questions require more than a one-word response • Students respond	The majority of the teacher's questions are closed-ended.	The teacher asks a mix of closed-ended and open-ended questions.	The teacher asks many open-ended questions.
Repetition and Extension • Repeats • Extends/elaborates	The teacher rarely, if ever, repeats or extends the students' responses.	The teacher sometimes repeats or extends the students' responses.	The teacher often repeats or extends the students' responses.
Self- and Parallel Talk • Maps own actions with language • Maps student action with language	The teacher rarely maps his or her own actions and the students' actions through language and description.	The teacher occasionally maps his or her own actions and the students' actions through language and description.	The teacher consistently maps his or her own actions and the students' actions through language and description.
Advanced Language • Variety of words • Connected to familiar words and/or ideas	The teacher does not use advanced language with students.	The teacher sometimes uses advanced language with students.	The teacher often uses advanced language with students.

GRAND VALLEY STATE UNIVERSITY
ED 693/695 Data Form

NAME: Molly Grosvenor

MAJOR: (Choose only1)

_____ Adult & Higher Education	_____ Educational Differentiation	_____ Library Media
_____ Advanced Content Specialization	_____ Education Leadership	_____ Middle Level Education
_____ Cognitive Impairment	_____ Educational Technology	_____ Reading
_____ College Student Affairs Leadership	_____ Elementary Education	_____ School Counseling
X Early Childhood Education	_____ Emotional Impairment	_____ Secondary Level Education
_____ Early Childhood Developmental Delay	_____ Learning Disabilities	_____ Special Education Administration
_____ TESOL		

TITLE: Strengthening Executive Function and Self-Regulation in Early Childhood Classrooms

PAPER TYPE: (Choose only 1)

X Project

_____ Thesis

SEM/YR COMPLETED: Winter, 2022

SUPERVISOR'S SIGNATURE OF APPROVAL_____

Using key words or phrases, choose several ERIC descriptors (5 - 7 minimum) to describe the contents of your project. ERIC descriptors can be found online at: http://eric.ed.gov/?ti=all

1. Educational Strategies
2. Curriculum Enrichment
3. Classroom Environment
4. Instructional Improvement

GRAND VALLEY STATE UNIVERSITY

The signatures of the individuals below indicate that they have read and approved the project of Molly E. Grosvenor in partial fulfillment of the requirements for the degree of Master of Education.

Nagnon Diarrassouba April 25, 2022

Project Advisor Date

4/28/22

Kathryn A. Ohle, Graduate Program Director Date

4/29/22

Ellen Schiller, Unit head Date