

EXPLORING THE INFLUENCE OF DEVELOPMENTAL KINDERGARTEN
ATTENDANCE ON LATER LITERACY AND SOCIAL-EMOTIONAL OUTCOMES: A
RECORDS REVIEW INVESTIGATION IN ONE MICHIGAN SCHOOL DISTRICT

By

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ABSTRACT

EXPLORING THE INFLUENCE OF DEVELOPMENTAL KINDERGARTEN ATTENDANCE ON LATER LITERACY AND SOCIAL-EMOTIONAL OUTCOMES: A RECORDS REVIEW INVESTIGATION IN ONE MICHIGAN SCHOOL DISTRICT

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The transition to kindergarten from previous early childhood experiences is a milestone and challenge for both children and parents. Developmental kindergarten (DK) is a specific type of early childhood educational intervention that is designed to ease the transition to kindergarten. However, very little research is published in peer-reviewed journals pertaining to the effects of DK as an early education intervention for five-year old children. Five years of archival data from one suburban school district in Michigan was used to better understand the influence of DK attendance on long-term academic social-emotional growth. The sample consisted of 1082 students ranging in age from five years to twelve years old. Thirty percent (30%) of the sample attended DK. Students were divided into cohorts based on current grade level. A two-level hierarchical linear model was used to compare the literacy and social-emotional growth trajectory of students who did versus did not attend DK. Results indicated that children who received the DK intervention and their peers who did not receive the intervention experienced similar literacy and social-emotional growth trajectories across time. Implications of this study are relevant to researchers and educators interested in the short and long-term effects of DK on typically developing children from advantaged backgrounds.

*Keywords: early childhood education, developmental kindergarten, early childhood
intervention*

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TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	x
CHAPTER 1	
INTRODUCTION	1
CHAPTER 2	
LITERATURE REVIEW	10
Definitions.....	10
Theoretical Models	17
Maturation Model	17
Comprehensive Model	17
Bronfenbrenner’s Bioecological Model.....	18
Developmental Model of Transition.....	18
Historical Early Childhood Programs	19
High/Scope Perry Preschool	20
Carolina Abecedarian Project	21
Chicago Child-Parent Centers.....	22
Head Start.....	23
Developmental Kindergarten Programs.....	25
Age at Kindergarten Entry	35
Redshirting	35
Perceived Gains Fade Over Time	36
Kindergarten Retention.....	38
Negative Effects Associated with Being Young in Kindergarten	43
Special Education Rates.....	43
School Readiness	45
Predictive Validity of School Readiness Measures	46
Perceptions of School Readiness	48
Risk Factors Relating to School Readiness	48
School Readiness in Relation to Family Income	50
School Readiness Skills and Prior Preschool Experience.....	51
Differential gains from Preschool Programs.....	52
Social-emotional Skills in Relation to Academic Skills	55
Preschool Social-Emotional Learning	57
Self-Management.....	57
Attention	60
Relationship skills.....	63
Early Literacy Skills	66

Early Literacy Skills Associated with Later Academic Achievement.....	68
Alphabet Knowledge	68
Phonological Processing	69
Phonological Awareness.....	69
Phonological Memory.....	70
Development of Phonological Processing Skills	70
Rapid Automatic Naming	71
Writing Letters and Writing Name	72
Concepts of Print.....	74
Oral Language.....	75
Visual Processing.....	76
Models of Emergent Literacy Development.....	77
Contemporary Models of Emergent Literacy Development.....	79
Development of Early Literacy Skills.....	80
Curriculum-Based Measurements.....	81
Current Study Research Questions and Hypotheses	85
Research Questions and Hypotheses	86
 CHAPTER 3	
METHOD	90
Participants.....	90
Inclusion criteria	92
Description of DK Program	93
Variables Considered in the DK Placement Process	93
Description of Kindergarten Program.....	94
Measures	94
Kindergarten Screening Measure.....	94
Scoring the Kindergarten Screener	95
DIBELS Scores.....	96
Letter Naming Fluency	97
Initial Sound Fluency.....	97
Phoneme Segmentation Fluency.....	98
Nonsense Word Fluency.....	98
Oral Reading Fluency	99
Rationale	100
Michigan Educational Assessment Program	100
Reliability.....	101
Validity	101
Rationale	102
Data Collection	103
Data Analysis	103
Research Questions One and Two	103
Research Question Three	107
Missing Data	108

CHAPTER 4	
RESULTS	112
Question One	112
Question Two.....	119
Question Three.....	124
CHAPTER 5	
DISCUSSION	128
Implications.....	132
Limitations	137
APPENDICES	140
Appendix A – Kindergarten Screener.....	141
Appendix B – Kindergarten Screener Rubrics.....	142
Appendix C – Information Obtained from CA-60 Files.....	145
Appendix D – End of Year Developmental Kindergarten Progress Report	146
Appendix E – Social-emotional Measures from Kindergarten through Fourth Grade Report Cards	147
Appendix F – Level 2 Descriptive Statistics.....	148
BIBLIOGRAPHY.....	150

LIST OF TABLES

Table 1	Early Childhood Interventions Available in one Michigan County	14
Table 2	Similarities and Differences between Pre-K and DK	26
Table 3	Examples of Michigan Early Childhood Standards of Quality for Pre-Kindergarten	32
Table 4	Characteristics of School Readiness	47
Table 5	Significant Differences Between Groups Based on Percentage	92
Table 6	Sample Size by Grade Level and School ID.....	92
Table 7	Variables Included in the Study	109
Table 8	Proposed Research Questions, Measures, and Analytic Procedures	110
Table 9	Second Grade Final Estimation of Fixed Effects – Literacy Growth	113
Table 10	Third Grade Final Estimation of Fixed Effects – Literacy Growth.....	114
Table 11	Fourth Grade Final Estimation of Fixed Effects – Literacy Growth	115
Table 12	Fifth Grade Final Estimation of Fixed Effects – Literacy Growth	116
Table 13	Average Raw Scores for Literacy Outcomes Across Time	117
Table 14	Percentage of Students Scoring at the Proficient or Advanced Level on the MEAP Test.....	118
Table 15	Third Grade Final Estimation of Fixed Effects – Social-Emotional Growth	120
Table 16	Fourth Grade Final Estimation of Fixed Effects – Social-Emotional Growth	121
Table 17	Fifth Grade Final Estimation of Fixed Effects – Social-Emotional Growth	122
Table 18	Average Raw Scores for Social-Emotional Outcomes Across Time	123
Table 19	Predictive Validity of Kindergarten Screening Measure Across time for Literacy Outcomes	124

Table 20	Predictive Validity of Kindergarten Screening Measure Across time for Social-Emotional Outcomes.....	125
Table 21	Second Grade Descriptive Statistics.....	148
Table 22	Third Grade Descriptive Statistics.....	148
Table 23	Fourth Grade Descriptive Statistics	148
Table 24	Fifth Grade Descriptive Statistics.....	149

LIST OF FIGURES

Figure 1	Developmental Model of Transition.....	19
Figure 2	Summary of Factors Associated with Early Literacy Development	81

CHAPTER 1

INTRODUCTION

“Mom had a hard time not getting upset. Mom was very anxious and worried that she wouldn’t make the right decision and was looking forward to hearing the kindergarten screening team’s opinion.”

“Parents are on the fence and feel torn.”

During the past two decades there has been greater interest in programs and policies that affect early childhood development (Reynolds & Temple, 2008). Since the turn of the century, research exploring the neurological development that occurs in early childhood and the importance of high quality early childhood relationships and environments has burgeoned through seminal works such as *From Neurons to Neighborhoods: The Science of Early Childhood Development* (Shonkoff & Phillips, 2000). Laws and policies have slowly begun to acknowledge the importance of early childhood, such as the provisions in *The Individuals with Disabilities Education Act* (IDEA) of 2004 for children from birth to age two (United States Department of Education, 2013). Although the intense focus on early childhood education reflected in the agendas of policy makers, economists, and researchers is somewhat recent, the difficult transitions and decisions that families face when a child is ready to begin kindergarten are long-standing. Parents are often left with many questions and few answers during this early childhood milestone.

The opening quotes were taken directly from kindergarten screeners and reflect the difficulties and struggles many families face in the transition from home-based or center-based care during the first years of a child’s life to formal K-12 schooling. In addition to adjusting to children spending less time at home, many parents wrestle with decisions related to their child’s

kindergarten attendance. Does my child have the appropriate school readiness skills to begin kindergarten? Would a year of developmental kindergarten (DK) prior to kindergarten help my child develop school readiness skills for kindergarten and beyond? Would delayed entry into kindergarten result in long-term academic benefits? Will my child struggle more in kindergarten because he was born later in the calendar year? Will my child be more likely to be retained if he begins kindergarten when he isn't "ready"? Rarely do parents turn to or have access to empirical research to better understand whether their child is "ready" for kindergarten or if kindergarten is "ready" for their child. Many parents and educators are also unfamiliar with the research base pertaining to children who experienced delayed entry into kindergarten and those who did not. Yet the age and time when a child begins kindergarten is a common decision that many parents face and some parents still question long after their child has graduated high school.

In order to alleviate some of parents' common fears related to the transition to kindergarten, the Michigan Department of Education (MDE) has several online guides for parents. For example, one guide is designed to help parents understand if their child is "ready" for kindergarten. In this guide, the MDE (2013a) encourages parents to note that kindergarten classrooms should be equipped to support all age-eligible kindergarten children – regardless of ability. Moreover, children are not required to take a test to qualify to enter kindergarten (MDE 2013b).

Some children seem too young or not ready for school. Some families and teachers believe that getting older will help the child get ready for kindergarten. This is not always true; remember that children change a lot between May and September. (MDE, 2013a, p.1)

In order to ease the transition to kindergarten and increase school readiness skills, some children attend DK the year they are age-eligible for kindergarten. From the MDE's perspective, DK is considered a form of kindergarten retention and is reflected accordingly on a child's school records (MDE, 2013c). "Developmental kindergarten is intended to provide children who are not ready with an extra year of schooling" (MDE, 2013c, p.1). In addition, the guide alerts parents that DK attendance is not associated with academic, athletic, or social benefits and increases a child's chances of dropping out of high school. The information presented in this one page guide seems to send mixed messages to parents about the outcomes associated with DK attendance.

Although the information in the MDE guides tends to highlight the lack of established benefits associated with DK, some parents choose to delay a child's entry into kindergarten to give their child a perceived cognitive or physical advantage over his peers, a practice commonly called "redshirting" (Cascio, 2008; Deming & Dynarski, 2008; Lincove & Painter, 2006). Redshirting, a term borrowed from the long-standing practice of delaying college athletic involvement for a year to allow a player to hone his skills and maximize physical ability, affects some children more than others as boys from affluent families are the most likely to be "redshirted" (Deming & Dynarski, 2008). The topic of "redshirting" has been rampant in the popular press, with articles addressing the subject in publications such as the New York Times ("Delay Kindergarten at Your Child's Peril"; Wang & Aamodt, 2011) and the Chicago Tribune ("Parents Bothered by Age Maximum in Chicago Schools"; Dizikes, 2011).

The evidence surrounding the academic outcomes associated with forms of delayed kindergarten entry or kindergarten retention is mixed. Overall, research indicates that children who are older than their peers tend to score better on academic assessments during first and

second grade but academic gains tend to fade over time (Robertson, 2011) and become negligible by middle school (Domaleski & Oshima, 2006). Using a diverse sample, Stipek and Byler (2001) found that children who entered kindergarten at a younger age initially did not perform as well academically as their older kindergarten peers, but the differences in academic achievement disappeared by third grade.

There is evidence that indicates young-for-grade kindergarten children stand to benefit from the spillover effects of attending class with older peers and achieve the same long-term outcomes as old-for-grade kindergarten children (Cascio & Schanzenbach, 2007). Elder and Lobotsky (2009) found that the differences in kindergarteners' achievement relative to their age was not due to each child's ability to learn material during the kindergarten school year, but rather the perceived academic advantage older kindergarteners had was due to their increased experiences and opportunities outside of the school setting.

However, other studies provide evidence for the long-term academic benefits of entering school later. In a study of over 13,000 kindergarten children, children with birthdays close to the kindergarten cutoff date scored lower on math and reading assessments than children with birthdays far from the kindergarten cutoff date during kindergarten and first grade, and the increased academic gains in older children were even more pronounced for boys and children with disabilities (Datar, 2006). There is also international evidence indicating that young-for-grade students score lower on standardized tests in fourth and eighth grade compared to old-for-grade students (Bedard & Dhuey, 2006).

Children who are young-for-grade may also be at an increased risk for special education eligibility or retention. In a study of 1474 disadvantaged first time kindergarten students, young-for-grade children were at a greater risk for retention even after controlling for prior preschool

experience and literacy scores (Huang & Invernizzi, 2013). Research also indicates that children with summer birthdays are more likely to receive special education services than older children in their class (Dhuey & Lipscomb, 2010; Martin, Foels, Clanton & Moon, 2004). However, this may be due to the relative nature of special education evaluations that typically compare children to their grade level peers as opposed to a child's absolute ability. Based on percentiles and other standardized measures, children who are younger than their peers may appear to be struggling academically more than their older peers even though the younger child's actual ability may be comparable to the older peer's ability at an earlier point in time.

Regardless of age, children who possess school readiness skills upon kindergarten entry experience better educational outcomes than children who do not possess school readiness skills upon kindergarten entry (Snow, 2010). School readiness skills are comprised of both academic skills and social-emotional skills, and the two types of skills are intricately intertwined with one another. Preschool-age children who exhibit developmentally appropriate social-emotional skills are less likely to exhibit externalizing or internalizing behaviors as adolescents (Bornstein, Hahn, & Haynes, 2010) and more likely to maximize their cognitive abilities (Bornstein, Haynes, O'Reilly, & Painter, 1996). Almost half of all young children lack school readiness skills prior to kindergarten entry (Rimm-Kaufman, Pianta, & Cox, 2000) and transitional programs prior to kindergarten are intended to increase students' school readiness skills and help maximize their academic success. Examples of school readiness skills include the ability to follow directions, interact with other children, identify shapes and colors, and write one's name (Raforth, Buchenauer, Crissman, & Halko, 2004).

Risk factors for developing school readiness skills are most strongly associated with poverty (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Rimm-Kaufman, Pianta, & Cox,

2000; Hernandez, Denton, & Macartney, 2007) and prior preschool experience (Camilli, Vargas, Ryan, & Barnett, 2010). Results of current research indicate that children from disadvantaged backgrounds stand to benefit more from attending preschool programs than their advantaged peers (Bumgarner & Line, 2014; Peisner-Feinberg & Schaaf, 2007). Research also indicates that children from all socioeconomic backgrounds stand to benefit from attending high quality preschool programs (Barnett, 2008; Burger, 2010; Goodman & Sianesi, 2005; Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004) and children from disadvantaged backgrounds experience even more growth during preschool when they attend integrated preschool programs with children from a variety of socioeconomic backgrounds (Hogden, 2007; Neidell & Waldfogel, 2010; Schechter & Bye, 2007).

The National Early Literacy Panel (NELP) (2009) has identified alphabet knowledge, phonological processing, rapid automatic naming of letters, digits, objects, and colors, and the ability to write one's name as some of the key indicators of school readiness related to early literacy skills. Alphabet knowledge has been the strongest indicator of early literacy skills since the 1960's (Chall, 1967) and it continues to be the most salient modern indicator of early literacy skills (NELP, 2009). Phonological processing skills, or the ability to break down and analyze the smallest units of spoken language, are also crucial to the development of early literacy skills (Anthony & Francis, 2005). Other variables that are moderately correlated with early literacy skills are concepts of print, print knowledge, reading readiness, oral language, and visual processing skills (NELP, 2009).

Developmentally appropriate social-emotional skills are also a critical component of school readiness skills. In fact, social-emotional skills have been cited as being more important than academic skills in relation to school readiness (Huey-Lin, Lawrence, & Gorrell, 2003).

Kindergarten teachers perceive children's social skills as the most important school readiness skills, above and beyond academic skills (Lin, Lawrence, & Gorrell, 2003). Current research provides substantial evidence for the link between early social-emotional skills and short-term and long-term academic success, reinforcing the reciprocal link between academic and social-emotional skills in children's school readiness skills (Arnold, Kupersmidt, Voegler-Lee, & Nastassja, 2012; Brennan, Shaw, Dishion, & Wilson, 2012; Dice & Schwanenflugel, 2012; Razza, Martin, & Brooks-Gunn, 2012; Raver, 2004; Vallotton & Ayoub, 2011).

Children who have the ability to interact pro-socially with peers and form and maintain friendships are more likely to be engaged in the classroom, enjoy attending school, and maximize academic success (O'Connor & McCartney, 2007; Vitiello, Booren, Downer, & Williford, 2012). Self-awareness, self-management, social awareness, and responsible decision-making are all components of social-emotional competence (Denham, 2010). Students who have the skills to share, cooperate, and interact with other students are more likely to be successful in kindergarten than students who have not already acquired those skills (Walker & Henderson, 2012). Children who lack appropriate social-emotional skills at the time of kindergarten entry exhibit more externalizing behaviors and struggle more academically than their peers who have acquired social-emotional skills (Raver, 2004).

In order to meet the increased cognitive demands that standardized tests require of children in the later elementary years and beyond, kindergarten expectations have become more rigorous and abstract in nature. For example, a typical kindergartner should be able to ask and answer questions about details in text with support, compare and contrast the experiences of characters in a story, and ask and answer questions about unknown words in text (MDE, 2013d). In mathematics, kindergarten students should be able to count objects in a set, compare numbers,

and have a conceptual understanding of addition and subtraction. In addition, kindergarteners should be able to create and identify shapes and analyze and compare shapes (MDE, 2013d). In order to meet these heightened expectations, educators often recommend that children who lack school readiness skills attend a year of DK prior to kindergarten.

In an increasingly competitive world, the increased academic outcomes often associated with DK and “the gift of time” are compelling arguments to delay a child’s entry into kindergarten even though the child meets the chronological age requirements. Developmental kindergarten programs are used as one type of intervention to support young children’s academic growth and transition to kindergarten, despite the lack of empirical evidence to support the intervention. Little research on DK exists although DK programs continue to be popular in the state of Michigan and other states. In a review of three types of kindergarten retention (traditional kindergarten retention, DK, or transitional first grade), researchers found positive academic effects during the intervention year but the positive effects faded over time (Karweit & Wasik, 1992). Children who struggled with school readiness skills continued to struggle in school, despite the kindergarten transition intervention (Karweit & Wasik, 1992).

Moreover, the evidence on programs such as DK is further complicated by research indicating that for young children some skills are a result of schooling whereas others are a result of biological maturation (Skibbe, Connor, Morris, & Jewkes, 2011). This makes it difficult to disentangle the effects of an educational intervention such as DK from the effects of everyday experiences children have as they grow older. Providing children with an additional “gift of time” through intervention programs such as DK may or may not have all of the positive effects educators and parents intend.

The purpose of this research study is to examine the influence of DK on later literacy and social-emotional growth by comparing the growth of students who attended DK to those who did not attend DK. Currently there is little empirical research to support the effectiveness of DK, a specific type of early childhood intervention. Although the data were gathered from a large DK program in a suburban school district in Michigan, the results of this study are intended to provide objective data about the influence of DK and other variables commonly associated with the transition to kindergarten on later literacy and social-emotional growth using a population of students with minimal risk factors. In order to inform the research questions and methodology of this study the following areas were addressed in the literature review: (a) historical early childhood programs, (b) developmental kindergarten programs, (b) age of kindergarten entry, (c) school readiness skills, (d) social-emotional skills and the relation to academic skills, and (e) common curriculum based measurements used to measure academic progress.

CHAPTER 2

LITERATURE REVIEW

The goal of this study is to better understand the association between attendance in a DK program and later literacy and social-emotional growth. This chapter provides an overview of models of early childhood education, a rationale for the model chosen for this study, and a review of selected historical early childhood programs. Next, DK programs are introduced and then an overview of kindergarten age effects is presented. After that, the concept of school readiness is introduced, followed by summaries of research of specific variables associated with school readiness. Last, a summary of the development of early literacy skills is presented, followed by an explanation of curriculum-based measurements and standardized tests used to measure literacy achievement in kindergarten and beyond. The chapter concludes with a reiteration of the purpose of the present study, its purported significance, and specific research questions and hypotheses.

Definitions

Defining early childhood interventions is a complex task since educational interventions vary at the local, county, state, and federal level. Some of the same early childhood intervention terms such as pre-kindergarten (Pre-K) or DK have different meanings even in the same Michigan county, making it difficult to use terms consistently in this literature review. Throughout this paper, developmental kindergarten (DK) refers to an educational intervention for children who are age-eligible for kindergarten but are delaying kindergarten entry by one year.

Developmental kindergarten programs in Michigan are similar to Young Five's programs in Michigan, except DK programs are comprised of children who will be six years old

at some point in the school year. In contrast, Young Five's programs are specifically designed for children who turn five years old between September 1 and December 1 of the calendar year (Michigan Department of Education, 2013b). Unlike other states, the state of Michigan does not offer any type of transitional kindergarten prior the kindergarten year on a statewide basis. Instead, the options vary based on the local school district.

The state of Michigan is in the process of revising the age requirements for kindergarten entry. Prior to enacting the new legislation, children had to turn five by December 1 to enroll in kindergarten. Beginning the in 2013-2014 school year, children had to turn five by November 1 to enroll in kindergarten. Children must turn five by October 1 to enroll in kindergarten in the 2014-2015 school year, and beginning in the 2015-2016 school year, children must turn five by September 1 to enroll in kindergarten. During this three-year time period, parents or legal guardians may submit a written request to enroll their child in kindergarten if he or she is too young to meet the revised age requirement but turns five by December 1. However, the state of Michigan does not provide state aid to school districts for four-year old children enrolled in kindergarten (MDE, 2013). Although awareness of early childhood education has become more apparent, formalized plans for statewide prekindergarten have yet to be established (Synder, 2014).

Other states such as California or Hawaii do have statewide transitional kindergarten programs. For example, in California, in order to be eligible for the transitional kindergarten program, a child's fifth birthday must occur between October 2 and December 2 during the 2013-2014 school year and between September 2 and December 2 during the 2014-2015 school year and subsequent school years. Parents who wish to enroll a child who is age-eligible for kindergarten must make a specific request in writing if they wish to enroll their child in the

transitional program. The transitional kindergarten program is a two-year kindergarten program. The first year is a modified kindergarten curriculum that is considered age appropriate and developmentally appropriate. The transitional kindergarten school day parallels the kindergarten school day in length and student to staff ratio, and the transitional programs are housed in public schools alongside kindergarten classrooms. Funding for the transitional program is provided through the same means as K-12 funding in the state of California (California Department of Education, 2013).

Hawaii also currently funds an intervention prior to the kindergarten year. Under *Act 219*, parents residing in Hawaii had the option of enrolling their children who turned five years old between August 2 and December 31 in Junior Kindergarten. The statewide Junior Kindergarten program is a full-day program housed in public schools that uses a modified kindergarten curriculum that is considered to be more age appropriate and developmentally appropriate for younger children (Hawaii State Department of Education, 2013). In Hawaii, the recent passage of *Act 178* changed the kindergarten age-cutoff date beginning in the 2014 – 2015 school year from December 31 to July 31. Whereas Hawaii once had the latest kindergarten age-cutoff date in the United States, they now have one of the earliest cutoff dates. Beginning in the 2014-2015 school year, the Junior Kindergarten program will no longer be available. Details of a new plan and potential interventions prior to kindergarten will be available at the end of the 2013 legislative year (Hawaii State Department of Education, 2013).

Each of the 50 states has its own unique policies and programs related to the transition to the formal K-12 education system. The three aforementioned states (Michigan, California, and Hawaii) illustrate examples of differences in transitional programming across states. Moreover, the current changes in Hawaii highlight the instability of many transitional early childhood

programs based on policy and funding changes at the state level. Rarely are programs formed and revised based on applicable scholarly research in the early childhood literature; rather they are often shaped and formed by the availability of resources and the perceptions of politicians. In order to elucidate the complexity of early childhood definitions within the same state, a table is provided below (Table 1) to highlight some of these differences and similarities in terms.

Although this is not a comprehensive list of all early childhood interventions available in all counties in Michigan or other in states, it provides a snapshot of typical early childhood interventions prior to kindergarten that are available in one Michigan county. In addition, it highlights the multiple meanings associated with early childhood interventions.

Table 1
Early Childhood Interventions Available in one Michigan County

Program Name	Definition	Funding Source	Typical Location
<i>Comprehensive Interventions</i>			
Michigan Early On	Designed for families with children 0 – 36 months old. Children suspected of having a disability are provided with screening and evaluation services.	Public	Varies based on evaluation services needed
Early Head Start	Intervention provided to low-income expectant mothers and to low-income families with children under age 3. The program provides 90 minute weekly home visits and bi-monthly socialization opportunities.	Public – Must meet one of several income requirements or have a child in foster care or a child with a disability	Home-based services; social gatherings in community centers
Head Start	Preschool intervention for 3 and 4 year old children from low-income families designed to meet the physical, emotional, medical, and educational needs of children and their families.	Public – Based on income eligibility	Public Schools, community centers, or faith-based organizations
Bright Beginnings	Intervention designed for families of children from birth to kindergarten that involves personal home visits, playgroups and parent meetings, developmental screenings and resource networks	Public – Free to all who reside in the county	Homes and community centers
<i>Non-academic Early Childhood Interventions</i>			
Childcare/Daycare	Safe spaces for children that meet their emotional and physical needs from birth to kindergarten entry.	Private – Grants, scholarships, and other financial assistance available for low-income families to access daycares that may otherwise be too costly.	Faith-based organizations, private businesses, homes

Table 1 (cont'd)

Early Childhood Educational Interventions

Preschool	Any structured school experience for children ages 3 or 4 that may occur in a variety of settings for varying lengths of time	Private	Faith-based organization or private companies; also located in homes and community centers
Early Childhood Special Education (ECSE)	Under IDEA Part C (Birth – 2 & Ages 3 -21). Early childhood education services for children with developmental delays. Funding is provided through <i>IDEA</i> . Services are available for children from birth to age 21. Programs are usually housed in public schools.	Public – Children must meet eligibility requirements	Public Schools
Michigan Great Start Readiness Program (GSRP)	Half-day preschool combined with half-day daycare for at-risk 4-year olds. At-risk is defined as living in a family with an income lower than three times the poverty level.	Public – Limited number of slots available and preference is given to children with the greatest need	Public schools or community centers
Pre-Kindergarten	A half-day or full-day pre-kindergarten experience designed for 4-year old children prior to the kindergarten year. Also a half-day or full-day pre-kindergarten experience prior to the kindergarten year for kindergarten-age-eligible children who may lack the school readiness skills associated with success in kindergarten.	Private or public schools. In public schools, there is usually a limited number of slots available and preference is given to children with the greatest need.	Public or private schools or community centers
Young Five's	A full day kindergarten experience that occurs the year before kindergarten and is designed for children who were born late in the calendar year who may benefit from delaying kindergarten entry by one year.	Public	Public Schools

Table 1 (cont'd)

Developmental Kindergarten	A half-day program designed for children who are age-eligible for kindergarten that occurs prior to the kindergarten year. The program is designed for kindergarten-age eligible children who may lack the school readiness skills associated with success in kindergarten.	Public	Public Schools
Accelerated Kindergarten	Kindergarten classrooms composed of children who are age-eligible for kindergarten. Children are grouped into classes based upon the period of the year in which they were born. Accelerated content is based on the age of the children, with the oldest children experiencing the most advanced content.	Public	Public
Kindergarten	First year of formal education available to all students who turn 5 years old by November 1 (2013 – 2014 school year), October 1 (2014-2015 school year), and September 1 (2015 – 2016 school year).	Public or Private	Public or Private Schools

**Please note. This table is not representative of all Michigan counties. Early childhood interventions vary at the local, county, state, and federal level.*

Theoretical Models

The formation of federal and state policies related to the transition to kindergarten has been formed and shaped during the past century by several different models. The major models associated with the kindergarten transition are outlined below and are intended to help the reader contextualize current transitional kindergarten practices in light of one of the most contemporary frameworks.

Maturational Model. The oldest model of child development is the maturational model which originated from the work of Charles Darwin (Gessell, 1929). According to the maturational model, children are ready to begin the formal education process after they have achieved certain developmental milestones (Hothersall, 2004). The maturational model espouses that development follows a predetermined course and sequence as long as the environment supports the established biological sequence (Hothersall, 2004). Examples of programs resulting from the maturational model of early childhood development include programs such as transitional kindergarten or DK.

Comprehensive model. Research from the 1940's and 1950's provided evidence for the effectiveness of early intervention for children with learning disabilities, challenging the maturational model (Kirk, 1958). Data indicated educational interventions had the ability to alter the course of biological development. According to the comprehensive model (Cook, Klein, Tessier, & Daley, 2011), a child's physical, emotional, and medical needs must be met alongside the child's educational needs. Under this model, comprehensive services are provided to both children and their families to provide children with the supports and services they need to maximize their success (Cook et al., 2004). Comprehensive models of early childhood education programs were established during the 1960's in response to President Lyndon B. Johnson's War

on Poverty and other policy initiatives. Examples of programs using the comprehensive models of early childhood education are the Carolina Abecedarian Project, Chicago-Parent Centers, and Head Start.

Bronfenbrenner's Bioecological Model. Urie Bronfenbrenner developed a bioecological theory of child development in the late 1970's that combined elements of the maturational and comprehensive models of child development. Bronfenbrenner's bioecological theory of development continues to be a prominent theory in child development and education. His bioecological theory was first published in 1979 and a more recent edition of the book, *Making Human Beings Human: Bioecological Perspectives on Human Development*, was published in 2005. According to Bronfenbrenner's bioecological theory, "The characteristics of the person at a given time in his or her life are a joint function of the characteristics of the person and of the environment over the course of that person's life up to that time" (Bronfenbrenner, 2005, p.108). Development is determined by the genetic characteristics of a person, as well as his or her environment. Ecological niches, or places in the environment that are particularly favorable or unfavorable to development depending on the specific characteristics of individuals are instrumental in shaping development (Bronfenbrenner, 2005).

Developmental Model of Transition. The model chosen for this study is the developmental model of transition (Pianta & Kraft-Sayre, 2003). The developmental model of transition specifically focuses on the transition from prekindergarten educational and social experiences to the more formal social and academic expectations of kindergarten and beyond. The developmental model of transitional (Figure 1) incorporates the same consideration of a child's biological characteristics and the social forces in multiple contexts highlighted by Bronfenbrenner's bioecological theory; however, the unique aspect of the developmental model

of transition is the changes in the relationships among and between contexts and individuals across settings during the transition from prekindergarten experiences to kindergarten. Under this model, the transition to kindergarten is a process girded by four tenets: schools being ready for children, community collaboration and support, family participation and knowledge, and the availability of high quality early childhood care settings (Pianta & Kraft-Sayre, 2003).

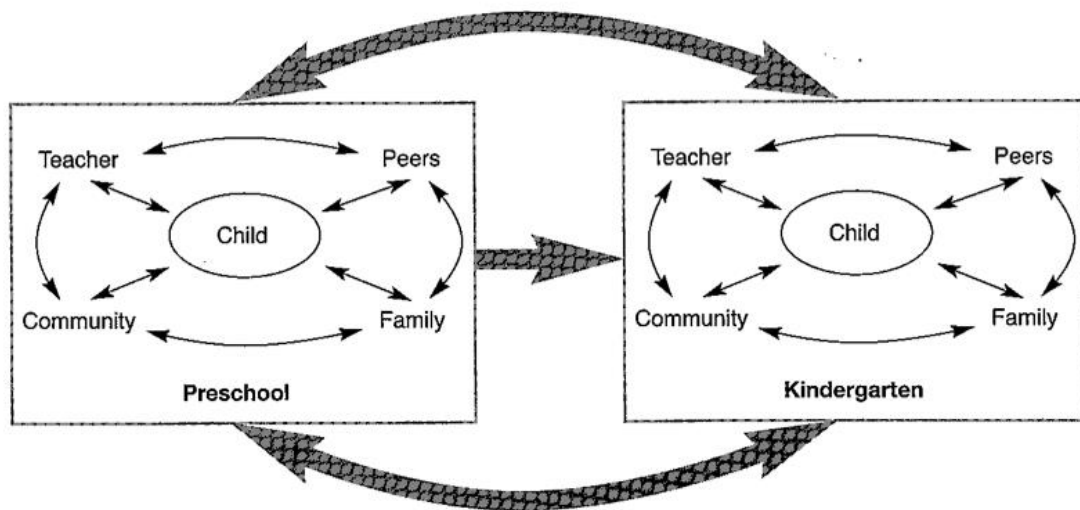


Figure 1

Developmental Model of Transition

From Pianta & Kraft-Sayre (2003, p.8)

Historical Early Childhood Programs

In order to understand contemporary dilemmas and debates in early childhood, it is important to understand the evolution of early childhood education in the United States of America. American citizens realized the benefit of public education for children beginning around 1825, and the field of education has experienced several paradigm shifts since that time (Merrell, Ervin, & Gimpel-Peacock, 2012). Although almost 120 years have passed since the first child's guidance clinic was formed – often considered the earliest early childhood

intervention (Merrell et al., 2012) - many scholars, educators, policy makers, and American citizens are more formally invested in maximizing young children's learning outcomes. More recently, the evidence-based movement has drawn attention to the importance of early childhood education. The 1983 report, "*A Nation at Risk*," brought attention to the achievement gap between American students and students in other industrialized countries. In 1989, the *National Education Goals 2000* initiative was drafted and in the early 1990's, the National Goals Panel broadened the definition of school readiness. In 2001, the *No Child Left Behind Act* was passed, mandating more accountability in education (Winter & Kelley, 2008).

As American policy makers and educators grappled with funding and implementing the most effective early childhood interventions in the twentieth century, earlier programs were influential in providing a research base to support the existence of early childhood education. A handful of large-scale early childhood interventions implemented in the twentieth century have shaped the way in which scholars, educators, and practitioners think about early childhood educational programs and the transition to formal schooling in relation to the evidence-based movement. A summary of some of the most notable American early childhood interventions follows including the High/Scope Perry Preschool Project, Carolina Abecedarian Project, Chicago Parent Centers, and Head Start.

High/Scope Perry Preschool. The High/Scope Perry Preschool Project was a study in Ypsilanti, Michigan that lasted two years. The project was created in the early 1960's to address the high percentage of young children in the school district who were retained in the early elementary years. Participants in the study were 123 African American children age three to four years old living in poverty. Children attended preschool for half a day every weekday, and received home visits during the school year. Children were in classes with a small teacher to

student ratio, and all teachers had a master's degree and training in child development. The approximate cost per child was \$12,884 per year (Schweinhart, 2003).

When children in the study reached 27 years of age, results of longitudinal analyses indicated that for every one dollar spent on the program over seven dollars were saved in public tax expenditures (Barnett, 1996). Many of these cost savings were associated with increased educational attainment and employment. For example, compared to children in the control group, children in the High Scope Perry Preschool project spent less than half of the time in classrooms for students with cognitive impairments. In addition, children in the High Scope Perry Preschool Project out-performed the control group on a school achievement test at age 14 and a literacy test at age 19 (Schweinhart, 2003). At age 40, the children who attended the preschool were more likely to have completed high school, hold a job, and earn more than a comparison group of children who did not attend the preschool (Schweinhart, 2003).

Carolina Abecedarian Project. The Carolina Abecedarian Project was designed to provide low-income children with high quality early childhood care (Campbell & Ramey, 1994). Researchers recruited participants between 1972 and 1977. One hundred nine families (111 infants) took part in the study and participants were assigned to the experimental group or the control group. All participants met poverty guidelines and 98% of participants were African Americans. Most mothers were young (i.e. average age was 20 years), unmarried, had less than a high school education, lived in a multigenerational house, and did not have any reported income. The experimental group was divided into two groups. One group received an early childhood intervention only, whereas the other group received an early childhood plus a school-age intervention. The early childhood intervention consisted of all day, year round childcare with developmentally appropriate activities. Families receiving the school-age intervention had a

home-school resource teacher who served as a liaison between the school and the family. Parents received curriculum packets to enhance skills that their children needed more assistance with.

One hundred five children were available for a follow-up study at age 21. The young adults who received either of the interventions as children had higher cognitive scores, higher academic achievement scores, completed more years of schooling, were more likely to delay childbearing, and were twice as likely to attend a four year college or university than children in the control group (Campbell & Ramey, 1994). Taken together, results of the study indicated that not only did children in the study experience an increased quality of life during childhood, the children achieved higher educational and occupational outcomes as adults than the comparison group.

Chicago Child-Parent Centers. The Chicago Child-Parent Center intervention is considered a “program that works” on the Promising Practices Network (www.promisingpractices.net, 2012). The program was created in 1967 and continues to provide comprehensive educational services to preschool children living in low-income neighborhoods in Chicago. The program is part of the Chicago Public School System and fosters preschool children’s cognitive and social growth through individualized education programs that require parental involvement (www.promisingpractices.net, 2012).

Participants in the first Chicago-Parent Centers study were 1,539 low-income minority children (93% Black, 7% Hispanic) who were born in 1979 or 1980. The intervention consisted of a half-day preschool program for three and four year old children, a half day or all-day kindergarten program, and two or three years of interventions in elementary schools (Reynolds & Temple, 2008). Results of the study provided relevant insight into factors mediating long-term school performance including attending a high-quality elementary school, experiencing low

mobility, having higher literacy scores in kindergarten, and being promoted to the next grade (Reynolds & Temple, 2008). For example, the effect of preschool was negligible if a student attended a high-quality elementary school as opposed to a low-quality elementary school. The effect of preschool also diminished if children remained in the same elementary school instead of attending multiple elementary schools.

Results of longitudinal analyses indicated participants who participated in the Chicago Parent Center Preschool attended school longer and had lower rates of juvenile arrests. Compared to the comparison group, children receiving the intervention had a 29% higher rate of high school completion, 41% reduction in special education placement, and 40% reduction in grade retention. Moreover, children in the control group earned more as adults (Reynolds, 2000).

Head Start. Head Start is a national program that promotes positive child development outcomes by enhancing the social, emotional, cognitive, and physical development of children through the provision of educational, health, nutritional, social and other services to students and their families (Office of Head Start, 2010). Head Start programs have been in existence since the 1960's and continue to maintain a steadfast presence in early childhood interventions. The *Head Start Reauthorization Project* (2007) provides increased funding for Head Start and allows for future expansion of the program. In 2013, federal funds for Head Start were appropriated at \$7.5 billion and provided enrollment for nearly one million American children (Head Start, 2013).

In addition to securing funding, the *Head Start Reauthorization Project* (2007) also seeks to improve Head Start teacher quality and teacher retention. Currently, approximately one-third of Head Start teachers have a Bachelor's degree, and one-fourth of teachers have an Associate's degree. Over time, all newly hired teachers will have a Bachelor's Degree and

current teachers who do not have a bachelor's degree will receive financial assistance to return to school (National Association for the Education of Young Children, 2009).

In addition to educational experiences, Head Start students receive preventative medical care and nutritious meals and snacks. Students interact with their peers during structured preschool activities as well as creative-play and gross motor activities. Parents or guardians of children in Head Start also receive support services through parent education courses, family nights, access to social workers, and interactions with Head Start staff. Family nights provide families with information about creating healthy parent and child relationships and ways to enhance student learning in the home setting (Head Start, 2013).

Research on the effects of Head Start has indicated positive educational, occupational, and quality of life outcomes. In a non-experimental study examining income data, adults who attended Head Start in the late 1960's and early 1970's had different outcomes than their peers who did not attend Head Start. Caucasian adults who attended Head Start were more likely to finish high school, attend college, and report higher earnings than their peers who did not attend Head Start. Former Head Start students of African American descent were less likely to be charged with a crime, and more likely than their siblings who did not attend Head Start to finish high school (Garces, Thomas, & Currie, 2000).

Recently, researchers completed the first longitudinal study of children enrolled in Early Head Start. The longitudinal study began in 1995 with 3,001 children and families enrolled in an Early Head Start Program (Kisker, Paulsell, Love, & Raikes, 2002). Researchers assessed student outcomes when students finished pre-kindergarten, and they will assess students again when they have completed fifth grade. Current trends in this longitudinal study on Early Head Start students pointed to several positive trends in child outcomes. Children receiving Head Start

services exhibited greater cognitive and language development and social-emotional development. In addition, parents reported more positive parental behaviors (Kisker et al., 2002).

It is important to note that many of the previously mentioned large-scale interventions such as Head Start have several commonalities that all early childhood programs may not possess. For example, the large-scale programs began early in the child's life, had well-educated, well-trained, and well-compensated staff, utilized small class sizes and high teacher-child ratios, and provided intensive services. In addition, the interventions had a distinct purpose, focused on the whole child, provided children with direct instruction as well as experiential learning opportunities, and provided teachers time to reflect on their own teaching practices and their students' progress (Galinsky, 2006).

Developmental Kindergarten Programs

In an era of education reform and an emphasis on accountability, the presence of early childhood transitional programs stands in the middle of several social, political, and educational debates (Zigler, Gilliam, & Barnett, 2011). Although DK programs vary in structure, length, curriculum, and theoretical orientation, the overarching purpose of DK programs is to create a smoother transition into the more structured and demanding kindergarten classroom. Transitional kindergarten programs are known by many different names, such as "DK," "Pre-Kindergarten" (Pre-K), "Begin-a-garten," and "Young Fives" (Meisels, 1992). Kindergarten marks the first year of formal schooling in the K – 12 school system and is associated with increased academic rigor, higher student to teacher ratios, increased social expectations, and less dependence on the teacher and other adults in the classroom (Rimm-Kaufman et al., 2000).

This study focuses on one very specific type of transitional program - DK. The purpose, existence, and age requirements of DK programs vary from state to state. For example, students

in many DK programs are typically age-eligible for kindergarten but were not yet “ready” to begin kindergarten for a variety of reasons (see Table 2). In the district under investigation within this study, the district requirements for DK were slightly different. Specifically, students who are not age-eligible for kindergarten are not eligible to enroll in the DK program. These requirements are more consistent with the maturational view of child development. In other states such as Oklahoma, Pre-K programs are universal preschool programs for all four-year-old children residing in the state. These children are not age-eligible to begin kindergarten (Oklahoma State Department of Education, 2013). However, in everyday conversation, the terms Pre-K and DK are often used interchangeably even though they may mean different things depending on the state and local context.

Table 2 Similarities and Differences Between Pre-K and DK		
Both Pre-K and DK are designed to...	Pre-K is...	The DK program in this study is...
Foster and develop school readiness skills	Designed for children who are not yet age-eligible for kindergarten	Designed for children who are age-eligible for kindergarten
Ease the transition to kindergarten	Designed for children who are three or four years old, depending on the program	Designed for children who are already five years old (or will turn five years old by the fall kindergarten cutoff date)
Enhance learning in kindergarten and beyond	A type of preschool followed directly by kindergarten	Often occurs between preschool and kindergarten (although preschool attendance is not required to attend DK)
Provide children with developmentally appropriate structure and activities	Typically in private or public schools	Typically in public schools
Serve as an early childhood intervention.	Not delaying a child’s entry into kindergarten.	Delaying a child’s entry into kindergarten.

For example, Magnuson, Ruhm, and Waldfogel (2007) used data from the Early Childhood Longitudinal Study (ECLS) to study the effects of Pre-K programs across the country. Results of the study indicated Pre-K programs were more effective for disadvantaged children than non-disadvantaged children. Overall results indicated that Pre-K attendance did not have long-lasting effects on children's skills by the end of the first grade year. However, Pre-K attendance was associated with long-term adverse effects on aggression and self-control (Magnuson et al., 2007).

In a multi-state study of Pre-K programs, Clifford et al. (2005) found that Pre-K programs vary in structure, content, and quality. For example, results of the study indicated that approximately half of Pre-K programs are half-day programs, whereas the other half are full day programs; half of publicly funded Pre-K programs are housed in public schools, while the other half of programs are housed in churches or community centers (Clifford et al., 2005).

In another effort to learn more about existing Pre-K programs, the National Center for Early Development & Learning (NCEDL) conducted a survey (Bryant et al., 2002). One hundred twenty five respondents were interviewed between August 2000 and March 2001. Results of the survey indicated that 34 states had state-funded Pre-K programs serving approximately 740,000 children, but the programs varied widely across states. The programs served three and four year old children and most of the programs were intended for at-risk children. Pre-K programs were located in a variety of venues, including public schools, community centers, and daycares. Pre-K classes were held for as little as 2.5 hours to as long as 10 hours a day for nine to ten months per year. Teacher qualification requirements ranged from a two-year Child Development Associate certificate to a bachelor's degree with teacher certification (Bryant et al., 2002). Although the

data gathered from this survey is important, it does little to further the research for DK programs designed for children who are eligible for kindergarten based on age requirements.

In another study with a sample of 2800 randomly selected four-year-old Pre-K students across 11 states, researchers found differences based on classroom quality. Data for the study were obtained from the National Center for Early Development and Learning Multi-State Study of Pre-Kindergarten and the State-Wide Early Education Programs Study. Individual measures of academic achievement were obtained using the *Peabody Picture Vocabulary Test*, the *Oral & Written Language Scale*, and the *Woodcock Johnson Test of Achievement: Applied Problems Subtest*. Children from both advantaged and disadvantaged families made small academic gains but overall literacy scores at the end of the Pre-K year were still below the national average. Children showed the greatest gains in academic skills when they were in high quality Pre-K classrooms or had a close relationship with the teacher (Howes et al., 2008).

LoCasale-Crouch and colleagues (2007) examined the classroom quality of 692 Pre-K classrooms in 11 states. Classroom teachers were rated on the level of social emotional support and instructional quality and each classroom was placed in one of five categories. Results of the study indicated only 15% of classrooms fell in the highest quality profile (high level of instruction and high level of emotional support) and 19% of classrooms fell in the lowest quality profile (lowest level of instruction and lowest level of emotional support). The lowest quality classrooms contained classrooms with the highest percentage of minority children and the lowest level of maternal education, indicating the most at-risk students were in the lowest quality classrooms (LoCasale-Crouch et al., 2007).

Burchinal and colleagues (2010) used data from the National Center for Early Development and Learning's Multi-State Pre-K study to better understand the effect of program,

classroom, and teacher characteristics that predict classroom quality and teacher child interactions. The study included 238 Pre-K classrooms in six states. High quality classrooms were most closely associated with specific teacher and child attributes, such as teacher attitudes and beliefs. Low classroom quality was associated with greater than 60% of the students in the classroom living in poverty, low level of teacher education, and authoritarian teaching styles (Burchinal et al., 2010). The works of Howes et al. (2008), LoCasale-Crouch et al. (2007), and Burchinal et al. (2010) further illustrate the complexity of factors that influence the outcomes of early childhood interventions.

Oklahoma is considered the nation's leader in adopting a universal Pre-K program (Rose, 2011). From the early 1980's to the late 1990's, the state of Oklahoma implemented the universal program quietly and slowly (Rose, 2011). The Oklahoma Pre-K program is particularly remarkable since Pre-K teachers receive the same compensation as K-12 teachers and the Pre-K programs are seamlessly meshed with the existing K-12 system (Phillips, Gormley, & Lowenstein, 2009). Oklahoma's prekindergarten classrooms are also recognized for their high quality instructional and emotional supports (Phillips et al., 2009). Few states, if any, have matched Oklahoma's high-quality, universal Pre-K program.

In a study designed to examine the effects of attending Oklahoma's Pre-K program, researchers sampled 1,567 pre-K children who just began attending the Pre-K program and 1,461 children who recently completed the Pre-K program. Results of the study indicated that students who just completed Pre-K scored 3 points higher on the word-identification score, 1.86 points higher on the spelling score, and 1.94 points higher on the applied problems score of the Woodcock Johnson Achievement Test. Scores improved for Hispanic, Black, White, and Native American children (Gormley, Gayer, Phillips, & Dawson, 2005). Although children who

attended the Pre-K program scored higher on achievement tests measures, the increased scores may not be practically significant. As states continue to work with smaller and smaller educational budgets, the practical significance of effect sizes of early childhood programs is of more and more importance.

In contrast to Oklahoma's grass roots Pre-K program, the Supreme Court's decision in *Abbott v. Burke (1985)* mandated preschool education for all three and four year old children in 31 school districts across the state of New Jersey. These Pre-K classrooms were named the Abbott Pre-K programs. The court decision was a landmark decision since it was the first court ruling mandating early childhood education (Frede, Jung, Barnett, & Figueras, 2009). In 2002, Governor James McGreevy required the state of New Jersey to develop a plan to monitor and commit to continuous quality improvement initiatives, and the state developed the Early Learning Improvement Consortium (ELIC) to collect and analyze data pertaining to the Pre-K program (Frede et al., 2009). Results of studies of the Abbott Pre-K program indicated classroom quality improved over time. At the end of second grade, students enrolled in the Abbott Pre-K program were less likely to be retained and have increased mathematics and language scores than a comparison group of children (Frede et al., 2009).

Some states with Pre-K programs have published documents available online that outline the program goals and content. In Nevada, early childhood specialists from states across the country are working with the Council of Chief State School Officers to align state Pre-K standards with the common core standards. Nevada has statewide Pre-K content standards in the following domains: cognition and general knowledge, language development and communication, personal and social-emotional development, creative expressions/experiences, and physical development and health (Nevada Pre-K Standards, 2010).

New Mexico educators emphasize the importance of providing developmental kindergarten students with developmentally appropriate structure and activities, helping to facilitate a smooth transition from developmental kindergarten to kindergarten (New Mexico's Early Learning Outcomes, 2006). Michigan has published standards for developmental kindergarten programs in the document, *Early Childhood Standards of Quality for Prekindergarten* (Michigan State Board of Education, 2005). Examples of some of these standards are outlines in Table 3. The Collaborative for Academic, Social, and Emotional Learning (CASEL, 2013) has the social-emotional learning standards available for transitional kindergarten programs for the 48 states that have published social-emotional standards.

Table 3

Examples of Michigan Early Childhood Standards of Quality for Pre-Kindergarten

Domain	Program Standard	Indicator Example
Statement of Philosophy	<i>Program Standard:</i> A written philosophy statement for the early childhood education and care program is developed and utilized as the basis for making program decisions and establishing program goals and objectives.	Develops a philosophy that incorporates suggestions from the program's staff (teachers, administrators, and support staff), governing board, families, and community representatives.
Community Collaboration and Financial Support	<i>Program Standard:</i> The program shows evidence of participation in cooperative efforts within the community and has membership on the community's early childhood collaborative council.	Participates in the development of a common community philosophy of early childhood expectations.
Physical and Mental Health, Nutrition and Safety	<i>Program Standard:</i> Programs address the need for continuous accessible health care (mental, oral, physical health, and fitness) for children.	Provides information and referral for parents of children to health care partners for preventive and primary health and mental health care needs and coverage.
Staffing and Administrative Support and Professional Development	<i>Program Standard:</i> Teachers are qualified to develop and implement a program consistent with the program philosophy and appropriate to the developmental and learning needs of the children and families being served, including the development of a continuing parent education and family involvement component.	Employs teachers with bachelor's degrees in early childhood education, or child development, including coursework and supervised field experience.
The Partnership with Families	<i>Program Standard:</i> Families have multiple opportunities for regular involvement with the program and its staff including	Enables the family to take part in the decision making process related to the child's participation

Table 3 (cont'd)

	placement, planning for individualization and evaluation related specifically to their child.	in the program, so program goals and expectations and goals for their child and family can be met.
The Learning Environment	<i>Program Standard:</i> The curriculum is designed to include experiences related to children's social, emotional, intellectual, language, creative, and physical development.	Assures that children have experiences to enhance their social development, including the acquisition of interpersonal skills, self-discipline, caring, and respect for others.
Child Assessment and Program Evaluation	<i>Program Standard:</i> The program uses information gained from a variety of assessment measures to plan learning experiences for individual children and groups.	Uses sound developmental learning theory to plan and conduct child assessment.

Michigan State Board of Education: Early Childhood Standards of Quality for PreKindergarten (2005)

Despite the increased availability and visibility of standards for some transitional kindergarten programs, the purpose of transitional programs is often difficult to ascertain. Transitional kindergarten programs that exist under the guise of kindergarten retention or delayed entry into kindergarten are distinctly different than those that exist as universal preschool for three or four year old children. It is important to advance the research base for DK programs that are used as an intervention year when the child is already five years of age in order to have a better understanding of the most effective types of early childhood programs.

Although studies of well-known, intensive early childhood programs indicate that the programs are successful in both long-term and short-term outcomes, there are still inconclusive results about the specific components of early childhood programs that maximize results (Zigler, et al., 2011). In addition, little is known about the specific types of early childhood programs that work the best for different specific groups of children. For example, results of the 2009 Head Start Family and Child Experiences Survey indicated that children in Head Start enter and exit the program with scores in English language, literacy, and math that are below national norms (Aikens, Kopack, Tarullo, & West, 2013).

Additionally, it is difficult to accurately assess the current cost-benefit ratios for early childhood programs since some programs have the capability to complete more long-term longitudinal studies than others (Kilburn & Karoly, 2008). The benefits of early childhood programs may decline over time and paying close attention to the amount of time required for an early childhood intervention to maximize long-term outcomes is important. Although calculating cost/benefit ratios is not the purpose of this study, adding to the research base pertaining to the long-term outcomes of DK is important to assist in future policies and programs shaping the transition to kindergarten.

Age at Kindergarten Entry

Redshirting. The age at which children begin kindergarten is changing and is an important factor in the kindergarten entry decision-making process. The availability of transitional kindergarten programs and societal expectations have delayed some children's entry into kindergarten. "Redshirting" is the original term used to describe delaying a college athlete's participation in athletics until the athlete was bigger and stronger. Many parents choose to "redshirt" their preschool-aged child and delay kindergarten entry by one year in order to potentially boost their child's academic and/or athletic success and provide their child with "the gift of time" (Deming & Dynarski, 2008). The practice of redshirting is considered a "zero-sum" game because it is inevitable that one child will be the youngest and one child will be the oldest in any given class (Deming & Dynarski, 2008). Nearly every state has increased the age at which children can enter kindergarten, even though research indicates that beginning school later is associated with decreased educational attainment. Although many point to the mandated standardized testing movement of the 1990's as the proponent of redshirting, redshirting began in the 1980's; surprisingly, 75% of the decisions to redshirt students are due to parent and educator choice as opposed to changes in state law regulating the age of kindergarten entry (Deming & Dynarski, 2008).

The practice of delaying kindergarten entry has become more widespread. For example, in the 1970's, approximately 10% of 18-19 year-olds were enrolled in high school. In 2005, approximately 18% of 18-19 year-olds were enrolled in high school. Older high school graduates often have several characteristics in common. The majority of 18-19 year-old high school students are male, from affluent families, and of Caucasian or Asian descent (Deming & Dynarski, 2008).

There are several interpretations to the large age gap among kindergarten children. Cascio (2008) outlined three common interpretations of the entry-age achievement gap. The first interpretation is that older kindergarten students have an advantage since they are physically larger and smarter than their peers. The older students tend to be tracked into top-performing reading groups and continually experience more advanced academic material in the early years than their classroom peers. Another interpretation is that older students have been exposed to enriching environments and academic material for a longer time than their younger peers and are better equipped to succeed when they enter school. Last, those who enter school late are older when they take standardized tests and their enriched and longer life experiences may contribute to success on standardized measures of academic performance (Cascio, 2008).

Perceived Gains Fade Over Time. Although studies have drawn various conclusions about the age at kindergarten entry, most of the initial gains due to birthday fade over time (Robertson, 2011). Researchers used data from the Early Childhood Longitudinal Study (ECLS) (Kindergarten class of 1998-1999) to examine the effects of age on academic achievement (Domaleski & Oshima, 2006). First-time kindergarten students with early birthdays (June, July, and August) were compared to first-time kindergarten students with late birthdays (September, October, and November). The age gap of these students was approximately seven to eleven months. Analyses indicated that the effect size (ES) for children with older birthdays compared to children with younger birthdays was .38 for reading, .55 for mathematics, and .50 for general knowledge. There was a rapid decrease in the ES for children up to third grade, a more gradual decline in fourth and fifth grade, and virtually no difference in scores in middle school. Reading scores were higher for girls than boys across kindergarten through eighth grade and gender differences were not apparent in mathematics scores (Domaleski & Oshima, 2006).

Additional studies have documented the same decline in birthday effects over time. In a study of 237 children from low-income families from three diverse sites (rural, predominantly Caucasian; urban, predominantly African American; and urban, predominantly Latino), researchers found that children who entered kindergarten younger than their peers performed less well academically initially. However, by third grade there was not a difference in academic achievement based on age (Stipek & Byler, 2001).

Lincove & Painter (2006) used data from the National Educational Longitudinal Survey to determine the effects of age of entry on later academic performance. Results of their study indicated redshirting does not improve student outcomes and age has little long-term effects on academic or social success. Furthermore, students who enter kindergarten early may have an advantage because they have an additional year in the workforce (Lincove & Painter, 2006). Parents and teachers are often more aware of the salient short-term effects of delayed kindergarten entry that are evident in the early elementary years and less aware of the negligible or negative long-term effects of delayed kindergarten entry.

In another study by Cascio & Schanzenbach (2007), data were used from the United States – Tennessee’s Project STAR (Student Teacher Achievement Ratio) study to better understand the effects of relative age among kindergarten students. Unlike other studies examining the effects of age at kindergarten entry in which parents or administrators may have lobbied for a student to wait a year to begin kindergarten, Project STAR students were randomly assigned to kindergarten classrooms. Results of the study indicated that students who entered kindergarten at a younger age benefitted more than students who entered kindergarten at an older age. The younger children benefited positively from the “spillover” effects of being in class with older peers. Compared to older students, the younger students performed similarly on

achievement tests across elementary and high school, were not any more likely to be retained, and just as likely to take future standardized tests such as the ACT or SAT. Moreover, the study found that the positive effects associated with age were more related to the absolute age of the child as opposed to the relative age advantage in comparison to other children in the classroom (Cascio & Schanzenbach, 2007).

Elder & Lubotsky (2009) used data from the Early Childhood Longitudinal Study kindergarten cohort (ECLS-K), and the National Educational Longitudinal Survey of 1988 (NELS:88) to better understand the correlation between age at which children begin kindergarten and later academic achievement. The positive association between age at kindergarten entry and academic achievement was due to skills acquired prior to entering kindergarten and not due to older peers' ability to learn more rapidly than their younger peers during the school year. In addition, Elder & Lobotsky (2009) found that the relationship between age at kindergarten entry and later academic achievement is greater for children from more privileged backgrounds than children from less privileged backgrounds. Results of the study also suggested that the spillover effects of attending school with older peers increased test scores, but also increased the probability that a student would be retained or diagnosed with a learning disability. Researchers concluded that delaying entry into kindergarten postpones learning and does not have any long-term benefits, especially for children from low SES backgrounds whose primary learning opportunities occur in public school classrooms (Elder & Lobotsky, 2009).

Kindergarten Retention

Kindergarten retention is a unique construct. Unlike retention in later grades, the delay of entry into kindergarten can be considered a form of kindergarten retention. As previously discussed, "redshirting" is a common phenomenon some parents use to give their children a

perceived advantage in kindergarten. Other children might experience delayed entry into kindergarten due to a lack of school readiness skills and attend a transitional program (such as DK) to prepare for kindergarten. In essence, delaying a child's entry into kindergarten – regardless of the reason- is a form of retention.

Comprehensive reviews of retention research spanning nearly a century indicate that retention does not have positive effects (Holmes & Mathews, 1984; Holmes, 1989; Jimerson et al., 2006, Allen et al., 2009) and early grade retention is one of the best predictors of later school withdrawal (Jimerson, Anderson, & Whipple, 2002). Despite the research evidence, retention is still an accepted practice due to political influences extending back to the Clinton Administration. President Bill Clinton called for an end to social promotion in his State of the Union addresses in 1997, 1998, & 1999 and the *No Child Left Behind Act* of 2001 enacted during the George W. Bush Administration has also led to increased accountability and retention (Hong & Raudenbush, 2006).

Interestingly, demographic characteristics are more associated with retention than actual academic achievement. Decades of retention research indicate that boys are twice as likely to be retained as girls, and children who are retained are more likely to have mothers with lower IQ scores, poor attitudes toward school, and low parental involvement. In addition, African American and Hispanic students are more likely to be retained than Caucasian students, and students who have social-emotional difficulties are more likely to be retained than students who do not (Hong & Yu, 2007; Jimerson et al., 2006).

One of the largest kindergarten retention studies to date by Hong & Raudenbush (2006) consisted of 471 kindergarten retainees and 10,255 promoted students in 1,080 schools drawn from the ECLS-K data set. Researchers used hierarchical linear modeling to account for

schooling effects. Results of the study indicated that kindergarten retention did not improve reading or math achievement regardless of whether a child attended a school with a high or low retention rate. Children who were retained in kindergarten learned less than their similarly performing peers who were not retained in kindergarten (Hong & Raudenbush, 2006). Hong & Raudenbush (2006) concluded that there was no empirical support for kindergarten retention and the kindergarten retainees would have learned more if they would have been promoted to first grade.

However, some advocates of retention believe that retaining kindergarteners will allow them to excel in the long run. Hong & Yu (2007) sought evidence using the ECLS-K data to either provide support for or refute this claim by comparing the math and reading achievement in 3rd and 5th grade of students who were either promoted or retained in either kindergarten or first grade. Data for the study were compiled from six waves of ECLS-K longitudinal data (n=21,409). Due to attrition, the sample size for the study consisted of 471 kindergarten retainees and 10,255 kindergarten students promoted to first grade, and 201 first grade retainees and 10,707 first graders promoted to second grade. Hong & Yu (2007) found that the achievement gaps were the largest when the kindergarten retainees finished their second year of kindergarten. At the end of their second year of kindergarten, the kindergarten retainees were 1.58 standard deviations behind their promoted counterparts in reading and 1.35 standard deviations behind their promoted counterparts in math. Five years later, the achievement gap diminished to 0.78 standard deviations in reading and 0.65 standard deviations in math. Whereas the achievement gap diminished over time for the kindergarten retainees, the achievement gap remained consistent in third and fifth grade for the first grade retainees. Results of the study suggest that kindergarten retention may be less harmful to children than retention in first grade; however

results of the study also indicated that both the kindergarten and first grade retainees would have learned more overall if they would have been promoted instead of retained (Hong & Yu, 2007).

Aside from researchers' inability to randomly assign students to a retained or promoted group and inability to account for consistent demographic differences in retained versus promoted students, kindergarten retention is an even more complex issue to address due to the rapidly evolving cognitive, physical, and social capabilities of young children. Research on the effects of schooling and young children indicates that some skills young children demonstrate are a result of schooling whereas other skills are a product of maturation and independent of schooling. Disentangling skills and competencies associated with biological maturation and environmental input is important to better understand the effects of schooling and the most appropriate interventions for students. Educators risk retaining students for failing to acquire skills that are a function of age and independent of years of schooling.

Skibbe et al. (2011) examined the schooling effects of children who were essentially the same age but varied in years of schooling due to age cutoffs. The small sample (n=76) consisted of children who were born two months before or two months after the school cutoff date. The slightly older children in the sample had two years of preschool while the younger children only had one year of preschool. Children were tested in the fall and spring of the school year using measures of self-regulation, decoding, letter knowledge, and vocabulary. Results of the study indicated that although children who attended preschool for two years had higher scores in decoding and letter knowledge, children in both their first and second year of preschool demonstrated the same growth in knowledge over the school year. Children's chronological age, rather than number of years of schooling, was associated with vocabulary and self-regulation scores. These results suggest that although additional schooling may have a cumulative effect on

academic outcomes, other variables such as biological maturation or the home environment may also affect children's self-regulation and vocabulary skills (Skibbe et al., 2011).

Bisanz, Morrison, & Dunn (1995) completed a similar study comparing the effects of age and schooling on conservation of number and mental arithmetic. Kindergarten and first grade children (n=56) were divided into three groups: different age but same level of schooling; different amount of schooling but same age; and different in age and schooling. Results of the study indicated that mental arithmetic competence improved with schooling. However, children's understanding of conservation of number was independent of schooling and only dependent on age (Bisanz et al., 1995). This study further illustrates certain skills are not a result of schooling but of biological maturation.

Results of meta-analyses suggest (Allen et al., 2009; Holmes, 1989; Holmes & Mathews, 1984; Jimerson et al., 2006) retention is not an effective educational intervention for struggling students. However, that does not imply that struggling students do not require additional support and remediation. Empirically supported interventions for struggling students involve the use of additional supports prior to or during the school years. Several of these empirically supported interventions involve alternative or "non-traditional" ways of thinking that are not currently supported by public policy. Examples of empirically supported interventions include preschool, comprehensive school-wide programs, summer school and after school programs, looping and multi-age classrooms, school-based mental health programs, parent involvement, early reading programs, effective instructional strategies and classroom management, and behavior/cognitive modification (Jimerson et al., 2006).

A recent study by Im et al. (2013) was the first study in published literature to use propensity scores to compare the academic, behavioral, and engagement outcomes of students

who were retained compared to their promoted counterparts. The retained and promoted students scored similarly on all outcomes, indicating that although retention may not be beneficial it is not as harmful as once thought (Im et al., 2013). In a review of grade retention research, Reschley and Christenson (2013) emphasize the importance of focusing on the larger picture – the need to identify evidence-based interventions that work for children who are struggling academically - as opposed to focusing on the narrower, dichotomous view of retention versus promotion. Retention should not be an automatic default when children are struggling or lack skills. Rather, re-thinking early childhood interventions and implementing empirically supported interventions with fidelity is necessary to maximize young children's educational attainment.

Negative Effects Associated with Being Young in Kindergarten

Special Education Rates. Although there is a significant amount of evidence largely dismissing the differential effects of age at kindergarten entry, special education placement rates have been linked to the age at kindergarten entry. Dhuey & Lipscomb (2010) used data from the ECLS-K class of 1998-1999 and NELS:88 to examine the special eligibility placement rate in relation to student age at kindergarten entry. Results of the study indicated that the relative age of a student at the age of kindergarten entry was predictive of future special education placement for learning disabilities but not for physical disabilities. Findings of the study highlight the subjective nature of the learning disability evaluations in the school setting and indicate that special education eligibility may be used as an intervention for young students (Dhuey & Lipscomb, 2010). When students who have attended DK enter kindergarten, the former DK students are typically a full year older than their peers. In light of the results of the Dhuey & Lipscomb (2010) study, students who attend DK may be less likely to be classified with a learning disability later during their school career.

A study by Martin and colleagues (2004) corroborates the findings of Dhuey & Lipscomb (2010). In a study of 2,768 Georgia kindergarten students, students with summer birthdays were more likely to struggle academically in kindergarten. Analyses of school records indicated a disproportionate number of students with summer birthdays (June, July, and August) were diagnosed with a specific learning disability (Martin et al., 2004).

In a study designed to account for the within child factors in kindergarten age entrance, Datar (2006) analyzed the kindergarten and first grade math and reading achievement scores of 13,818 children in the ECLS-K dataset based on children's age relative to the kindergarten cutoff date in their respective state. Results of the study indicated that older children had a statistically significant advantage compared to their younger peers during kindergarten and first grade. Boys and students with disabilities benefited the most from entering kindergarten one year later (Datar, 2006). Data were not available to determine if the academic benefits persisted over time. Based on the results of this study, DK may be more advantageous for boys and students who already have an identified disability.

The study of the effects of age in relation to kindergarten entry is not limited to the United States. A study by Bedard & Dhuey (2006) demonstrated that age of kindergarten entry has a long-term effect on later academic achievement across nineteen countries. Using data from the Trends in International Mathematics and Science Study (TIMSS), younger students scored lower on nationally standardized tests than older students at the end of fourth grade and eighth grade. Young students were at a four to twelve percentile disadvantage at the end of fourth grade and at a two to nine percentile disadvantage at the end of eighth grade. Older students were also more likely to take college preparatory classes in their later high school years and attend a flagship postsecondary institution (Bedard & Dhuey, 2006).

Even after controlling for the effects of preschool, age at the time of kindergarten has an effect on children's long-term outcomes. In a study of 1474 economically disadvantaged first-time kindergarten students, researchers examined whether or not preschool mediated the effects of being young for one's grade. Findings of the study indicated that preschool attendance was associated with higher literacy scores, but students who were young for their grade were at a higher risk for retention after controlling for literacy scores and preschool attendance (Huang & Invernizzi, 2013).

Results of the studies relating to age at kindergarten entry are mixed. Although a large body of literature exists that indicates the initial gains due to birthday fade over time (Robertson, 2011; Domaleski & Oshima, 2006), other studies have found negative effects related to being young for one's grade. Children who are young for their grade are more likely to receive special education services (Domaleski & Oshima, 2006) or more likely to be retained (Huang & Invernizzi, 2013). The mixed results of the studies related to redshirting or delaying kindergarten entry reinforce the need to increase the evidence base in this area.

School Readiness

School readiness skills are a critical component of the transition to kindergarten. The concept of school readiness has been around since 1836 when compulsory education laws were first passed (Snow, 2010). "School readiness refers to the state of child competencies at the time of school entry that are important for child success" (Snow, 2010, p.9). Although great variation exists among school readiness definitions, all share the common theme of acknowledging the acquisition of competencies that are linked to later school success (Snow, 2010). School readiness is partly due to knowing (e.g., letters, numbers, and shapes) and partly due to ways of

being (e.g. willingness to share with others). In addition, there is cultural variation in terms of school readiness, and school readiness factors vary based on geographic location (Graue, 2010).

School readiness was originally based on a maturationist perspective, indicating children needed to reach a certain level of maturation prior to entering school (Pianta, Cox, & Snow, 2007). From a maturationist viewpoint, American school readiness was defined in terms of a threshold, “Something you need x amount of to be able to profit from kindergarten” (Graue, 2010, p.47). However, many scholars and educators are calling for a more ecological view of school readiness. Instead of expecting children to be ready for school, schools should be ready for children (Graue, 2010).

Predictive Validity of School Readiness Measures. Both standardized and non-standardized measures of school readiness are used to determine whether a child is “ready” for kindergarten. However, defining the construct of school readiness is difficult, as well as creating measurement tools with adequate reliability and validity (Graue, 2010). School readiness assessments are particularly difficult to create considering the differences in experiences children have based on parental income level, as well as differences in experiences based on culture and ethnicity. Current kindergarten screening assessments have limited predictive validity, and research indicates that delaying school entry based on school readiness may not be beneficial for all (Snow, 2010).

In a meta-analysis of 70 longitudinal studies measuring the effect sizes of standardized and non-standardized measures of early academic and social-emotional skills and early academic and social-emotional outcomes measured after kindergarten and in first or second grade, researchers found approximately 25% of variance in later academic outcomes could be attributed to school readiness measures of academic and social-emotional skills and less than 10% of

variance in later social-emotional outcomes could be attributed to school readiness measures of social-emotional outcomes (La Paro & Pianta, 2000). Notably, correlations between the initial kindergarten screening assessment and subsequent assessments ranged from .03 to .87, indicating substantial variability across studies (La Paro & Pianta, 2000). Interestingly, correlations in the La Paro & Pianta (2000) varied widely for both standardized and non-standardized measures of school readiness, further illustrating the difficulty of selecting kindergarten screening measures with high effectiveness and overall utility.

Calls have been made to shift the burden of school readiness from the individual child to the school (Raforth et al., 2004). In contrast to the traditional within child measures of school readiness, some argue the most effective school readiness tools would be designed for teachers to use to adapt their daily classroom routines based on the needs of their students (Graue, 2010). Others have emphasized creating standardized tests of school readiness that match a student's areas of need with specific interventions (Hair et al., 2006).

Table 4

Characteristics of School Readiness

- Ability to follow structured daily routines
- Ability to dress independently
- Ability to work independently with supervision
- Ability to listen and pay attention to what someone else is saying
- Ability to get along with and cooperate with other children
- Ability to play with other children
- Ability to follow simple rules
- Ability to work with puzzles, scissors, coloring, paints, etc.
- Ability to write their own name or to acquire the skill with instruction
- Ability to count or acquire the skill with instruction
- Ability to recite the alphabet (or quickly learn with instruction)
- Ability to identify both shapes and colors
- Ability to identify sound units in words and to recognize rhyme

Raforth et al., 2004.

National Association of School Psychologists

Perceptions of School Readiness. Parents and teachers view school readiness differently. Parents emphasize counting and alphabet knowledge as the most important skills for school readiness, whereas teachers emphasize social-emotional competencies as essential for school readiness (Snow, 2010). “Social competence in children manifests in emotional self-regulation, social cognition, positive communication, and prosocial relationships with family members, peers, and teachers” (Bornstein et al., 2010, p.718).

In an effort to understand kindergarten teachers’ perception of school readiness, Lin and colleagues (2003) used data from 3,305 kindergarten teachers in the ECLS-K cohort in the 1998-1999 school year. When kindergarten teachers were asked to rate a list of 13 items that indicated school readiness, a student’s ability to state his or her needs and thoughts, not be disruptive, and follow directions were rated as the top three items, respectively. A key finding from the study is that kindergarten teachers perceive social skills to be more important to school readiness than academic skills (Lin et al., 2003).

Data from the School Readiness survey of the 2007 National Household Education Surveys Program were used to assess the school readiness of children three to six years of age (O’Donnell, 2008). Data were gathered from phone calls to 2,633 randomly selected parents. Results of the survey indicated that 93% of children had speech that a stranger could recognize, 63% could count to 20 or higher, 60% could write their first name, 32% could recognize the entire alphabet, and 8% could read words in books. Parents planned to delay kindergarten entry for 9% of boys and 4% of girls (O’Donnell, 2008). The national survey did not survey parents about social-emotional factors related to school readiness skills.

Risk Factors Relating to School Readiness. A high percentage of young children lack school readiness skills prior to entering kindergarten. A national sample of kindergarten

teachers (N=3,595) surveyed in the National Center for Development and Learning's *Transition Practices Survey* provided insight into how kindergarten teachers perceive children at the time of kindergarten entry. Teachers reported that almost half of students (46%) had difficulty transitioning to kindergarten. The rates of reported transition problems were related to school minority composition, district geographic composition, and average household income level of the district (Rimm-Kaufman et al., 2000). Children in the lowest socioeconomic group had cognitive achievement scores that were 60% below those of the most affluent socioeconomic group (Lee & Burkam, 2002) and disparities in achievement increased over time (Klein & Knitzer, 2006). In a recent study of 781 children of Latino/a descent, school readiness risk factors included being male, lack of preschool experience, and poor English proficiency (Quirk, Nylon-Gibson, & Furlong, 2013).

In another study examining risk factors related to school readiness skills, researchers used data from the ECLS-K Class of 1998-1999 (N=17,219) (Hair et al., 2006). Students were divided into four groups: comprehensive positive development (30%), social-emotional and health strengths (34%), social-emotional risk (13%) and health risk (23%) at the time of kindergarten entry. Student academic outcomes and social adjustment outcomes were analyzed when the students completed first grade. Results of the study indicated that children with a comprehensive positive development profile scored the highest on the social-emotional and academic outcomes at the end of first grade and children with one of the two risk categories scored the lowest on the same outcomes. Children's placement into one of the two risk categories was related to economic disadvantage (Hair et al., 2006).

In one of the largest studies examining school readiness factors, researchers analyzed six large-scale longitudinal data sets (Duncan et al., 2006). Two data sets were nationally

representative of U.S. children, two data sets contained data from multi-site studies of U.S. children, and two contained data from multi-site studies of children in Great Britain and Canada. The study built upon previous school readiness research, examined multiple dimensions of academic achievement, and controlled for ecological variables commonly related to achievement. Results of the study indicated that academic achievement prior to attending school, attention, and social-emotional skills had similar effects for boys and girls from families of both high and low socioeconomic status. Early math skills were more predictive of later reading achievement than early reading skills, but both early math and reading skills were associated with higher levels of academic performance. Early attention abilities were more predictive of later academic success than early social-emotional skills (Duncan et al., 2006).

School Readiness in Relation to Family Income. There are several risk factors related to school readiness skills, and most of the risk factors are related to poverty. In a review of risk factors related to the transition to kindergarten, Hernandez et al. (2007) cited inconsistent parental work opportunities, low parental education, low parental pay, parental limited English proficiency, and general family poverty status as common risk factors for young children's school readiness.

In order to better understand the relationship between school readiness skills and income, data from two nationally representative birth cohort studies were used from the United Kingdom and the United States. Data from the United States was gathered from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), and data from the United Kingdom was obtained from the Millennium Cohort Study (MCS) (Waldfoegel & Washbrook, 2011). Interviews were completed at three points in time from age zero to five. Each data set was divided into five income quartiles. Income-related gaps were noted in literacy, mathematics, and language skills.

American children who attended Pre-K scored 6.8 percentiles higher on the ECLS-B literacy assessment than children who did not attend Pre-K. Parenting style and learning environment were the greatest two factors, respectively, in explaining the school readiness gaps across income groups (Waldfogel & Washbrook, 2011).

Data from the Family and Children's Experiences Survey was used to examine the school readiness of low-income children enrolled in Head Start (McWayne, Cheung, Wright, Green, Hahs-Vaughn, 2012). Children in the sample fell into five profiles: average academic and social skills, low average behavior problems (28%); high behavior problems at school, low-low average social and academic skills (17%); high behavior problem at home (15%); high social skills (21%); high cognitive skills (19%). Differences in school readiness were evident across the five profiles. Children who exhibited behavior problems at school were more likely to be boys, children of color, and the youngest children in the class compared to the children with behavioral problems at home. Children with behavior problems at home tended to have average to high skills in the social and cognitive domains. Children with high cognitive skills made more academic gains by the end of the school year than children with high social skills, but the achievement gap between the high social skills and high cognitive skills groups decreased over the school year (McWayne et al., 2012).

School Readiness Skills and Prior Preschool Experience. Prior high-quality preschool experiences are associated with increases in school readiness. In a recent analysis of 123 comparative studies of early childhood interventions, Camilli et al. (2010) found that preschool attendance was most strongly positively associated with increased cognitive outcomes. Preschool attendance was also positively associated with children's social skills and overall progress in school (Camilli et al., 2010). Data from the ECLS-K dataset that included 7,748 children who

entered kindergarten in the fall of 1998 indicated that kindergarteners who attended preschool entered kindergarten with higher academic skills than their peers who did not attend preschool (Magnuson et al., 2007). Large-scale studies of state-funded preschool programs indicate that the preschool programs are associated with increased gains in math and reading in the early school years and reductions in kindergarten grade retention (Huang & Invernizzi, 2013; Magnuson et al., 2007). Head Start has also been associated with modest benefits in children's cognitive abilities (United States Department of Health and Human Services, 2010).

Domitrovich et al. (2013) analyzed the effects of an enhanced, two-year preschool program for three and four year old children compared to a one-year program for four-year-old children. Propensity scores were used to account for the selection bias of children assigned to each of the two groups. Results of the study indicated that children who participated in the two-year preschool program had enhanced literacy and mathematics outcomes compared to the children who participated in the one year preschool program (Domitrovich et al., 2013). This study was particularly important since the research on dosage effects of preschool and other transitional programs is limited.

Differential Gains from Preschool Programs. Over forty years ago, evidence emerged indicating students from lower socioeconomic backgrounds benefited more from an extended day kindergarten program than students from higher socioeconomic backgrounds attending school in the same school district (Winter & Klein, 1970). Results of a recent meta-analysis indicate that early childhood preschool programs benefit children from all socioeconomic backgrounds but children from low socioeconomic backgrounds benefit differentially more from a small number of early childhood programs than peers from higher socioeconomic backgrounds (Burger, 2010). Differential gains from early childhood programs are typically due to risk factors

such as socioeconomic status, level of maternal education, English language proficiency, and the level of quality of the preschool program (Barnett, 2008).

Overall, preschool is associated with higher levels of cognitive and social development for all children (Sylva et al., 2004), but differences in effectiveness vary based on specific attributes of preschool programs. For example, children benefit the most from high-quality preschool programs that meet throughout the year (Sylva et al., 2004). The quality of preschool programs is often associated with geography. As a community's resources increase, so does the quality of early childhood education (Hatfield, Lower, Cassidy, & Faldowski, 2014). Children from high-income backgrounds typically attend pre-kindergarten programs that provide richer and more engaging experiences than pre-kindergarten programs serving children from low-income backgrounds (Early et al., 2010). Moreover, as a child's socioeconomic status increases, the probability that he will attend preschool increases (Tucker-Drob, 2012).

Although preschool has been associated with positive effects for all children into later adulthood (Goodman & Sianesi, 2005), several studies have shown direct links to differential benefits for children from disadvantaged backgrounds. In a study of 600 twin pairs in which one twin did not attend preschool and the other twin did attend preschool, researchers analyzed the effect of genes, the shared environment, and the non-shared environment on cognitive and achievement scores. For children who attended preschool, shared environmental influences accounted for 47% of the variance in math scores and 43% of the variance in reading scores at five years of age. For children who did not attend preschool, shared environmental influences accounted for 72% of the variance in math scores and 73% of the variance in reading scores at five years of age (Tucker-Drob, 2012). These results demonstrate the buffer effect that preschool

environments can have on environmental variables that may hinder children's early development.

Data from the state-wide North Carolina Pre-Kindergarten program (formerly known as North Carolina More at Four) evaluation indicated that the pre-kindergarten program had differential effects based on a child's level of risk. Risk was divided into four levels and based on eligibility for free or reduced price lunch, presence or absence of an identified special need, limited English proficiency, and presence of a chronic health condition. Results indicated that children in the highest risk group had lower baseline levels of language/literacy skills and general knowledge, but equivalent levels of prosocial behaviors. Results measuring students' growth in skills over the course of the school year indicated children in the highest risk group made statistically significant greater gains in receptive language, applied math skills, color knowledge, and social awareness over the course of the year whereas the lowest risk group made statistically significant greater gains in rhyming (Peisner-Feinberg & Schaaf, 2007).

Bumgarner & Lin (2014) used the ECLS-K dataset to determine whether socioeconomic status moderated the association between center-based early childhood education and English proficiency at the time of kindergarten entry for first and second-generation Hispanic immigrant children. Results indicated that Hispanic children in the lowest income group were twice as likely to be proficient in English if they received a center-based early childhood education. Center-based early childhood education was not a statistically significant predictor of English proficiency for children in the higher income group (Bumgarner & Lin, 2014).

Maximizing the potential of children from disadvantaged backgrounds through early childhood programs is complex, even though evidence indicates children from disadvantaged backgrounds typically differentially benefit from attending high quality preschool programs.

Research also indicates that children from disadvantaged backgrounds learn more while in preschool programs if they attend a preschool with children from diverse socioeconomic backgrounds. These results are not limited to American classrooms, as results of a longitudinal study in New Zealand indicated preschool quality and preschool socioeconomic mix moderated the influence of preschool on outcomes at age 16 over and above individual or family characteristics (Hogden, 2007).

Integration of students from a variety of economic backgrounds is seldom mentioned, but research indicates that the benefits of integration in preschool for children from disadvantaged backgrounds are substantial. Positive peer spillover effects in reading and mathematics are associated with preschool attendance (Neidell & Waldfogel, 2010). In a study by Schechter & Bye (2007) preschool children from low-income backgrounds were assigned to attend a preschool with peers from similar backgrounds or an integrated preschool with peers from higher income backgrounds. Baseline receptive language scores for both groups of low-income children were equivalent. At the end of the school year, the children from low-income backgrounds who attended the integrated preschool had statistically significant higher receptive language scores than their peers from low-income backgrounds and equivalent receptive language scores to their peers from higher-income backgrounds (Schechter & Bye, 2007).

Social-emotional Skills in Relation to Academic Skills

School readiness skills are comprised of both social-emotional and academic skills for valid reasons. Social-emotional skills are considered the most critical elements of academic learning (Wang, Haertel, & Walberg, 1997). According to the National Research Council and the Institute on Medicine, “The elements of early intervention programs that enhance social-emotional development are just as important as the components that enhance linguistic and

cognitive competence” (Shonkoff & Phillips, 2000, pp.398-399). Self-awareness, self-management, social awareness, and responsible decision-making are all components of social-emotional competence (Denham, 2010).

Social interactions are the building blocks of learning and engagement in infancy (Shonkoff & Phillips, 2000), and social-emotional skills continue to shape development throughout the lifespan. Children who lack appropriate social-emotional skills at the time of kindergarten entry exhibit more externalizing behaviors and struggle more academically than their peers who have acquired social-emotional skills (Raver, 2004). In adolescence, healthy social-emotional skills are associated with increased school attendance, greater engagement in schoolwork, increased grade point averages and standardized test scores, and decreases in substance abuse (Payton et al., 2008). The outcomes of social-emotional learning (SEL) interventions also lend evidence to the importance of social-emotional skills. A recent meta-analysis of SEL interventions indicated all SEL interventions are associated with improved social-emotional skills, improved attitudes about one’s self and others, positive social behavior, reductions in conduct problems and emotional distress, and increases in student achievement scores (Guerra, Graham, & Tolan, 2011).

In a longitudinal study of first born children in 118 American families, social competence and externalizing and internalizing behaviors were assessed when each child was four, ten, and 14 years old (Bornstein et al., 2010). Data were collected from children and their mothers at all three time points; classroom teachers provided data at the latter two time points. Results of the study indicated that children with lower social competence skills at 4 years of age were more likely to demonstrate externalizing behaviors at ten years of age and internalizing behaviors at 14 years of age. Social competence in early childhood was negatively correlated with overall

behavioral adjustment in adolescence (Bornstein et al., 2010). When the results of this study are coupled with the fact that behavioral adjustment problems in children are negatively associated with cognitive abilities, the reciprocal relationship between social and academic skills in young children is even more apparent (Bornstein et al., 1996).

Preschool Social-Emotional Learning. The Collaborative for Academic, Social, and Emotional Learning (CASEL) divides social-emotional learning into five competencies: self-management (manage emotions and behaviors to achieve goals), self-awareness (recognizing emotions), responsible decision-making (making safe, healthy behavioral choices), relationship skills (forming positive relationships and getting along with others), and social awareness (demonstrating sympathy and empathy for others) (www.casel.org, 2013). Although each of these competencies is important in the development of social-emotional skills, the development of self-regulation skills (self-management) and relationship skills are particularly relevant to preschool-age children.

Self-Management. Self-management requires a preschool child to regulate her behavior and emotions in order to accomplish a goal. Achieving goal-directed behavior requires self-regulation skills – including the ability to regulate one’s attention. Children who are able to regulate their own behavior and maintain focused attention are less likely to be excused from the classroom setting for behavioral issues and more likely to maximize learning outcomes through interactions with their peers.

“Self-regulation is widely recognized as a critical social emotional skill underpinning children’s abilities to act pro-socially with peers and adults, participate productively in learning activities, and adapt successfully to new or challenging situations” (Vallotton & Ayoub, 2011, p.169). Cumulative risk factors in childhood predict lower levels of self-regulation skills;

however, self-regulation skills are an important protective factor for at-risk children (Lengua, 2002).

Vallotton and Ayoub (2011) used a longitudinal data set from the Early Head Start program to better understand the relationship between children's language skills and self-regulation. Data were collected from mothers and children when the children were 14, 24, and 36 months old. Eighty-five percent (N=105) of mothers were Caucasian and the average income of each respondent was \$17,463. Children's talkativeness and vocabulary were used as predictors of self-regulation. Results indicated that vocabulary was the greatest predictor of self-regulation skills, even after controlling for cognitive ability; the effect of vocabulary on self-regulation was stronger for boys than girls (Vallotton & Ayoub, 2011).

The results of this study highlight the importance of vocabulary acquisition in young children and toddlers. Although vocabulary is usually associated with cognitive ability, it is noteworthy that in young children, vocabulary development is associated with the development of appropriate social-emotional skills. For toddlers and young children, vocabulary skills allow them to express their needs to adults and negotiate relationships with peers. Interestingly, Vallotton and Ayoub (2011) noted that scores on the Bayley Scales of Infant Development were usually very similar across sociodemographic groups in the first year of life. However, within a few short years, the vocabulary skills and standardized test scores of toddlers and young children varied greatly based on socioeconomic status. As children grow older, family income plays an increasingly important role in their development.

The findings in the Vallotton & Ayoub (2011) study are supported by the seminal work by Risley, Hart, & Bloom (1995) that revealed the vast differences in the volume of words young children were exposed to based on socioeconomic status. By the time the children of

professionals were three years old, the professionals' children's vocabulary surpassed the vocabulary of parents receiving welfare assistance (Risley et al., 1995). Expressive and receptive language skills are critical to the development of age-appropriate self-regulation skills and interactions with peers.

In another study designed to examine the influence of peer effects on children's self-regulation skills, researchers used the Head-Toes-Knees-Shoulders to measure the self-regulation skills two cohorts of ethnically diverse first graders (N=1,078) (Skibbe et al., 2012). Sociodemographic status was based on the percentage of students who received free and reduced lunch. Results of the study indicated sociodemographic status was correlated with self-regulation skills. Children in classrooms with lower means of self-regulation developed fewer self-regulation skills during the school year. As the overall affluence of a classroom decreased, the mean self-regulation skills of children decreased. In addition, children in classrooms with lower mean levels of self-regulation had poorer gains in passage comprehension and vocabulary acquisition across the school year than children in classrooms with higher levels of self-regulation. Overall, peer regulation was positively associated with literacy gains (Skibbe et al., 2012).

The Skibbe et al. (2012) study was unique because few studies have examined young children's self-regulation skills in relation to the overall level of children's self-regulation skills in their classroom. When these results are considered in the context of the results of the Vallatoun & Ayoub (2011) study, it seems apparent that young children's school readiness skills are the result of a "domino" effect. Young children who are born into poverty are less likely to develop the appropriate vocabulary skills to help them develop self-regulation skills, and they are

less likely to experience “spillover effects” from peers with strong self-regulation and vocabulary skills.

The ability to negotiate peer relationships and engage in the problem-solving process is associated with young children’s ability to self-regulate. Walker and Henderson (2012) examined whether preschool children’s social problem solving (SPS) skills mediated temperament and later academic achievement in kindergarten and first grade. Participants were 1,117 children enrolled in the National Institute of Child Health and Human Development Study of Early Child Care. Results of the study indicated that inhibitory control (a SPS) predicted better academic achievement in kindergarten and first grade than shyness (temperament). Promoting good SPS in early childhood may help alleviate future academic problems in children with extreme temperaments (Walker & Henderson, 2012). However, children must possess the appropriate vocabulary skills to be able to engage in the problem solving process.

Attention. Attention also affects young children’s ability to learn. In a study by Dice and Schwanenflugel (2012), researchers hypothesized that a child’s early reading skills mediated the relationship between attention and decoding abilities in late kindergarten. The diverse sample included 250 children attending kindergarten or Pre-K at a lottery-based public school program. Thirty-nine percent of the students in the sample received free or reduced lunch. Of the parents reporting ethnicity, 65% identified as African American, 32% identified as Caucasian, 3% reported as Hispanic, Asian, or Bi-racial, and 19% did not report ethnicity. Fifty-four percent of mothers completed high school, 12% attended some college, 12% had a bachelor’s degree, and 6% had advanced degree. Contrary to popular belief, results indicated that attention contributed more to the development of early reading skills than maternal education (Dice & Schwanenflugel, 2012).

In another study, researchers used a longitudinal design to explore the link between attentional regulation in preschool and academic outcomes at age nine. The study included 2,595 diverse preschool students from the Fragile Families and Child Wellbeing Study. Focused attention at age five was predictive of academic achievement outcomes at age nine, and impulsivity at age five was predictive of behavioral outcomes at age nine. Income status, maternal warmth, and infant temperament did not moderate the outcome (Razza, Martin, & Brooks-Gunn, 2012).

Brennan and colleagues (2012) examined the predictive validity of parent ratings of toddler aggression, oppositionality, inattention, and hyperactivity-impulsivity to predict academic achievement when the children were 7.5 years of age. Participants were recruited from Women, Infants, and Children Nutrition Programs in three metropolitan areas (N=566 children). All participants in the sample had two of the following three risk factors: child behavior problems (e.g., conduct problems, aggression), family problems (e.g., maternal depression, substance abuse), or low socio-economic status. Results of the study indicated that aggression at age two or three had the most association with academic achievement at age 7.5 (Brennan et al., 2012). Although this study found that toddler aggression was more related to later academic achievement than hyperactivity or impulsivity, it is difficult to ascertain how much toddler aggression in the home setting may be replaced with hyperactivity in the school setting. Furthermore, if aggressive toddlers are frequently removed from preschool or kindergarten classrooms, perhaps the absence of instruction causes their academic achievement to diminish over time.

Duncan et al. (2006) used six longitudinal data sets (ECLS-K, The Children of the National Longitudinal Study of Youth, The National Institute of Child Health and Human

Development Study of Early Childcare Youth Development, The Infant Health and Development Program, The Montreal Longitudinal-Experimental Preschool Study, and The 1970 British Birth Cohort) to estimate the effects of three components of school readiness (school-entry academic skills, attention, and socioemotional skills) and later school reading and math achievement. All children in the study were five or six years of age. Interestingly, the strongest predictors of later academic success were school-entry math skills, school-entry reading skills, and attention, respectively. The influence of each of these three variables did not differ based on gender or socioeconomic status. Contrary to the authors' original hypotheses, social-emotional behaviors were not associated with later academic outcomes. The authors completed many follow-up analyses to verify or refute their findings based on additional factors and variables, but all evidence supported the initial findings (Duncan et al., 2006).

In another study, Belsky, Fearon, & Bell (2007) tested the assumption that attentional control processes mediate the effect of parenting on later externalizing behaviors. Data for this study were collected as part of the NICHD Study of Early Childcare and Youth Development. Data were consistently collected from 1,364 mothers of children from the time of the child's birth, and researchers followed children from 54 months of age to fifth grade. Data were gathered through videotapes coded for maternal sensitivity, the Continuous Performance Test (CPT), and selected subscales of the Achenbach Teacher Report Form (TRF). Results of the study indicated that greater maternal sensitivity at 54 months and first grade predicted more attentional control over time, and more attentional control in first and third grade predicted less externalizing behaviors over time (first, third, and fifth grade) (Belsky et al., 2007).

In a study of 467 preschool children (average age 55.9 months) enrolled in a Head Start program or a daycare program with a similar demographic composition, researchers examined

the relationship between academic development and social-emotional functioning (Arnold et al., 2012). Standardized measures were used to assess preliteracy, language, and mathematics. Children reported their feelings about school using the *Feelings about School Measure* and the *IOWA Conners Teacher Rating Scale* was used to measure attention and aggression. Results of the study indicated attention difficulties were associated with poorer academic outcomes and social-emotional skills were associated with better academic outcomes (Arnold et al., 2012).

Results of these studies highlight that self-management skills are both directly and indirectly essential to preschool-age children's academic success. Children learn more when they are engaged in classroom activities with their teacher and peers, and have the ability to listen to and follow directions and participate in classroom activities. Expressive and receptive language skills enhance children's ability to regulate their behavior and interactions with others. When children are removed from the classroom for behavioral reasons or lack the ability to regulate their attention while in the classroom, their academic achievement suffers. Academic skills are cumulative, and children with appropriate self-management and attention skills are at a short-term and long-term advantage academically compared to their peers.

Relationship skills. Interactions with same-age peers are important predictors of later mental health and wellbeing (Denham, 2010). Peer relationships in the preschool years are dependent upon appropriate social-emotional skills and also influence academic outcomes. A child is able to maximize his or her classroom experience through positive interactions with teachers and peers (Vitiello et al., 2012). Preschool children who have warm, affectionate relationships with their mothers have higher levels of achievement in elementary school (Pianta & Harbors, 1996). Positive student-teacher relationships are associated with increased academic success, prosocial behavior, and increased social skills in all grades (O'Connor & McCartney,

2007; Palermo, Hanish, Martin, Fabes, & Resier, 2007; Pianta & Stuhlman, 2004). In contrast, students who consistently have negative interactions with teachers and peers during elementary and middle school score lower on academic measures than students who do not have consistently negative interactions with teachers and peers (Hamre & Pianta, 2001).

The ability to form friendships in preschool is a foundational skill in order for children to continue to develop and sustain friendships over time. In a study of 166 three to six year old preschool children, researchers interviewed children about their friendships (Lindsey, 2002). Results of the study indicated that children with at least one mutual friend were better liked by their peers, and teachers rated those children as more competent than the children who did not have one mutual friend. In addition, children with mutual friends in preschool were better liked by their peers the following year (Lindsey, 2002).

In the same manner that positive peer relationships are associated with increased academic performance, negative peer relationships are associated with decreased academic performance. In 2001, Buhs and Ladd completed a study to examine the peer relations processes that might mediate the relationship between peer rejection and children's emotional adjustment and academic outcomes. The sample included 399 mid-western kindergarteners from a variety of socioeconomic backgrounds. Results of the study indicated that children who were rejected by their peers were more likely to be treated negatively by their peers, were less engaged in classroom activities, more likely to want to avoid school, and demonstrated decreased achievement on academic measures (Buhs & Ladd, 2001). In a study of 380 children who were part of a large study on children's psychological and school adjustment, Buhs and colleagues (2006) followed the children from kindergarten to fifth grade to further examine the effects of

exclusion in later grades. Results of the study indicated that decreased classroom participation due to chronic peer exclusion was associated with the greatest decline in student achievement.

Classroom interactions with peers are an essential element of children's academic learning. Bierman and colleagues (2009) used a diverse sample of 356 four-year-old children who were attending Head Start to examine the degree to which classroom participation, prosocial behavior, and aggression control were related to children's academic knowledge and executive functioning. Classroom participation was assessed with a school readiness inventory developed specifically for the study, prosocial behavior was assessed with the *Social Competence Scale*, aggressive behavior was assessed with the *Teacher Observation of Child Adaptation-Revised*, cognitive ability was assessed with the block design subtest on the *Wechsler Preschool and Primary Scale of Intelligence – III*, academic knowledge was assessed with the *Test of Preschool Early Literacy*, and executive functioning was assessed with the *Peg Tapping Task*. Results of the study indicated prosocial and aggressive behaviors were negatively correlated ($r = -.69$), prosocial behavior and classroom participation were positively correlated ($r = .82$), and classroom participation and aggression were negatively correlated ($r = -.65$). The overall academic achievement composite and Block Design score were positively correlated with class participation and prosocial behavior and negatively correlated with aggressive behavior (Bierman et al., 2009).

Interestingly, in the study by Bierman and colleagues (2009), children with the most pronounced deficits in prosocial skills also had lower cognitive scores, lower levels of classroom participation, less academic knowledge, and lower executive functioning skills than children who did not have prosocial skills deficits. Prosocial behavior with peers was highly correlated with classroom participation and also correlated with academic knowledge and executive functioning

skills (Bierman et al., 2009). One unexpected finding of the study was that children with aggressive behavioral tendencies and low prosocial behaviors had more gains in academic achievement than children with low prosocial behaviors alone. This finding highlights the importance of classroom participation in academic achievement (Bierman et al., 2009).

Children who are able to form friendships and interact prosocially with their peers and adults in the classroom are more likely to enjoy school, spend more time engaged in academic activities, and maximize their learning potential. Moreover, social-emotional skills are also beneficial to preschool children – independent of academic outcomes (Arnold et al., 2012, CASEL, 2013). Providing young children with opportunities to develop appropriate social-emotional skills is an important part of early academic experiences; however, delaying children's entry into kindergarten may not be the most appropriate way to foster social-emotional development in young children.

Early Literacy Skills

In addition to social-emotional skills, early literacy skills are an important component of school readiness skills. Early literacy skills are foundational in the attainment of later literacy skills (West, Denton, & Reaney, 2000) and instrumental in shaping a child's quality of life as an adult. For example, low literacy skills are associated with poor school attendance, grade retention, teen pregnancy, and poor management of health issues (Kutner, Greenberg, Jin, & Paulsen, 2006; Matson & Haglund, 2000). In 2011, only 42% of 4th graders scored at the "at or above Proficient" or "at Advanced" level of reading proficiency and only 37% of 8th graders scored at the "at or above Proficient" or "at Advanced" level of reading proficiency (Kutner et al., 2006).

The importance of literacy in overall wellbeing has placed literacy attainment at the forefront of American education. In 2000, the National Reading Panel reviewed over 100,000 studies to identify the most important components of reading. The five most important skills were phonemic awareness, phonics, fluency, vocabulary, and text comprehension. Although the *Report of the National Reading Panel: Teaching Children to Read* is a seminal work in literacy research, the findings do not apply to children from birth to five years of age. In order to address this gap in research, the National Early Literacy Panel (NELP) was formed to review the literature pertaining to literacy skills in early childhood (NELP, 2009). Five hundred research articles that met strict search criteria were used in the meta-analyses. Results of the study indicated that after controlling for cognitive ability and socioeconomic status, six skills were strongly correlated with later literacy skills. These six skills included: alphabet knowledge, phonological awareness, rapid automatic naming (RAN) of letters or digits, RAN of objects or colors, writing letters or writing one's name, and phonological memory. Five additional variables were moderately correlated with later reading ability: concepts of print, print knowledge, reading readiness, oral language, and visual processing (NELP, 2009). Each of these 11 variables are intertwined and often correlated with one another.

Children's abilities in each of these areas prior to entering kindergarten vary greatly (West et al., 2000). Environmental factors, such as having books available to read, parenting style, socioeconomic status, and parental proficiency in English are all key factors in children's early literacy development and explain many of the later literacy gaps among groups of older children (Waldfoegel, 2012). An overview of each of these variables follows. The areas of print knowledge and reading readiness are not outlined since print knowledge includes the constructs of decoding, alphabet knowledge, and concepts of print and reading readiness includes the constructs of

alphabet knowledge, concepts of print, vocabulary, and phonological awareness (NELP, 2009). The explanation of each of these variables is followed by models associated with early literacy skill development and an overview of parental contributions to early literacy learning.

Early Literacy Skills Associated with Later Academic Achievement

Alphabet Knowledge. Alphabet knowledge is defined as “Knowledge of the names and sounds associated with printed letters” (NELP, 2008, p.3). Letter knowledge is one of the oldest and long-standing positive predictors of later reading ability with research dating back to the 1960’s (NELP, 2008). In 1961, Jeanne Chall, a well-respected reading researcher, spent three years visiting classrooms, completing meta-analyses, scouring textbooks, and interviewing educators to enhance the reading literature base. Chall concluded that for beginning readers, alphabet knowledge was more important to reading achievement than a child’s cognitive ability (Chall, 1967). Although more recent research continues to confirm alphabet knowledge as the most powerful predictor of reading ability (Catts, Fey, Tomblin, & Zhang, 2002; Lonigan, Burgess, & Anthony, 2000; Muter, Hulme, Snowling, & Stevenson, 2004), alphabet knowledge at kindergarten entry may be more predictive of parental investment and guidance prior to kindergarten entry (Hecht, Burgess, Torgeson, Wagner & Raschotte, 2000).

Drouin, Horner, & Sondergeld (2012) used Rasch model analyses to examine multiple elements of the construct of alphabet knowledge including letter recognition (lower case and upper case), letter naming (lower case and upper case), and letter sounds. Participants (N=378) were preschoolers enrolled in 15 different childcare facilities. Results of the study indicated that the three alphabet tasks were measures of a single ability and supported the notion of a unitary alphabetic construct. However, letter recognition was easier than letter naming and letter naming

was easier than letter sounds. Children identified uppercase letter names easier than lowercase letter names (Drouin et al., 2012).

A study by Justice, Pence, Bowles, & Wiggins (2006) lent further evidence to the notion that letter learning is not random. Participants in the study included 339 four year-year-old low-income children attending public preschool. Children were more likely to recognize letters that were in their own name, were in the beginning of the alphabet, corresponded to the sound of the letter, or corresponded to the earliest acquired sounds during infancy (Justice et. al, 2006). In another study composed of an urban and suburban sample, researchers concluded that lowercase letters are more difficult for preschoolers to identify than uppercase letters and lower case letters improve the validity of studies of alphabet knowledge (Bowles, Pentimonti, Gerde, & Montroy, 2014).

Phonological Processing. Phonological processing refers to the ability to process sounds in one's native language. There are three distinct, yet interrelated phonological processing abilities including phonological awareness, phonological memory, and phonological access to lexical storage (Anthony & Francis, 2005).

Phonological Awareness. Phonological awareness is defined as “The ability to detect, manipulate, or analyze the auditory aspects of spoken language (including the ability to distinguish or segment words, syllables, or phonemes) independent of meaning” (NELP, 2002, p.3). Decades of literacy research and statistical and technological advances support phonological awareness as a unitary construct that evolves over time. “Phonological awareness is a single cognitive ability that manifests behaviorally in a variety of skills” (Anthony & Francis, 2005, p.256). Four longitudinal studies of preschoolers provide further support for phonological awareness as a unitary ability (Anthony & Lonigan, 2004). The direct link between literacy skills

and phonological awareness has been firmly established in research. In a meta-analysis preceding the *National Reading Panel: Teaching Children to Read*, phonemic awareness and letter-sound knowledge were considered the most powerful predictors of word reading skills (Adams, 1990). Results of the *Report of the National Reading Panel (2000)* indicated phonological awareness skills had an effect size of 0.86 (National Reading Panel, 2000). Direct instruction in phoneme segmentation and manipulation is a critical component of reading instruction, especially for children at-risk of reading difficulties (Vaughn, Wanzek, Woodruff, & Linan-Thompson, 2008).

Phonological Memory. Phonological memory is defined as “The ability to remember spoken information for a short period of time” (NELP, 2002, p.3). Although phonological memory has not been studied as much as phonological awareness, the two concepts are intertwined with one another (Anthony & Lonigan, 2004). Phonological memory increases between four and twelve years of age and corresponds to increases in verbal skills (Alloway, Gathercole, & Pickering, 2006). Nithart and colleagues (2011) studied the development of phonological abilities and the influence of phonological development on reading acquisition. Forty-four preschool children (mean age = 5 years) were tested at the end of kindergarten before they received any formal reading instruction and again at the end of first grade. Results of the study indicated that phonological awareness skills were more highly correlated with reading skills at the end of kindergarten. However, at the end of first grade, phonological memory skills were more highly correlated with reading skills. Phonological discrimination, awareness, and memory were all correlated with one another, but phonological memory developed with children’s short-term memory capacity (Nithart et al., 2011).

Development of Phonological Processing Skills. The development of phonological awareness skills follows a typical pattern, and children are continuously refining previous knowledge while acquiring new knowledge (Anthony & Francis, 2005). Children usually begin to develop phonological processing skills around two to three years of age when they begin to play with sounds and monitor their own speech during unstructured play times (Snow, Burns, & Griffin, 1998). As children grow older, their ability to detect smaller and smaller parts of words increases. Children are able to detect similar and dissimilar words (e.g. map, book) before they are able to detect sounds within individual words. Children develop the ability to detect onsets and rimes (e.g. m/ap, l/ap) prior to being able to detect the individual sounds in words (e.g. m/a/p/). The ability to blend phonological information typically precedes the ability to segment phonological information. It is important to note that the attainment of phonological skills is influenced by both biological and environmental factors (Anthony & Francis, 2005).

Rapid Automatic Naming. Rapid automatic naming refers to “The ability to rapidly name a sequence of random letters, numbers, or repeating sets of pictures of objects or colors” (NELP, 2002, p.3). Rapid automatic naming fluency predicts word identification skills (Bowey, Storey, & Ferguson, 2004; Miller et al., 2006), reading fluency skills (Georgiou, Parrila, & Kirby, 2006), and reading comprehension skills (Katzir et al., 2006). Tasks that require rapid naming of numbers or letters are called graphological tasks, whereas tasks that require rapid naming of colors or objects are non-graphological tasks (Wolf, Bally, & Morris, 1986). The predictive validity of graphological and non-graphological tasks changes over time and is debated in the literature (Hammill, Mather, Allen, & Roberts, 2002). For example, graphological and non-graphological rapid naming tests used at the beginning of kindergarten predicted of

reading abilities at second grade, but the same tasks were not predictive of when they are used just prior to first grade (Smith, Scott, Roberts, & Locke, 2008). Kirby and colleagues (2003) assessed the rapid naming skills (color naming and picture naming) of 115 kindergarten children. Five years later, researchers assessed the overall reading ability of the same children when they were in fifth grade. Results of regression analyses indicated that rapid naming skills had little effect in the early elementary years on overall reading ability, but the effect of rapid naming skills on predicting overall reading ability increased in the later elementary years (Kirby, Parilla, & Pfeiffer, 2003).

Writing Letters and Writing Name. This skill refers to writing letters in isolation upon request and possessing the ability to write one's name (NELP, 2009). One of young children's first writing activities is writing their name, a behavior that extends across boundaries of culture and socioeconomic status (Levin, Both-DeVries, Aram, & Bus, 2006). Vygotsky (1978) considered a child's ability to write his or her name a developmental milestone, since it required a child to connect oral and written language. Name writing and letter knowledge usually develop at similar times and the two skills are related to one another (Blair & Savage, 2006). Puranik & Lonigan (2012) studied the effect of name-writing ability on preschool children's other early literacy abilities. In the study of 296 preschoolers age four to five, name writing proficiency was a statistically significant predictor of alphabet knowledge and spelling ability. Results of the study indicated that the length of the child's name did not matter in predicting alphabet knowledge or spelling ability; however, proficiency in name writing did matter (Puranik & Lonigan, 2012).

Other studies have downplayed the importance of name writing ability in preschool children's literacy abilities. In a study of 114 typically developing preschool children, name

writing skills were related to letter knowledge (Drouin & Harmon, 2009). However, children often were able to write letters as part of their name but unable to identify those same letters out of context. In contrast, some children were able to recognize the letters in their name, but they were not able to write them. The children with excellent letter recognition (but unable to write their name) had greater letter recognition scores than children who had excellent name writing skills (but unable to identify as many letters). Results of the study indicated that children's name writing skills may be a better proxy of mechanical skills than conceptual literacy knowledge (Drouin & Harmon, 2009).

In a study examining which emergent literacy skills contribute to preschool children's writing abilities, Puranik, Lonigan, & Kim (2011) found that print knowledge and letter-writing skills were related to name writing, whereas a different set of skills including alphabet knowledge, print knowledge, and name writing were related to letter writing. Interestingly, only letter writing ability was associated with spelling ability. Results of the study indicated that children's overall letter writing skills, as opposed to the ability to write their name, is more predictive of preschool literacy skills (Puranik et al., 2011).

Diamond, Gerde, & Powell (2008) designed a study to examine the relationship among preschool children's early writing skills, knowledge of letter names, sensitivity to initial sounds in words, and understanding of concepts of print. Participants in the study were preschool children enrolled in 35 Head Start classrooms. Results of the study indicated that the preschool children who could write letters in the fall were on a different growth trajectory for recognizing letter names than the children who could not any letters in the fall. For children who could write one or more letters in their name at the beginning of the school year, growth in writing skills was directly related to growth in letter knowledge. However this bidirectional relationship between

letter knowledge and writing skills did not exist for children who were not able to write one or more letters in their name at the beginning of the school year (Diamond et al., 2008).

In another study of 103 children ages three to five years old, researchers analyzed the effect of letter knowledge, decoding, motor skills, problem behaviors, and the home literacy environment on children's ability to write their name. Researchers found that children's knowledge of capital letters and their gross motor skills accounted for the greatest variance (almost one-fourth of the total variance) in children's ability to write their name (Gerde, Skibbe, Bowles, & Martoccio, 2012).

Concepts of Print. Concepts of print refer to knowledge of text conventions of print, such as the way text is written in a book as well as concepts of text such as where to locate the author's name (NELP, 2002). Concepts of print knowledge is considered a constrained skill (Paris, 2005), but young children's acquisition of print knowledge is important and is related to later reading success (Levy, Gong, Hessles, Evans, & Jared, 2006; NELP, 2002). The development of concepts of print at an early age is particularly important because it indicates children have begun to control and direct their attention and attend to print in a specific way (Clay, 2000). Children's concept of print is developed gradually through multiple warm interactions and experiences with caregivers and books (Clay, 2000). Although it is important not to rush the process, a child's knowledge of concepts of print knowledge is heavily dependent upon adult interaction (Lovelace & Stewart, 2007).

In a study of 474 children ages 48 to 83 months, researchers examined the developmental trajectory of print knowledge, and analyzed the relationship between concepts of print and early reading skills (Levy et al., 2006). Parents of the children were also given a questionnaire about home literacy activities. Results of the study indicated children begin recognizing word shapes,

followed by recognizing correct letter orientations, and then common spelling patterns. Researchers found that the development of print knowledge is not a passive process. Rather, children must be actively engaged letter printing, letter naming, and developing language skills. Understanding correct word and letter orientation was related to reading achievement on a standardized measure, after accounting for age variation and phonological abilities (Levy et al., 2006).

In another study of print awareness, 128 children (ages 3 – 5) were given the Preschool Word and Print Awareness Measure (PWP). Children were from urban, suburban, and rural regions of southeast Ohio and 34% were from low SES backgrounds. All participants in the study were native English speakers, passed a hearing test, and did not have a history of any type of impairment. During the testing process, 34 children were identified and tested for a potential language impairment. Results of the study indicated that children from low SES backgrounds performed similarly on the PWP to students with a language impairment (Effect Size -1.5 for SES and -1.2 for language impairment). The environmental and developmental risk factor each exerted nearly the same effect on concepts of print knowledge. Researchers also discovered that there was a lack of a cumulative effect when both the developmental and environmental risk factors were present (Justice, Bowles, & Skibbe, 2006).

Oral Language. Young children's oral language skills are also important to the development of literacy skills. Oral language skills involve producing language (expressive language skills) and comprehending language (receptive language skills) (NELP, 2009). Measures of long-term outcomes attest to the importance of children's oral language skills. For example, children with an expressive or receptive language impairment in kindergarten are much

more likely to be diagnosed as a student with a learning disability by second grade (Catts et al., 2002).

Children's oral language skills provide insight into their overall literacy development. In a study of the relationship between oral language, print knowledge, and phonological sensitivity skills at during the preschool years and later elementary school, researchers followed 96 children (mean age 41 months) during the preschool year, and 97 children (mean age 60 months) from preschool to kindergarten or first grade. Results of the study indicated letter knowledge and phonological sensitivity were predictors of later decoding skills, and children's phonological skills were relatively stable across time (Lonigan et al., 2000).

There is a substantial body of literature documenting the differences in the oral language skills of preschoolers. On average, children living in poverty have fewer enriched language opportunities than their more affluent peers (Risley et al., 1995). Although the language development of children living in poverty is usually described in general terms, Cabell and colleagues (2011) studied the oral language development of 492 preschoolers enrolled in a Head Start program. Researchers administered eight measures of emergent literacy, including four measures of oral language. Five profiles of emergent literacy skills emerged, indicating great variability among at-risk children (Cabell et al., 2011).

Visual Processing. The orthographic nature of print requires the ability to visually process information in order to read text (NELP, 2009). Although there is less research investigating visual processing ability than other skills related to early reading, visual processing skills are a predictor of later reading success. As children grow older and the volume of text increases, visual processing skills become increasingly important to read text fluently and accurately (Badian, 2001). In a longitudinal study of 96 kindergartens, children's pre-reading

skills were assessed using a variety of measures, including the *Orthographic Processing* measure, six months prior to kindergarten entry. Results of the study indicated visual processing skills accounted for an increasing proportion of the variance in reading ability as the children grew older (Badian, 2001).

Models of Emergent Literacy Development. There are several frameworks for understanding the development of early literacy skills and are beyond the scope of this paper. The following are selected developmental, component, interactional, and more general frameworks of emergent literacy development.

The development of emergent literacy skills begins when children begin to observe the environment around them. Linnea Ehri's (1995) phases of word recognition development model outlines the phases children progress through as they acquire increasingly sophisticated literacy skills. Children begin in the pre-alphabetic stage and "read" or recognize common logos or signs. Children begin to realize that print serves a purpose and then begin to interact with print. Next, children transition to the pre-alphabetic stage and recognize some sounds and letters in words, and often guess a word based on the first and last letters of the word. Then, children progress to the full alphabetic stage, which requires letter and sound recognition. During this phase, children decode words slowly, but accurately. The next phase is the consolidated alphabetic phase, a phase in which children are able to retain multisyllabic words in their memory and process words quickly. The final phase is the automatic phase. During this phase, children are proficient, fluent readers and implement multiple strategies to figure out unfamiliar words. Children are able to focus on comprehending text instead of decoding text (Ehri, 1995).

Developmental frameworks of emergent literacy emphasize the notion that the relationship between print and meaning occurs prior to understanding forms of print. The

Goodman (1986) framework posits that children first learn to recognize print in their own environment and then they translate that to other forms of discourse such as magazines or newspaper. Finally, children develop metacognition related to reading and they are able to articulate that they are reading a page of a book or point to a specific word in the text (Goodman, 1986). The McCormick & Mason (1986) framework acknowledges children's emergent literacy skills as a hierarchy and children first learn to recognize the function of print and then learn to recognize forms of print. Last, children integrate the function and form of print (McCormick & Mason, 1986).

The Strommen & Mates (2000) framework emphasizes the social aspect of reading. Children first look at the illustrations in a book and then begin to tell a sequenced story through the pictures in the book, then progress to retelling the story while retaining the original meaning, and then children attempt to refer to the print to retell the story. Finally, children use multiple strategies to attempt to decode the print and read the story (Strommen & Mates, 2000).

Component frameworks of early literacy skills focus on the particular components of early literacy. The Storch & Whitehurst (2002) framework divides children's early literacy skills into code-related skills (e.g. concepts of print and writing one's name) and oral language skills (e.g. expressive and receptive vocabulary). Another component literacy framework, the van Kleeck framework (1998), is centered on four major components: (1) the context processor (e.g., word knowledge, book conventions), (2) the meaning processor (e.g., word awareness, vocabulary development), (3) the orthographic processor (e.g. letter knowledge), and (4) the phonological processor (e.g., onsets and rhymes). Each of these "processors" helps young children to acquire emergent literacy skills.

Contemporary Models of Emergent Literacy Development. The most contemporary frameworks for emergent literacy development, the child and environmental influences perspective, acknowledge the interaction between the child's biology and environment in the development of emergent literacy skills. These frameworks are closely aligned with Bronfenbrenner's bioecological theory of child development and recognize the multiple influences that lead to outcomes in a child's development. The McNaughton (1995) socialization model emphasizes the role of the family in literacy acquisition and includes four family literacy components: (1) family practices, (2) child and family activities, (3) systems for learning and development, and (4) relationships between settings in the child's environment. Family practices include cultural expectations the family holds pertaining to reading, such as expecting that children will learn to read. Child and family literacy activities include such things as writing thank-you notes to friends and relatives or taking trips to the public library. The systems that reinforce literacy development include continuous book sharing with a sibling or consistently engaging in literacy tasks of increasing difficulty with a parent. Children maximize their acquisition of literacy skills when family practices are reinforced in multiple environments such as the homes of extended family members, daycare centers, and preschools (McNaughton, 1995).

The Wasik & Hendrickson (2004) framework also emphasizes the role of the family. The authors identified four family variables in the research that have the most support children's literacy development. The four key variables in the model are (1) parental characteristics (e.g., culture, ethnicity, parental beliefs, SES), (2) child characteristics (e.g., cognitive ability, motivation), (3) home literacy environment (e.g., parents' attitude toward literacy activities), and (4) parent-child relationships (e.g., warm supportive relationships lead to better literacy outcomes). Results of the National Institute of Child Health and Human Development Study

(NICHD) (2000) revealed that family and parent features were more strongly associated with early cognitive and language development than the features of early childhood care centers. The literacy activities, literacy tools, and developmentally appropriate parental scaffolding related to literacy tasks are directly correlated with young children's literacy abilities (Aram & Levin, 2001). Moreover, research indicates parenting practices are the strongest predictor of young children's literacy skills (NICHD ECCRN, 2003). Warm, positive, and caring relationships between caregivers and children (Clay, 2000) and marital couples (Froyen, Skibbe, Bowles, Blow, & Gerde, 2013) increase children's early literacy acquisition. A child's home environment provides his or her first experiences with language development, a print-rich environment, and continuous interactions with text (Neuman & Dickinson, 2011).

Development of Early Literacy Skills. The development of early literacy skills is a complex, dynamic process that research continues to unravel (Figure 2). Early literacy skills refer to the behaviors young children exhibit that demonstrate they have an understanding of reading and writing before they have the ability to read or write (Schickedanz & Collins, 2013). The development of early literacy skills begins as soon as an infant hears sounds prenatally, as early literacy development occurs in tandem with language development. For young children, the functions of early literacy (e.g. inviting a friend over or ordering a meal) are just as important as traditional forms of literacy (e.g. recognizing letters or words or looking through books) (Teal & Sulzby, 1986).

Although research is still unraveling the mechanisms young children use to develop emergent literacy skills, certain over-arching principles have been uncovered. For example, children who are surrounded by books and are read to develop print awareness quicker than children who do not have these experiences (Honig, Diamond, & Gurlohn, 2008). The

development of phonological processing skills are critical to children's later reading success, as it is estimated that 90% of children with reading difficulties have a core deficit in processing phonological information (Honig et al., 2008).

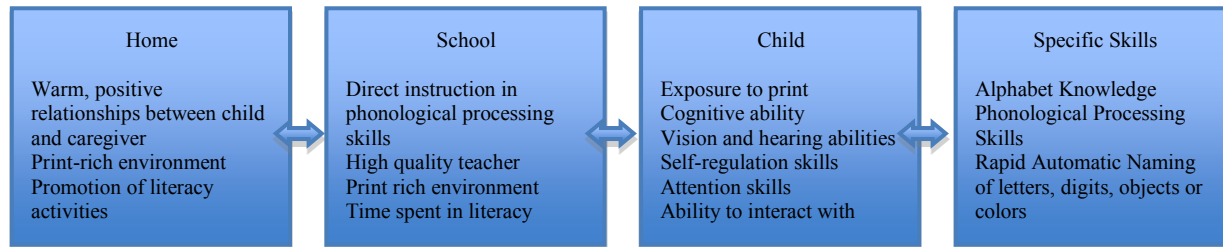


Figure 2

Summary of Factors Associated with Early Literacy Development

Curriculum-Based Measurements

The use of curriculum-based measurements (CBMs) has increased as a result of legislative efforts (e.g. *No Child Left Behind, 2001*) to increase accountability in American public schools and comply with the new special education guidelines and requirements outlined in the *Individuals with Disabilities Education Improvement Act (IDEIA)* of 2004. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) are a commonly used curriculum-based measure to assess student growth in reading in the early grades. The DIBELS measures are designed to measure the over-arching ideas that are key to early literacy success (Phonological Awareness, Alphabetic Principle, Fluency, Vocabulary, and Comprehension) in a cost-effective and efficient manner (University of Oregon, 2013). The DIBELS measures are frequently used to assess the literacy progress and general outcomes of children in kindergarten through sixth grade. Due to the overlapping nature of the DIBELS measures and the over-arching ideas that are key to early literacy success, DIBELS measures are frequently used to assess kindergarten

children. Kindergarten children are assessed in initial sound fluency, letter naming fluency, phoneme segmentation fluency, and nonsense word fluency (University of Oregon, 2013).

The DIBELS measures are frequently used in schools for several reasons. The DIBELS measures are flexible and appropriate for individual and group use and can be administered in a matter of minutes. In addition, the DIBELS measures are designed to help teachers tailor instruction to best meet the needs of their students and monitor student growth across time. It is important to note that the DIBELS were designed to be *indicators* of a student's literacy skills and overall reading competence as opposed to a finite measure of literacy skills or reading competence. On a group level, DIBELS measures can be used to allocate intervention resources and refine and reform curriculum based on students' needs (Kaminski et al., 2008).

Recently, the validity of CBMs has been called into question since CBMs are often used to make high-stakes decisions in Response to Intervention Models (Catts, Petscher, Schatschneider, Bridges, & Mendoza, 2009; Schatschneider, Wagner, & Crawford, 2008). However, CBMs were not originally designed to be used to make high-stakes decisions. The DIBELS oral reading fluency (ORF) measures have a strong validity base when the ORF measures are used for their original intention – to *indicate* a child's overall reading competence.

Despite the recent emergence of DIBELS in schools across the country, the oldest ORF validity study was published over 30 years ago by Deno, Mirkin, & Chiang (1982). Researchers examined the relationship between several curriculum-based measures of reading. Data from 88 typical students and 56 students with a learning disability in first through sixth grade indicated that the ORF CBM was most strongly correlated with standardized tests of reading ($r=.71$ to $.91$). Fuchs, Fuchs, & Maxwell (1988) also published a historical validity study of CBMs using a sample of middle school students receiving special education services. Oral reading fluency

CBMs were more highly correlated with selected Stanford Achievement Subtests than other CBMs (Fuchs et al., 1988).

More recent studies have also supported the validity of CBMs in reading. Ninety-seven students in third grade general education classrooms were given the Iowa Test of Basic Skills (ITBS), reading subtests of the Woodcock-Johnson III (WJ-III BR), and four R-CBM probes to determine the predictive validity of CBM versus a standardized achievement test in predicting reading achievement (Ardoin et al., 2004). Results of the study indicated that scores on the WJ-III BR were strongly correlated with student performance on the R-CBM ($r=.70$). The R-CBM predicted WJ-III BR scores equally as well as the total reading score on the ITBS. However, regression analyses indicated that R-CBM explained more of the variance in a student's total reading achievement on the WJ-III, but the ITBS comprehension task explained more of the variance in comprehension skills measured by the WJ-III. These results suggest that although R-CBM and the ITBS predicted students' basic reading skills equally well, educators need to carefully consider what type of information they are seeking during universal screenings (Ardoin et al., 2004).

In another study, oral reading fluency data from approximately 9,600 students enrolled in 34 Oregon Reading First schools was used to predict student performance on the Stanford Achievement Test – Fourth Edition (SAT-10) and the Oregon State Reading Assessment (OSRA) (Baker et al., 2008). Grade 1 winter ORF probes correlated .72 in the winter and .82 in the spring with the Grade 1 SAT-10. Grade 2 spring ORF probes correlated .80 with the Grade 2 SAT-10. The ORF level and ORF slope explained 70% of the variance on the SAT-10 reading test administered at the end of second grade. Overall, ORF rates from first to third grade were

associated with performance on the SAT-10 reading test in grade two and the OSRA test in grade three, with most correlations ranging from .60 to .80 (Baker et al., 2008).

Recently, researchers completed a comprehensive review of Curriculum-Based Measurement in Reading (CBM-R) (Ardoyn, Christ, Morena, Cormier, & Klingbeil, 2013). The review included 171 journal articles and other written sources. Overall results of the review indicated that there is limited psychometric or empirical support for using CBM-R probes to make high-stakes decisions about individual children. Research is inconsistent in the number of data points that should be collected and whether growth outcomes should be measured using data points or the trend line. However, curriculum-based measurements in reading are considered appropriate for measuring relative rates of student growth, identifying whether students are meeting benchmark reading objectives, and assessing the effect of reading instruction on large groups of students (Ardoyn et al., 2013).

In another recent article, researchers used a new methodology to answer questions related to CBMs in arguably the most efficient and effective way possible (Christ, Zopluoglo, Monaghan, & Pike-Balow, & Van Norman, 2013). Researchers completed five studies using simulation methods to better understand the reliability and validity of CBM in oral reading. Simulations involved several different progress monitoring durations, schedules, and data set quality types. Overall results of the study indicated that validity was greater than .70 after eight to sixteen weeks of progress monitoring, depending on the quality of the dataset. Reliability was greater than .70 and sufficient for low-stakes decisions after ten to eighteen weeks of progress monitoring, depending on the quality of the dataset. High stakes decisions (reliability greater than .90) required 14 weeks of progress monitoring with a very high quality data set. Very poor data sets were not reliable enough for any type of decision-making. One of the most important –

and unexpected- findings of the study was that student growth is best demonstrated with progress monitoring tools over a long period of time with a small number of data points rather than a short period of time with several data points. In addition, the quality of the passage is extremely important (Christ et al., 2013). Although the use of CBMs has evolved over time for purposes not originally intended by the creators, it is important to remember that policy is often ahead of research.

“When something has a low level of evidence, it does not mean that it is bad or poor practice. What is suggested is that there is a need for increased research about the practice and the use of the practice needs to be done with appropriate cautions”
(Christ, 2013, p.62).

In this study, the DIBELS measures are used provide a gauge of a student’s general reading competence and reading skill set – consistent with the original purpose of CBMs and the original validity studies supporting the use of ORF CBMs to gauge reading progress.

Current Study Research Questions and Hypotheses

Making the transition from early childhood care to the more formal, structured, and demanding kindergarten classroom is an important milestone for young children and their families. Research clearly indicates that overall, early childhood education provides positive outcomes for all children although children from disadvantaged backgrounds stand to benefit more from high quality early childhood programs (Burger, 2010). Ensuring that children are equipped with appropriate school readiness skills prior to transitioning to kindergarten helps promote their wellbeing. Children’s early literacy skills include foundational elements such as alphabet knowledge, phonological awareness, rapid automatic naming (RAN) of letters or digits, RAN of objects or colors, writing letters or writing one’s name, and phonological memory

(NELP, 2009). Early social-emotional skills, particularly self-management and relational skills, are clearly linked to academic success and mental health and wellbeing in elementary school and beyond. The acquisition of school readiness skills is influenced by a children's environment and several demographic variables have been linked to the acquisition of school readiness skills including socioeconomic status, level of maternal education, and English language proficiency (Barnett, 2008). Many types of kindergarten transitional programs exist to foster school readiness skills and promote children's short and long-term success in school, and determining which types of transitional kindergarten programs are the most effective for specific early childhood populations is an ongoing endeavor.

The majority of the literature pertains to early childhood programs designed for children who are not yet age-eligible for kindergarten entry. There is a lack of research pertaining to DK, a specific type of early childhood intervention designed for children who are age-eligible for kindergarten. Moreover, there is even less evidence documenting the effects of DK on children from advantaged backgrounds. This study addressed a gap in the literature by examining the long-term literacy and social-emotional growth of typically developing children who attended DK compared to children from the same population who did not attend DK.

Research Questions and Hypotheses

1. *What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills (i.e., ability to follow structured daily routines, ability to work independently with supervision, ability to listen and pay attention to what someone else is saying, ability to get along with and cooperate with other children, ability to play with other children, ability to follow simple rules, ability to work with puzzles, scissors,*

coloring, paints, etc., ability to write their own name, ability to count, ability to recite the alphabet, ability to identify both shapes and colors) on children's literacy growth trajectories (i.e., MEAP scores, DIBELS scores)?

Hypothesis: The influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education status, and school readiness skills on literacy growth will fade across second, third, fourth, and fifth grade.

Rationale: The academic advantages associated with delayed entry into kindergarten are typically salient during the first two years after the intervention but fade over time.

Domaleski and Oshima (2006) found that the academic advantage older kindergarten students had over younger kindergarten students rapidly decreased during first, second, and third grade and by middle school, the differences between the old and young group were negligible. Stipek & Byler (2001) found that initially, older kindergarten students had an academic advantage over younger students, but the advantage disappeared by the time children were in third grade. In another study of old-for-grade kindergarten students and young-for-grade kindergarten students, Lincove and Painter (2006) did not find any differences in the long-term academic outcomes of the two groups.

2. *What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills (i.e., ability to follow structured daily routines, ability to work independently with supervision, ability to listen and pay attention to what someone else is saying, ability to get along with and cooperate with other children, ability to play with other children, ability to follow simple rules, ability to work with puzzles, scissors, coloring, paints, etc., ability to write their own name, ability to count, ability to recite the*

alphabet, ability to identify both shapes and colors) on children's social-emotional growth trajectories (i.e., social-emotional report card measures)?

Hypothesis: The influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills on social and emotional measures will remain constant across time.

Rationale: Data from the ECLS suggested that attendance in a Pre-K program was associated with reduced aggression and increased self-control in later years (Magnuson et al., 2007). Children with developmentally appropriate social and emotional skills at the time of kindergarten entry demonstrate fewer externalizing behaviors in later years (Raver, 2004). Children's social competence at kindergarten entry is correlated with social competence in later years (Bornstein et al., 2010). Developmental kindergarten is designed to foster children's school readiness skills and enhance children's social and emotional competence. If this aim is achieved, children who attend developmental kindergarten will have stronger social and emotional skills than their peers who did not attend developmental kindergarten but shared other demographic characteristics.

3. Do school readiness skills at the time of kindergarten screening predict later literacy (*i.e. DIBELS scores and MEAP scores*) and/or social-emotional growth (*i.e. social-emotional report card measures*)?

Hypothesis: School readiness skills at the time of kindergarten screening will predict later literacy and social-emotional growth due to the stability of demographic factors associated with the development of school readiness skills. The kindergarten screening measure will have higher predictive validity for literacy outcomes than social -

emotional outcomes.

Rationale: Kindergarten screeners designed to measure school readiness skills have little predictive validity, lack empirical support, and vary based on context (Graue, 2010).

Children's school readiness skills tend to vary more with group demographic characteristics than individual characteristics prior to kindergarten entry (Hernandez et al., 2007). Children from less affluent and minority backgrounds are more likely to have lower school readiness skills and experience difficulty transitioning to kindergarten than their more affluent and privileged peers (Rimm-Kaufman et al., 2000). Risk factors related to school readiness are usually related to economic disadvantage (Hair et al., 2006) and gaps in school readiness tend to increase over time (Klein & Knitzer, 2006). As a result of the stability of the risk factors associated with school readiness skills measured by kindergarten screeners, school readiness scores at the time of kindergarten screening will predict academic and social-emotional outcomes; based on the results of the study by La Paro & Pianta (2000) it is expected that the predictive validity of the kindergarten screener will be higher for academic outcomes than social- emotional outcomes. In a meta-analytic review of 70 longitudinal studies consisting of predominantly homogenous Caucasian populations, social and emotional competencies measured on kindergarten screeners accounted for less than 10% of the variance in later elementary outcomes and academic competencies accounted for approximately 25% of variance in early school/academic cognitive performance (La Paro & Pianta, 2000).

Chapter 3

METHOD

Participants

The data for this study were collected from student CA-60 files housed at eight elementary schools in one suburban school district in Michigan. The school district is located in a community of approximately 6,000 residents and has received national academic distinctions. According to the 2008-2012 American Community Survey, median household income in the community is \$55,000, median home value is approximately \$150,000, and 44% of citizens between 25 and 64 years of age have at least a bachelor's degree (United States Census Bureau, 2014).

At the time of data collection, all children were currently enrolled in kindergarten, first, second, third, fourth, or fifth grade. The sample consisted of 1082 students including 526 boys (49%) and 556 girls (51%). Thirty percent of the sample (N=325) attended DK. Fifty-seven percent of students enrolled in DK were boys (N=184) and 43% of students enrolled in DK were girls (N=141). Ages of children in the entire sample ranged from 66 months to 147 months (M=103.36, SD=21.18 months). Average age at kindergarten entry for all children was 67.72 months (SD=4.53). The average age at kindergarten entry for children who did not attend DK was 65.65 months (SD=3.56) and the average age at kindergarten entry for children who attended DK was 72.52 months (SD=2.41). Significant differences between children who did and did not attend DK are outlined in Table 5.

Ten percent of the sample (N=103) qualified for free and reduced price lunch (FRPL) during the 2012-2013 school year. Nine percent of children (N=67) who did not attend DK qualified for FRPL and 11% (N=36) of children who did attend DK qualified for FRPL during

the 2012-2013 school year. During this same school year, 19% of all students in the school district qualified for FRPL and 48% of students across the state of Michigan qualified for FRPL (Center for Educational Performance and Information, 2013), reflecting the high level of financial resources in the community.

Preschool information was obtained from parental self-report in a questionnaire given to parents on the day of kindergarten screening. Seventy-five percent (N=809) of all children attended preschool, ten percent (N=106) did not attend preschool, and fifteen percent of children (N=167) did not have information on file. Of the children who did not attend DK, 77% (N=579) attended preschool prior to the kindergarten screening, 8% percent of children (N=59) did not attend preschool prior to the kindergarten screening, and preschool information was not available for 16% (N=199) children. Of the children who attended developmental kindergarten the school year after the kindergarten screening, 71% (N=230) attended preschool prior to the kindergarten screening, 15% (N=47) of children did not attend preschool, and 15% (N=48) did not have preschool information on file.

Four percent of children (N=41) became eligible for special education services at some point between kindergarten and fifth grade. Fifty-nine percent (N=24) of the children who became eligible for special education services did not attend DK and forty-one percent (N=17) of children who became eligible for special education services attended DK. Five children (<1%) who did not attend developmental kindergarten were retained in kindergarten. All children who attended developmental kindergarten were promoted in kindergarten and subsequent grade levels.

Table 5
Significant Differences Between Groups Based on Percentage

Demographic	Did not Attend DK (<i>N</i> = 757)	Attended DK (<i>N</i> = 325)	<i>p</i>
Gender			<.001
Girls	55.0 (415)	43.0 (141)	
Boys	45.0 (342)	57.0 (184)	
Qualify for FRPL Preschool	9.0 (67)	11.0 (36)	.25
Attendance	76.0 (579)	71.0 (230)	<.003
Eligibility for Special Education Services after kindergarten	3.0 (24)	5.0 (17)	.10
Average Age at Kindergarten Entry (<i>months</i>)	66.0	73.0	<.001

Note. P values are based on Chi Square Tests of Independence. The *p* value for average age at kindergarten entry is based on an Independent-Samples T Test.

Table 6
Sample Size by Grade Level and School ID

ID	<i>N</i> (K)	<i>N</i> (1 st)	<i>N</i> (2 nd)	<i>N</i> (3 rd)	<i>N</i> (4 th)	<i>N</i> (5 th)	<i>N</i> (Total)
1	22	26	34	34	29	32	177
2	27	11	30	5	16	17	106
3	30	26	24	36	13		129
4	24			14			38
5	11	33	22	26	16	28	136
6	22	17	26	19	15	18	117
7	28	27	32	28	19	27	161
8	41	41	41	32	23	32	210
Total	205	181	209	194	131	154	1074

Note. This sample size is smaller than the original sample due to missing outcome data.

Inclusion criteria. Children were included if they attended school in the same school district in DK or kindergarten through fifth grade, a kindergarten screener was present in the CA-60, and they were not eligible for special education services prior to kindergarten.

Description of DK Program. From fall 2008 to spring 2012, the DK program was a half-day (three and one-half hours) program held five days a week for approximately seventeen and one-half hours each week with an average class size of 20 students. Due to changes in state policy, the DK program became a full day program in fall 2012. Children attend DK approximately 35 hours a week. The DK program is integrated with the K-12 programming in the school district, and all children have the option of free public transportation to and from school. All developmental kindergarten teachers (N=16) have bachelor's (38%) or master's (62%) degrees and valid teaching certificates in the state of Michigan. Each DK classroom has one paraprofessional to assist with classroom activities for one-half of each school day. Acknowledging the teacher quality in the DK classroom is important to note, as several studies have identified teacher quality as an important component of early childhood educational environments (Howes et al., 2008; LoCasale-Crouch et al., 2007; National Association for the Education of Young Children, 2009). An established DK curriculum does not exist. Each DK teacher creates his or her own lesson plans that promote student mastery of the DK objectives on the progress report (Appendix D).

Variables Considered in the DK Placement Process. Children in this study were screened in April prior to kindergarten entry to see if their school readiness skills were appropriate for kindergarten placement or necessitated a year of DK (typical of a maturational model). The decision to enter DK or kindergarten is made by a team of individuals using a kindergarten screener that asks assessors to obtain both objective and subjective data. Examples of objective data include a child's documented awareness of concepts of print, answers to comprehension questions based on a short story, the ability to write one's name, and demonstrating one-to-one correspondence categorizing objects into groups based on prompts

(e.g., color, function, material). Examples of subjective data include a child's ability to pay attention to a story, behavior in a large group setting, or interactions with other children during free-play activities. Although educators conducting the kindergarten screenings collect both qualitative and quantitative data related to kindergarten readiness skills and share their placement opinion with parents, parents have ultimate authority in determining their child's placement.

Description of Kindergarten Program. From fall 2008 to spring 2012, all kindergarten classes from were held for approximately 18 hours each week, with each week consisting of two full days and one half day of school. In fall 2012, kindergarten classes were held all day, every day for approximately 35 hours per week with an average class size of 25 students. All kindergarten teachers have bachelor's or master's degrees and valid teaching certificates in the state of Michigan. The average number of years of teaching experience is 14 years. Each kindergarten classroom has one paraprofessional to assist with classroom activities for one-half of each school day.

All children were involved in the same spring kindergarten screening process prior to the beginning of the kindergarten or DK school year. School personnel and parents make the decision in April to enroll each student in either DK or kindergarten the following September marking the beginning of the new school year. Children who attended DK began kindergarten the following school year.

Measures

Kindergarten Screening Measure. Few standardized measures of kindergarten readiness exist and most kindergarten screeners are developed based on the needs and values of individual school communities. As a result, creating kindergarten screening measurement tools with adequate reliability and validity is challenging (Graue, 2010) since it is difficult to create an

assessment for a construct that lacks a standard operational definition. Despite the widespread use of community-based kindergarten screening measures, the measures have limited predictive validity and researchers caution using the screeners to determine placement decisions (Snow, 2010). However, a kindergarten screener was scored and used as part of this study since the screener is an integral part of the kindergarten placement process at this suburban Michigan school district. School staff created the kindergarten screening measure used in this study. In order to obtain a measure of predictive validity, the literacy scores on the kindergarten screener were correlated with third grade reading and math scores. During the kindergarten screening process, teachers read students a short story and ask children comprehension questions about the story. In addition, children are tested on concepts of print and phonemic awareness and name, number, and color recognition. Children are also asked to write their name, use scissors to cut on a straight line, and answer general questions such as, “*Tell me about your family*” (Appendix A). Kindergarten screening staff recorded children’s answers on the kindergarten screening measure and noted any behavioral concerns during the screening process, such as inattentiveness during the story, inattentiveness during the entire screening process, deficits in verbal abilities, difficulty interacting with other children, or separation anxiety from caregivers. Kindergarten screening staff members use the kindergarten screening measures to suggest placement decisions (DK or kindergarten) to parents/guardians.

Scoring the Kindergarten Screener. For the purposes of this study, the author and a graduate student used a rubric to score the kindergarten screener (Appendix B). Scoring criteria were established using the early reading competencies identified by the National Early Literacy Panel (2008) and social-emotional skills that evaluators consistently monitored during group activities. These reading competencies include: alphabet knowledge, phonological awareness,

RAN of letters or digits, RAN of objects or colors, writing letters or writing one's name, phonological memory, concepts of print, print knowledge, reading readiness, oral language, and visual processing (NELP, 2008). Scores on the scoring rubric range from 0 to 26.

DIBELS Scores. Dynamic Indicators of Basic Early Literacy Skills – Next (*DIBELS NEXT*) was used to assess individual literacy growth across time. The DIBELS measures are used to measure selected components of the Big Ideas in Beginning Reading set forth by the National Literacy Council in 2005. The DIBELS is an appropriate, standardized measure for assessing English language literacy development for students in grades K-6 (Kaminski & Cummings, 2007). The DIBELS measures are frequently used in research to assess literacy skills and the effectiveness of different types of early childhood instruction (Zvoch, Reynolds, & Parker, 2008; Zvoch & Stevens, 2013). Although the DIBELS is a widely used measure of literacy proficiency, it is important to note that scores on the DIBELS measures have correlated with the construct of cognitive control (Coldren, 2013). For example, verbal inhibitory executive functioning skills are associated with performance on tests of phoneme awareness, letter knowledge, and word reading (Foy & Mann, 2013). Self-regulation skills such as effortful control, false belief understanding, and attention-shifting abilities are associated with math reading ability in three to five year old children (Blair & Razza, 2007).

Although the cognitive demands with each DIBELS task may affect a child's measured output the DIBELS are considered an effective measure in the school setting. The Initial Sound Fluency (ISF) and Phoneme Segmentation Fluency (PSF) measures both test phonemic awareness skills, the Nonsense Word Fluency (NWF) measure tests mastery of the alphabetic principle, and the Oral Reading Fluency (ORF) measure tests a child's ability to read accurately and fluently. Field tests of the *DIBELS Next* measures indicate that a composite score for the

beginning, middle, and end of the kindergarten year and the beginning of the first grade year are the most accurate measure of a student's literacy skills (University of Oregon, 2012). After the beginning of first grade, there is a negligible difference in the ability of the ORF score or the composite score in predicting literacy achievement on the *Stanford Early School Achievement Test – 10th Edition* (University of Oregon, 2012). For this reason, a DIBELS composite score will be used to measure kindergarten and first grade literacy skills and the ORF score will be the only score used to measure literacy skills in later grades. Due to the timing of progress monitoring implementation in the school district, kindergarten DIBELS scores were not available for current fourth graders, and kindergarten and first grade DIBELS scores were not available for current fifth graders.

Letter Naming Fluency. The LNF test does not measure one of the five big ideas in beginning reading, but it does measure a child's level of risk. During this test, the examiner presents the child with one page of upper and lowercase letters and asks the child to read as many letters as he or she can. If a child does not know the letter, the examiner provides the child with the letter. The score is the number of letters the child names correctly in one minute. The test is administered during the beginning, middle, and end of kindergarten and first grade. The one-month alternate reliability form of the LNF measure is .88 in kindergarten. The LNF measure has .70 median criterion validity with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score in kindergarten and .65 in first grade (Good et al., 2004).

Initial Sound Fluency. The DIBELS ISF measure is designed to assess a child's ability to recognize and produce the first sound of a word presented orally. The examiner shows four pictures to the child, names each picture, and asks the child to point to the picture that begins with the sound the examiner states. The child is also asked to state the beginning sound of a word

that the examiner orally presents to the child; the beginning sound matches one of the beginning sounds in the four pictures. A child's score is based on the number of correct sounds he or she states in one minute. The ISF test is administered at the beginning, middle, and end of kindergarten (University of Oregon, 2013). The alternate form reliability of the ISF measure is .72 in the middle of the kindergarten year (Good et al., 2004). When the measure is administered four times in kindergarten, the alternate form reliability increases to .91 (Nunnally, 1978). The concurrent criterion-related validity of the ISF with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score is .36 in the middle of the kindergarten year and .36 at the end of the first grade year (Good et al., 2004).

Phoneme Segmentation Fluency. The PSF task is designed to assess a child's ability to divide a word into phonemes. The examiner states a word with three to four phonemes, and asks the child to segment the word. For example, if the examiner says "sun," the child would say "/s/ /u/ /n/" to receive three points for the word. The number of correctly produced phonemes in one minute determines the child's final PSF score. The PSF test is administered at the beginning, middle, and end of kindergarten and first grade. The two-week PSF alternate reliability is .88 (Kaminski & Good, 1996), and the one-month alternate-form reliability is .79 at the end of kindergarten (Good et al., 2004). At the end of kindergarten, the concurrent criterion validity of the PSF is .54 with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score. The predictive validity of the first grade PSF with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score is .68 (Good et al., 2004).

Nonsense Word Fluency. The NWF task measures a child's mastery of the alphabetic principle. During this task, children are tested on letter-sound correspondence and their ability to blend letters in words. Children are presented with randomly ordered vowel-consonant and

consonant-vowel-consonant words (e.g., yit, uv) and asked to produce as many letter-sounds as he or she can or read as many words as he or she can. Children receive a score for the number of correct letter sounds read and/or the number of correct whole words read. The NWF test is given at the beginning, middle, and end of kindergarten, first grade, and second grade. The one-month alternate form reliability of the NWF measure in the middle of first grade is .83 (Good et al., 2004). The concurrent criterion-related validity of the NWF measure with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score ranges from .36 to .59 in first grade. The predictive validity of the NWF measure is .82 in the middle of first grade with the DIBELS ORF measure, .60 at the end of second grade with the DIBELS ORF measure, and .66 with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster score (Good et al., 2004).

Oral Reading Fluency. The most well established predictor of reading ability is oral reading fluency (ORF) (Deno et al., 1982; Shinn, 1989; Burke & Hagan-Burke, 2007). During the ORF test, students are asked to read a grade-level appropriate passage. The number of words read correctly in one minute determines the student's score. The DIBELS ORF measure has strong reliability and validity; inter-rater reliability ranges from .94 – 1.00, composite score alternate form reliability ranges from .66 to .97, and test-retest reliability ranges from .81 - .94 (Good & Kaminski, 2011). Psychometric studies assessing the reliability and validity of additional DIBELS measures such as Letter Naming Fluency, Phoneme Segmentation Fluency, and Nonsense Word Fluency have concluded that these measures have adequate reliability and validity (Burke & Burke-Hagan, 2007). However, further research is needed to determine the psychometric properties for DIBELS measures in each grade. The ORF measure is given at the beginning, middle, and end of first through sixth grade.

Rationale. DIBELS scores collected at the beginning, middle, and end of each academic year will be used to assess a student's literacy skills from kindergarten through second grade. Subtests used in the data analysis were based on the recommended sequence of assessments published by the University of Oregon DIBELS Data System (University of Oregon, 2012). Table 3 provides a complete list of DIBELS scores that will be used in the analysis. The school district uses these DIBELS measures to monitor student progress and determine Response-to-Intervention (RtI) eligibility and special education eligibility related to a learning disability in reading.

Michigan Educational Assessment Program

The Michigan Educational Assessment Program (MEAP) is a standardized assessment administered to all students in third through ninth grade attending public schools in the state of Michigan. The MEAP test is administered during the fall and spring of the school year as part of the regular school day. Content on the MEAP test is derived from the Michigan Grade Level Content Expectations (GCLE). The MEAP is used to assess each school district's annual yearly progress and is a critical component of school accountability in Michigan (MDE, 2013e). The MEAP test is a criterion-referenced test that assesses student results against a performance standard. The State of Michigan assumes that students who meet standards on the MEAP are meeting grade level expectations. Appropriate accommodations are provided to students with Individual Education Plans (IEP). The Michigan Educational Assessment Program provides a continuous score for each subtest and assigns a categorical label to each score. The scores are divided into four levels: Level 1 (Advanced); Level 2 (Proficient); Level 3 (Partially Proficient); and Level 4 (Not Proficient). According to the 2010-2011 MEAP technical report, it is appropriate to use MEAP scores to measure students' academic achievement compared to state

standards, measure student progress over time, target academic intervention efforts, and determine if programs and policies are having the desired effect. In addition to providing information about a student's achievement relative to content standards, the MEAP also provides a way to compare a student's performance to a similar demographic group or the school district. Michigan Educational Assessment Program scores are also used to determine middle school and high school Michigan Merit Award recipients.

Reliability. Due to the high-stakes nature of the MEAP test in determining both individual outcomes (e.g. Michigan Merit Awards) and district-level outcomes (e.g. overall quality of education and attractiveness of the district to parents), all MEAP scores have reliability greater than or equal to .90. This level of reliability is considered “high” (Field, 2009). All testing items are reviewed for item difficulty, item discrimination, and differential item functioning. Internal consistency reliability on the MEAP subtests are as follows: mathematics .87 - .91; reading .83 - .87; science and social studies .80 - .89; and writing .89 and .87, (4th grade and 7th grade, respectfully). Extensive inter-rater reliability processes and coding procedures are used to ensure that qualitative responses such as the essays are score reliably. Inter-rater agreement on the qualitative reading comprehension responses ranges from .89 to .98 and inter-rater agreement on the essay response ranges from .97 to .99 (MDE, 2011). Item response theory reliabilities indicate that items are equally reliable for multiple subgroups including ethnicity, gender, socioeconomic status, and limited English proficiency (MDE, 2011).

Validity. Several educational professionals and test development experts across the country monitor the content of the MEAP test to ensure alignment with content standards the MEAP test is designed to measure. Items that are not congruent with content standards are revised or discarded. Currently, there is some evidence for construct validity but no evidence for

criterion validity (MDE, 2011). Alignment studies for English and Language Arts (ELA) indicated that alignment with content level expectations increased as grade level increased because distinctions between objectives and specific grade-level content expectations became more apparent. Thirteen mathematics reviewers indicated full alignment between the MEAP and content-level expectations in grade six. Full alignment could be achieved by replacing one item in grades four, five, and eight or by replacing three items in grade seven. Full alignment in grade three required replacing six items. A team of nine science experts determined that the science subtest lacked full alignment due to the difficulty of assessing the standard related to science reflection or awareness. Overall, the alignment on the grade five and grade eight science tests were considered acceptable. The process teams of experts used to align the MEAP subtests with state GCLE provided evidence for content validity. At this time, MEAP criterion-related validity data is not available, and limited data from 2005 is available to establish construct validity. Available ELA and mathematics data indicate that the effect size of prior achievement is .60, while effect sizes of demographic variables are negligible (.005 to .13) (MDE, 2011).

Rationale. Although there are limitations with respect to the validity of the MEAP test, the MEAP scores were used as a dependent variable in this study because MEAP scores influence academic decisions on an individual, school, and state level. All students attending Michigan public schools are required to take the MEAP test, making the practicality and familiarity of the MEAP test significant across the state. Due to the archival nature of this study, MEAP test results were available in each student's CA-60 file. Results of MEAP tests have been used to measure academic achievement in other studies in peer-reviewed journals (Bettinger, 2005; Jackson et al., 2006; Neuenschwander et al., 2007)

Data Collection

Permission from the district superintendent and assistant superintendent of the school district was obtained to access the extant data. The author obtained approval from the Michigan State University Institutional Review Board (IRB) prior to beginning the study. Data were obtained from each student's cumulative student record folder (CA-60), which includes each student's kindergarten screening measure. Data were collected from archival data stored in each student's CA-60 file and each student's electronic DIBELS records. One graduate student in a school psychology program and the researcher collected data on-site during a four-week period in the summer. Training included an explanation of each piece of data collected and where to find the data in the CA-60. Specific coding procedures for the kindergarten screener were explained and coding materials were given to the graduate student. Prior to coding independently, the graduate student scored ten CA-60s with the author. Then the graduate and student scored groups of ten files independently and compared the data entered into the database for each of the ten files. The author and the graduate student scored groups of 10 files independently until .90 inter-rater reliability was achieved because this level of reliability is considered "high" (Field, 2009). After the first day, the author and the graduate student randomly checked two files each day to calculate reliability. If .90 reliability was not achieved, the author and graduate student discussed the discrepancy and continued to compare data obtained from files until .90 inter-rater reliability was achieved. Inter-rater reliability remained at .90 across data collection sessions.

Data Analysis

Research Questions One and Two. To answer research questions one "*What is the influence of age at kindergarten entry, gender, income, prior preschool attendance,*

developmental kindergarten attendance, special education eligibility, and school readiness skills on children's literacy growth trajectories (i.e., MEAP scores, DIBELS scores)? and question two, “*What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills on children's social-emotional growth trajectories (i.e., social-emotional report card measures)?*”, hierarchical linear modeling was used to compare the influence of common predictors (Table 5) cited in the literature in the growth in literacy and social-emotional development of the two groups (no DK/DK) across time. Hierarchical linear modeling was chosen for several reasons. Hierarchical linear model is an advantageous statistical technique in educational research because it accounts for the nesting effects inherent within schools (individuals nested within classrooms nested within schools nested within districts) (Stage, 2001; Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Hart, Berniger, & Abbott, 1997). Analyses were conducted using the *Statistical Package for the Social Sciences* (SPSS version 19) software and HLM software (version 7.0; Raudenbush, Bryk, & Congdon, 2004).

In this study, student literacy growth and social-emotional growth were obtained through a two-level hierarchical linear model. Students in the sample were divided into cohorts based on their grade at the time of data collection, thus allowing for more control of changes occurring across time. For example, the length of the kindergarten week was approximately two and one-half days for five of the cohorts in the sample and five days a week for one cohort in the sample. Growth in literacy skills was analyzed using the second, third, fourth, and fifth grade cohorts individually. Growth in social-emotional skills was analyzed using the third, fourth, and fifth grade cohorts individually. A minimum of three data points was necessary to calculate growth in

either literacy or social-emotional skills. First level variables were centered using group mean centering.

Equations

Level 1:

$$\text{Growth} = \beta_0 + \beta_1(\text{Observations}) + r$$

Beta zero represents the intercept and β_1 represents observation scores for each individual student. Observations for level one vary based on grade level. The following literacy observations were used to calculate literacy growth for the following grades:

Second Grade

Kindergarten observation: End of Year DIBELS Composite (Letter Naming Fluency +Phoneme Segmentation Fluency+ Nonsense Word Fluency Correct Letter Sounds); *First grade observation:* End of Year Oral Reading Fluency; *Second Grade:* End of Year Oral Reading Fluency

Please note: For each grade cohort, the raw DIBELS scores were standardized and the standardized variables were used in the analysis.

Third Grade

Kindergarten observation: End of Year DIBELS Composite (Letter Naming Fluency +Phoneme Segmentation Fluency+ Nonsense Word Fluency Correct Letter Sounds); *First grade observation,* End of Year Oral Reading Fluency; *Second Grade:* End of Year Oral Reading Fluency; *Third Grade:* MEAP Reading Standard Score

Please note: For each grade cohort, the raw DIBELS and MEAP scores were standardized and the standardized variables were used in the analysis.

Fourth Grade

Kindergarten observation: End of Year DIBELS Composite (Letter Naming Fluency +Phoneme Segmentation Fluency+ Nonsense Word Fluency Correct Letter Sounds); *First grade observation:* End of Year Oral Reading Fluency; *Second Grade:* End of Year Oral Reading Fluency; *Third Grade:* MEAP Reading Standard Score; *Fourth Grade:* MEAP Reading Standard Score

Please note: For each grade cohort, the raw DIBELS and MEAP scores were standardized and the standardized variables were used in the analysis.

Fifth Grade

Kindergarten observation: End of Year DIBELS Composite (Letter Naming Fluency +Phoneme Segmentation Fluency+ Nonsense Word Fluency Correct Letter Sounds); *First grade observation:* End of Year Oral Reading Fluency; *Second Grade:* End of Year Oral Reading Fluency; *Third Grade:* MEAP Reading Standard Score; *Fourth Grade:* MEAP Reading Standard Score; *Fifth Grade:* MEAP Reading Standard Score

For a description of the social-emotional composite score, please see Table 8.

Please note: For each grade cohort, the raw DIBELS and MEAP scores were standardized and the standardized variables were used in the analysis.

Level 2:

$$\beta_0 = \gamma_{00} + \gamma_{01}(\text{SpecialEducation}) + \gamma_{02}(\text{Male}) + \gamma_{03}(\text{FRPL}) + \gamma_{04}(\text{DKAttendance}) + \gamma_{05}(\text{AttendPreschool}) + \gamma_{06}(\text{AgeKindergarten}) + \gamma_{07}(\text{Kindergarten Screener}) + \gamma_{08}(\text{Kinderteacher}) + \gamma_{09}(\text{School}) + u_0$$
$$\beta_1 = \gamma_{10} + \gamma_{14}(\text{DKAttendance}) + u_1$$

The second level of analysis consisted of student, teacher, and school-level fixed effects. Student level fixed effects in the model ($\gamma_{01} - \gamma_{07}$) included γ_{01} special education status (0= never

eligible for special education services, 1= eligible for special education services between kindergarten and fifth grade), γ_{02} gender (0=male, 1=female), γ_{03} FRPL (0 = No Free/Reduced Price Lunch, 1 = Free/Reduced Price Lunch), γ_{04} developmental kindergarten attendance (0=attended, 1=did not attend), γ_{05} preschool attendance (0=did not attend preschool, 1=attended preschool), γ_{06} age at kindergarten entry (in months), and γ_{07} kindergarten screener score (raw score). Kindergarten teacher effects (γ_{07}) were measured by creating a dummy variable for each kindergarten teacher. School effects were measured by creating a dummy variable for each school (γ_{08}). Student, teacher, and school level variables were uncentered. Developmental kindergarten attendance was considered a cross level interaction effect.

Research Question Three. To answer the third research question “*Do school readiness skills at the time of kindergarten screening predict later literacy (i.e., MEAP scores and DIBELS scores) and/or social-emotional outcomes (i.e., social-emotional report card measures)?*” a regression analysis was used for each cohort (kindergarten, first, second, third, fourth, fifth). The regression analysis is a one-year analysis; the most recent data point corresponding to each cohort year was used in the regression analysis. For example, to determine the predictive validity of the kindergarten screening measure for the DIBELS kindergarten composite score, the DIBELS kindergarten composite scores of the kindergarten cohort were used. Analyses were conducted using the *Statistical Package for the Social Sciences* (SPSS version 22).

Regression Analysis:

$$\pi_0 = \beta_0 + \beta_1(\text{SpecialEducation}) + \beta_2(\text{Male}) + \beta_3(\text{FRPL}) + \beta_4(\text{DKAttendance}) + \beta_5(\text{AttendPreschool}) + \beta_6(\text{AgeKindergarten}) + \beta_7(\text{SchoolReadinessScreening}) + \beta_8(\text{Kinderteacher}) + \beta_9(\text{School}) + e$$

Student level predictors in the model (β_1 - β_7) included β_{01} special education status (0= never eligible for special education services, 1= eligible for special education services between kindergarten and fifth grade), β_{02} gender (0=female, 1=male), β_{03} FRPL (0 = No Free/Reduced Price Lunch, 1 = Free/Reduced Price Lunch), β_{04} developmental kindergarten attendance (0=did not attend, 1=attended), β_{05} preschool attendance (0=did not attend preschool, 1=attended preschool), β_{06} age at kindergarten entry (in months), and β_{07} school readiness screener score. (standardized continuous score). Kindergarten teacher effects (β_{08}) were measured by creating a dummy variable for each kindergarten teacher. School effects were measured by creating a dummy variable for each school (β_{09}).

Missing Data. Approximately 5% of cases (N=32) in the second, third, fourth, and fifth grade data sets had at least one missing literacy value. Due to the low percentage of missing data statistical techniques to handle missing data were not used (Graham, 2009). Approximately 25% of cases in the third, fourth, and fifth grade data sets had at least one missing social-emotional score composite value. Due to the nature of the extant data set and the manner in which the social-emotional composite score variable was calculated, the analyses were run using the raw data collected and techniques for handling missing data were not used. Cases containing missing variables were not used in the analyses.

Table 7 Variables Included in the Study	
Variable	Information Origin
Age at Kindergarten Entry	Birth Month and Birth Year in CA-60
School Readiness Skills	Kindergarten Screening Score in CA-60 (Score ranging from 0 – 32)
FRPL	Received from district administrator
Gender	Demographic information located in the front of the CA-60
Preschool Attendance	Kindergarten Screening Parent Questionnaire located in CA-60
Length of Kindergarten Day	Available from district administrator/Based on academic year
DK Attendance	School year grid located in the front of the CA-60
Special Education Services	Individualized Education Plan paperwork located in the CA-60
Teacher Education Level	Received from district administrator
Years Teaching Experience	Received from district administrator
School-Wide FRPL Count	Retrieved from Michigan Department of Education website
Top-to-Bottom Percentile Ranking	Retrieved from Michigan Department of Education website
<i>Outcome Measures</i>	
Kindergarten	EOY DIBELS Composite (LNF +PSF + NWF CLS) Report Card Social-emotional Score Composite
First Grade	EOY ORF Report Card Social-emotional Score Composite
Second Grade	EOY ORF Report Card Social-emotional Score Composite
Third Grade	MEAP Reading Report Card Social-emotional Score Composite
Fourth Grade	MEAP Reading Report Card Social-emotional Scores Score Composite
Fifth Grade	MEAP Reading Report Card Social-emotional Score Composite

Table 8
Proposed Research Questions, Measures, and Analytic Procedures

Research Questions	Predictors	Dependent Variables	Measures	Analyses
1. What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, DK attendance, special education status, and school readiness skills on the literacy growth of children in the sample?	<p>Level 1: Student scores at the end of each school year</p> <p>Level 2: Student predictors (Age at kindergarten entry, gender, FRPL, preschool attendance, DK attendance, special education status, school readiness score), Teacher Dummy Variables, School Dummy Variables</p>	Standardized DIBELS Scores/MEAP Test Scores	<p>Kindergarten: EOY DIBELS Composite (LNF +PSF + NWF CLS)</p> <p>First Grade: EOY ORF</p> <p>Second Grade: EOY ORF</p> <p>Third Grade: MEAP Reading Standard Score</p> <p>Fourth Grade: MEAP Reading Standard Score</p> <p>Fifth Grade: MEAP Reading Standard Score</p>	HLM
2. What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, DK attendance, special education status, and school readiness skills on the social-emotional growth of children in the sample?	(See Question #1)	Individual Report Card Social-emotional Composite Scores	<p>Kindergarten through Fourth Grade:</p> <p>Exhibiting self-control</p> <p>Showing active involvement in the learning process</p> <p>Showing respect for adults and children</p> <p>Following directions</p> <p>Working cooperatively</p> <p>Organizing self, materials, and</p>	HLM

Table 8 (cont'd)

			belongings Using time wisely Using good judgment in asking for help Doing personal best on classroom work	
3. Do school readiness skills at the time of kindergarten screening predict later literacy and/or social-emotional growth?	Block 1: Age at kindergarten entry, gender, FRPL, preschool attendance, DK attendance, special education status, teacher dummy variables, school dummy variables Block 2: Kindergarten School Readiness Screener Score	Standardized DIBELS Scores/MEAP Test Scores & Annual Report Card Social-emotional Composite Score	Academic Measures Kindergarten: EOY DIBELS Composite (LNF +PSF + NWF CLS) First Grade: EOY ORF Second Grade: EOY ORF Third Grade: MEAP Reading Fourth Grade: MEAP Reading Fifth Grade: MEAP Reading Social-emotional Measures See Question 2	Regression

CHAPTER 4

RESULTS

Question One. To answer research question one “*What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills on children’s literacy growth trajectories (i.e. MEAP scores, DIBELS scores)?*”, a two level hierarchical linear model was used. Descriptive statistics for the HLM models used in the analysis can be found in Appendix F, Tables 21 – 24. The two level model was run in HLM 7 without using the teacher and school dummy variables due to collinearity effects. Further analysis of the full model using a regression model in SPSS indicated the model could not be run with the school and/or teacher dummy variables included due to collinearity effects (Appendix G). The two level model was run on four separate occasions for the second, third, fourth, and fifth grade cohorts.

Second grade. Results of fixed effects indicated special education eligibility (coefficient -0.75, $p<.002$), developmental kindergarten attendance (coefficient 0.36, $p=.05$), and the kindergarten screener score (coefficient 0.23, $p<.007$) were significant predictors of literacy growth. Developmental kindergarten attendance was significant as an interaction effect (coefficient -0.12, $p=.09$). Results of the null model indicated the final estimation of variance components for Intercept 1: standard deviation = 0.82; variance component 0.68; degrees of freedom = 207; chi square =1421.83, $p<.001$. Compared to the null model, the conditional model accounted for an additional 16% of the variance between students.

Table 9 Second Grade Final Estimation of Fixed Effects – Literacy Growth					
Fixed Effect	Coefficient	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.05	0.15	-0.34	200	.73
Special Education, γ_{01}	-0.75	0.24	-3.14	200	<.002
Male, γ_{02}	-0.07	0.11	-0.67	200	.50
FRPL, γ_{03}	-0.31	0.18	-1.71	200	.08
DK Attendance γ_{04}	0.36	0.19	1.94	200	.05
Attend Preschool, γ_{05}	-0.07	0.13	-0.59	200	.56
Age at Kinder Entry, γ_{06}	-0.02	0.09	-0.26	200	.80
Kindergarten Screener, γ_{07}	0.23	0.07	3.37	200	<.001
For SCORE, slope, γ_1					
INTRCPT2, γ_{10}	0.08	0.04	1.83	382	.07
DK Attendance, γ_{14}	-0.12	0.07	-1.68	382	.09
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_0	0.75	0.57	200	1211.14	<.001
Level-1, e	0.56	0.31			

Third grade. Results indicated special education eligibility (coefficient -0.61, $p = .01$) and the kindergarten screener (coefficient 0.21, $p = <.001$) were significant predictors of literacy growth. Developmental kindergarten attendance was significant as an interaction effect (coefficient -0.12, $p = .07$). Results of the null model indicated the final estimation of variance components for Intercept 1: standard deviation 0.63; variance component 0.40; degrees of freedom = 189; chi square = 671.71, $p < .001$. Compared to the null model, the conditional model accounted for an additional 18% of the variance between students.

Table 10 Third Grade Final Estimation of Fixed Effects – Literacy Growth					
Fixed Effect	Coefficient	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.06	0.13	-0.45	193	.65
Special Education, γ_{01}	-0.61	0.23	-2.69	193	.01
Male, γ_{02}	-0.09	0.10	-0.85	193	.40
FRPL, γ_{03}	-0.10	0.13	-0.74	193	.46
DK Attendance γ_{04}	0.07	0.15	-0.49	193	.62
Attend Preschool, γ_{05}	0.19	0.12	1.61	193	.11
Age at Kinder Entry, γ_{06}	0.07	0.07	1.00	193	.32
Kindergarten Screener, γ_{07}	0.21	0.05	4.01	193	<.001
For SCORE, slope, γ_1					
INTRCPT2, γ_{10}	0.01	0.03	0.40	523	.69
DK Attendance, γ_{14}	-0.10	0.05	-1.79	523	.07
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_0	0.57	0.33	182	556.74	<.001
Level-1, e	0.76	0.58			

Fourth grade. Results indicated special education eligibility (coefficient -0.98, $p=.04$) was a significant predictor of literacy growth. Developmental kindergarten attendance was not significant as an interaction effect (coefficient -0.02, $p=.80$). Results of the null model indicated the final estimation of variance components for Intercept 1: standard deviation 0.71; variance component 0.51; degrees of freedom 129, chi square 651.48, $p<.001$. Compared to the null model, the conditional model accounted for an additional 6% of the variance between students.

Table 11 Fourth Grade Final Estimation of Fixed Effects – Literacy Growth					
Fixed Effect	Coefficient	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	0.21	0.21	0.98	122	.33
Special Education, γ_{01}	-0.98	0.50	-1.97	122	.04
Male, γ_{02}	-0.06	0.14	-0.47	122	.64
FRPL, γ_{03}	-0.21	0.32	-0.64	122	.52
DK Attendance γ_{04}	0.15	0.23	0.65	122	.52
Attend Preschool, γ_{05}	-0.20	0.21	-0.94	122	.35
Age at Kinder Entry, γ_{06}	-0.10	0.10	-1.03	122	.30
Kindergarten Screener For SCORE, slope, γ_1	0.08	0.08	0.96	122	.34
INTRCPT2, γ_{10}	0.00	0.03	-0.03	380	.98
DK Attendance, γ_{14}	-0.02	0.07	-0.26	380	.80
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_0	0.70	0.48	122	591.25	<.001
Level-1, e	0.70	0.50			

Fifth grade. Results indicated attending preschool (coefficient 0.24, $p=.05$) was a significant predictor of literacy growth. Developmental kindergarten attendance was significant as an interaction effect (coefficient -0.11, $p=.08$). Results of the null model indicated for the final estimation of variance components for Intercept 1: standard deviation 0.42; variance component 0.18; degrees of freedom 146; chi square 274.08; $p<.001$. Compared to the null model, the conditional model did not account for any additional variance between students.

Table 12 Fifth Grade Final Estimation of Fixed Effects – Literacy Growth					
Fixed Effect	Coefficient t	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.07	0.13	-0.52	139	.60
Special Education, γ_{01}	-0.38	0.27	-1.36	139	.18
Male, γ_{02}	-0.20	0.10	-1.93	139	.06
FRPL, γ_{03}	-0.14	0.25	-0.52	139	.60
DK Attendance γ_{04}	-0.10	0.16	-0.65	139	.52
Attend Preschool, γ_{05}	0.24	0.12	1.95	139	.05
Age at Kinder Entry, γ_{06}	0.05	0.06	0.78	139	.43
Kindergarten Screener, γ_{07}	-0.09	0.04	-2.23	139	.30
For SCORE, slope, γ_1					
INTRCPT2, γ_{10}	0.04	0.03	1.35	487	.18
DK Attendance, γ_{14}	-0.11	0.07	-1.78	487	.08
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_o	0.41	0.17	139	252.93	<.001
Level-1, e	0.94	0.88			

Table 13
Average Raw Scores for Literacy Outcomes Across Time

	Literacy Scores By Grade					
	Kindergarten (SD=)	First (SD=)	Second (SD=)	Third (SD=)	Fourth (SD=)	Fifth (SD=)
Second Grade Cohort						
DK	127 (35)	77 (36)	102 (34)			
No DK	125 (40)	71 (35)	99 (36)			
Third Grade Cohort						
DK	119 (40)	64 (41)	93 (40)	338 (24)		
No DK	112 (38)	68 (34)	109 (61)	346 (36)		
Fourth Grade Cohort						
DK	123 (42)	75 (41)	103 (33)	344 (23)	445 (26)	
No DK	118 (33)	76 (37)	109 (37)	346 (24)	446 (27)	
Fifth Grade Cohort						
DK	110 (30)	74 (36)	130 (87)	341 (17)	450 (35)	501 (159)
No DK	115 (38)	73 (38)	115 (56)	343 (29)	450 (33)	520 (126)
Benchmark Score	100	40	90	300/324	419	521

Note. MEAP Benchmark scores refer to the minimum score necessary to receive a “Proficient” rating. The minimum score for the fifth grade cohort to receive a “Proficient” rating for the third grade MEAP reading test was 300. For the third and fourth grade cohorts, the minimum score necessary for a “Proficient” rating on the MEAP reading test was 324. Literacy outcomes are as follows: kindergarten (Kindergarten DIBELS Composite Score); first and second grade (End of year DIBELS Oral Reading Fluency); third, fourth, and fifth grade (MEAP Reading Standard Score).

Table 14 Percentage of Students Scoring at the Proficient or Advanced Level on the MEAP Test						
	2012-2013 School Year		2011-2012 School Year		2010-2011 School Year	
	Study Sample	Statewide	Study Sample	Statewide	Study Sample	Statewide
Third Grade Cohort	.80	.66	-	-	-	-
Fourth Grade Cohort	.79	.68	.74	.63	-	-
Fifth Grade Cohort	.94	.71	.86	.67	.94	.64

Question Two. To answer research question two “*What is the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills on children’s social-emotional growth trajectories (i.e. report card social-emotional scores)?*”, a two level hierarchical linear model was used. The two level model was run in HLM 7 without using the teacher and school-level variables due to collinearity effects. Further analysis of the full model in SPSS indicated the full model could not be run due to collinearity effects. The two level model was run on three separate occasions for the third, fourth, and fifth grade cohorts because students in those cohorts had a minimum of three social-emotional data points.

Third grade. Results indicated that none of the fixed effects were significant predictors of social-emotional growth. Results of the null model indicated for the final estimation of variance components for Intercept 1: standard deviation 0.66; variance component 0.44; degrees of freedom 151; chi square 437.61; $p < .001$. Compared to the null model, the conditional model did not account for any additional variance between students.

Table 15 Third Grade Final Estimation of Fixed Effects – Social-Emotional Growth					
Fixed Effect	Coefficient	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.33	0.10	3.51	144	<.001
Special Education, γ_{01}	-0.24	0.37	-0.65	144	.52
Male, γ_{02}	-0.25	0.13	-1.82	144	.07
FRPL, γ_{03}	-0.24	0.14	-1.79	144	.46
DK Attendance γ_{04}	-0.06	0.18	-0.34	144	.74
Attend Preschool, γ_{05}	-0.21	0.11	-1.85	144	.07
Age at Kinder Entry, γ_{06}	0.03	0.07	0.42	144	.68
Kindergarten Screener, γ_{07}	0.07	0.07	0.94	144	.35
For SCORE, slope, γ_{11}					
INTRCPT2, γ_{10}	0.02	0.06	-0.26	204	.80
DK Attendance, γ_{14}	-0.04	0.12	-0.39	204	.70
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_0	0.65	0.43	144	405.72	<.001
Level-1, e	0.75	0.56			

Fourth grade. Results indicated male gender (coefficient -0.51, $p < .004$) was a significant predictor of social-emotional growth. Developmental kindergarten attendance was significant as an interaction effect (coefficient -0.25, $p < .002$). Results of the null model indicated for the final estimation of variance components for Intercept 1: standard deviation 0.64; variance component 0.41; degrees of freedom 94; chi square 338.07; $p < .001$. Compared to the null model, the conditional model did not account for any additional variance between students.

Table 16 Fourth Grade Final Estimation of Fixed Effects – Social-Emotional Growth					
Fixed Effect	Coefficient t	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.33	0.22	1.51	89	.14
Special Education, γ_{01}	-1.11	0.70	-1.57	89	.12
Male, γ_{02}	-0.51	0.17	-3.09	89	<.004
FRPL, γ_{03}	-0.13	0.22	-0.58	89	.57
DK Attendance γ_{04}	0.09	0.27	0.37	89	.72
Attend Preschool, γ_{05}	-0.13	0.21	-0.61	89	.54
Age at Kinder Entry, γ_{06}	0.19	0.10	1.85	89	.07
Kindergarten Screener, γ_{07}	0.01	0.09	0.06	89	.95
For SCORE, slope, γ_1					
INTRCPT2, γ_{10}	0.08	0.04	1.84	261	.07
DK Attendance, γ_{14}	-0.25	0.08	-3.09	261	<.002
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_0	0.60	0.36	89	297.40	<.001
Level-1, e	0.75	0.56			

Fifth grade. Results indicated that none of the fixed effects were significant predictors of social-emotional growth. Developmental kindergarten attendance was not significant as an interaction effect (coefficient -0.06, $p=.20$). Results of the null model indicated for the final estimation of variance components for Intercept 1: standard deviation 0.66; variance component 0.44; degrees of freedom 114; chi square 456.80; p value <.01. Compared to the null model, the conditional model did not account for any additional variance between students.

Table 17

Fifth Grade Final Estimation of Fixed Effects – Social-Emotional Growth

Fixed Effect	Coefficient t	Standard Error	T-ratio	Approx <i>d.f.</i>	<i>p</i> -value
INTRCPT, γ_0					
Intercept2, γ_{00}	-0.11	0.22	-0.48	107	.63
Special Education, γ_{01}	-0.22	0.22	-1.01	107	.32
Male, γ_{02}	-0.25	0.14	-1.77	107	.08
FRPL, γ_{03}	-0.02	0.20	-0.01	107	.94
DK Attendance γ_{04}	0.16	0.25	0.65	107	.52
Attend Preschool, γ_{05}	0.23	0.20	1.14	107	.26
Age at Kinder Entry, γ_{06}	-0.05	0.14	-0.35	107	.73
Kindergarten Screener, γ_{07}	0.11	0.08	1.48	107	.14
For SCORE, slope, γ_1					
INTRCPT2, γ_{10}	0.02	0.03	0.68	308	.50
DK Attendance, γ_{14}	-0.06	0.05	-1.27	308	.20
Final Estimation of Variance Components					
Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
Intercept 1, r_o	0.65	0.42	107	416.08	<.001
Level-1, e	0.73	0.54			

Table 18 Average Raw Scores for Social-Emotional Outcomes Across Time					
	Kindergarten (SD=)	First (SD=)	Second (SD=)	Third (SD=)	Fourth (SD=)
Third Grade Cohort					
DK	25.68 (2.09)	34.60 (2.30)	34.08 (3.16)	-	-
No DK	25.80 (1.79)	34.40 (3.06)	35.00 (4.52)	-	-
Fourth Grade Cohort					
DK	25.88 (2.27)	34.18 (2.51)	34.31 (2.88)	46.28 (3.69)*	-
No DK	25.65 (2.86)	34.78 (2.42)	34.68 (2.67)	48.59 (2.82)*	-
Fifth Grade Cohort					
DK	26.16 (1.51)	-	34.35 (3.16)	47.76 (3.03)	44.26 (3.74)
No DK	25.78 (1.87)	-	34.58 (2.42)	48.55 (7.06)	44.25 (5.47)
Highest Score Possible	27	36	36	55	50

Note. * Denotes significance at the 0.05 level.

Question Three. To answer question three, “*Do school readiness skills at the time of kindergarten screening predict later literacy and/or social-emotional growth?*”, a regression analysis was used. The regression analysis measures the predictive validity of the screener on an annual basis. Results of the regression analysis using literacy scores as outcomes indicated that the kindergarten screening measure was not a significant predictor of literacy outcomes for kindergarten ($\Delta R^2 = .01$, $F[1,175] = 2.81$, $p = .10$) first ($\Delta R^2 = .02$, $F[27,148] = 3.36$, $p = .07$), fourth ($\Delta R^2 = .04$, $F[21,64] = 1.51$, $p = 0.11$), and fifth grade ($\Delta R^2 = .01$, $F[21,124] = 2.25$, $p = 0.14$) literacy outcome measures. Results indicated the kindergarten screener was a significant predictor of second ($\Delta R^2 = .04$, $F[23,166] = 2.34$, $p < .0001$) and third grade ($\Delta R^2 = .01$, $F[21,64] = 1.51$, $p = 0.04$) literacy outcomes.

Table 19 Predictive Validity of Kindergarten Screening Measure Across Time for Literacy Outcomes									
Kindergarten Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	R ² Change	F Change	df1	df2	Sig F Change
1	.56	.32	.23	.86	.32	3.70	22	176	.00
2	.57	.33	.24	.85	.01	2.81	1	175	.10
First Grade Model									
1	.47	.22	.08	.97	.22	1.53	27	148	.06
2	.49	.24	.09	.96	.02	3.36	1	147	.07
Second Grade Model									
1	.50	.25	.14	.93	.25	2.34	23	166	.00
2	.54	.29	.18	.90	.04	9.81	1	165	.00
Third Grade Model									
1	.76	.58	.51	.69	.58	8.02	27	157	.00
2	.77	.59	.52	.68	.01	4.23	1	156	.04
Fourth Grade Model									
1	.58	.33	.11	.95	.33	1.51	21	64	.11
2	.59	.35	.12	.94	.02	1.58	1	63	.21
Fifth Grade Model									
1	.53	.28	.15	.96	.28	2.25	21	124	.00
2	.54	.29	.16	.96	.01	2.21	1	123	.14

Results of the regression analysis using social-emotional scores as outcomes indicated that the kindergarten screening measure was not a significant predictor of social-emotional outcomes for second ($\Delta R^2 = .01$, $F[1,82] = 1.09$, $p = .30$), third ($\Delta R^2 = .02$, $F[1,63] = 1.51$, $p = .21$), and fourth grade ($\Delta R^2 = .00$, $F[1,93] < .0001$, $p = 0.96$) social-emotional outcome measures. Results indicated the kindergarten screener was a significant predictor of kindergarten ($\Delta R^2 = .05$, $F[1,102] = 7.58$, $p < .001$) and first grade ($\Delta R^2 = .11$, $F[1,81] = 12.25$, $p < .001$) social-emotional outcomes.

Kindergarten Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	R ² Change	F Change	df1	df2	Sig F Change
1	.57	.33	.18	.85	.33	2.28	22	103	.00
2	.61	.37	.23	.82	.05	7.58	1	102	.01
First Grade Model									
1	.37	.14	.00	1.00	.14	.94	14	82	.52
2	.50	.25	.11	.94	.11	12.25	1	81	.00
Second Grade Model									
1	.44	.20	.02	.69	.20	1.17	18	83	.35
2	.45	.21	.02	.67	.01	1.09	1	82	.30
Third Grade Model									
1	.58	.33	.11	.95	.33	1.51	21	64	.11
2	.59	.35	.12	.94	.02	1.58	1	63	.21
Fourth Grade Model									
1	.69	.47	.37	.79	.47	4.72	18	94	.00
2	.69	.48	.37	.80	.00	.00	1	93	.96

CHAPTER 5

DISCUSSION

Parents are charged with continually making decisions on behalf of their children, which can be a particularly daunting endeavor. Decisions surrounding kindergarten entry, an important milestone in the life of a child raised in America, often leave parents wondering if they made the right or wrong decision based on a variety of factors including their child's age, school readiness skills, ability to interact with other children in social situations, and general observations of their child in comparison to his peers. As with most decisions, careful analysis of the benefits and drawbacks in conjunction with peer-reviewed research does not guarantee a parent that he or she made a right or wrong decision. But data exist to help a parent make an informed decision. The purpose of this study was to add to the early childhood literature base and help aid educators and parents in making an informed decision surrounding the potential academic and social-emotional benefits of DK, a specific type of early childhood intervention. In light of informed decision making, the homogeneity, affluence, and stability of the sample size used for this study should be taken into account and carefully compared and contrasted with results of studies that include samples comprised of children from other demographic and developmental backgrounds.

The primary purpose of this study was to explore the literacy and social-emotional growth across time of children who attended DK compared to children who did not attend DK as well as the influence of common student-level predictors associated with success in school. The secondary purpose of this study was to determine the predictive validity of the kindergarten screener of later literacy and social-emotional outcomes. The first hypothesis was that the influence of age at kindergarten entry, gender, income, prior preschool attendance, and

developmental kindergarten attendance on literacy growth would fade across time. This hypothesis was partially supported.

Special education status, developmental kindergarten attendance and preschool attendance were significant predictors of literacy growth, although these predictors were not significant across all cohorts. Although special education eligibility was a significant predictor across second, third, and fourth grade, the effect of special education eligibility on the intercept fluctuated over time. Special education eligibility is often determined by poor academic performance, making it logical that special education eligibility status would be correlated with literacy scores across time. Unlike the results of this study, some studies have demonstrated that the probability of special education eligibility increases for children who are young-for-grade (Dhuey & Lipscomb, 2010; Martin et al., 2004). Although this study did not analyze probability of special education eligibility based on age at kindergarten entry, it is interesting to note that age at kindergarten entry was not a significant predictor of literacy growth.

The association between preschool attendance and improvements in literacy growth is expected, as the evidence supporting the advantageous effects of preschool attendance is robust (Camilli et al., 2010; Gormley et al., 2005; Magnuson et al., 2007). Preschool is associated with positive effects for children from all backgrounds (Barnett, 2008; Goodman & Sianesi, 2005) and increased levels of cognitive and social development (Sylva et al., 2004). Although the academic effects of preschool are often found to be short term (Magnuson et al., 2007), children's gains are maximized when they attend high quality preschool programs and have a positive relationship with the teacher (Howes et al., 2008).

The kindergarten screening measure was a significant predictor of literacy growth for the second and third grade cohorts but was not a significant predictor of literacy growth for the

fourth and fifth grade cohorts. Although school readiness skills are associated with increased academic outcomes (Snow, 2010) and cognitive abilities (Bornstein et al., 1996), these associations appear to be stronger when children are younger and fade over time. Age at kindergarten entry, gender, and income status were not significant predictors of literacy growth at any point in time.

Across time, the differences in the literacy growth of children who attended DK versus children who did not attend DK were not statistically significant. The raw scores presented in Table 13 illustrate that from a statistical and practical perspective, the difference in the two groups' scores across time is negligible. The small differences in raw scores among the two groups, particularly the differences in scores at the end of kindergarten, is a unique attribute of this sample as typically more significant gains between pre and post kindergarten intervention groups are evident immediately after the intervention year.

These results reflect the larger body of research on the effect of early childhood interventions on later academic outcomes. For the majority of cohorts, children who attended DK had higher literacy scores at the end of kindergarten but these gains faded over time. These results are consistent with research indicating that the perceived benefits of delayed entry into kindergarten fade over time (Domaleski & Oshima, 2006; Stipek & Byler, 2001). However, studies on delayed kindergarten entry frequently focus on the age of children as opposed to the experiences the children had prior to delaying kindergarten. Results across cohorts in this study clearly indicated that age at kindergarten entry was not associated with growth in literacy skills across time. Recent studies have indicated that some advances in skill development are due to classroom-based experiences, whereas other advances are a result of biological maturation (Bisanz et al., 1995; Skibbe et al., 2011). Moreover, results consistently indicated that the fixed

effects included in the model are not accounting for a significant proportion of the variance in student growth over time.

The second hypothesis was that the influence of age at kindergarten entry, gender, income, prior preschool attendance, developmental kindergarten attendance, special education eligibility, and school readiness skills on social-emotional measures would remain constant across time. This hypothesis was partially supported. Analyses of fixed effects indicated being male was associated with a decline in social-emotional skill growth across all cohorts. This finding is consistent with research indicating statistically significant gender gaps in self-regulation skills (Matthews et al., 2009). In addition, a substantial body of literature indicates that females are more successful in building strong, positive relationships with teachers throughout their educational career than males, ultimately improving females' educational experience (Duckworth & Seligman, 2006). In contrast, males are more likely than females to be expelled, suspended, or drop out (Office of Juvenile Justice and Delinquency Prevention, 2006).

Receiving special education services, attending preschool, attending developmental kindergarten, receiving free and reduced price lunch, and age at kindergarten entry were negatively associated with growth in social-emotional skills at different points in time. Although the specific reasons for the differences in predictors associated with lower social-emotional scores across cohorts are unknown, results are consistent with earlier research relating to risk factors for social-emotional development including poverty, English language proficiency, and maternal education (Barnett, 2013; Lee & Burkam, 2002; Rimm-Kaufman et al., 2000). It is plausible that the demographic or skill-based factors associated with DK placement resulted a negative association between DK attendance and social-emotional growth, but these results do not imply causality. Consistent with special education placement rate as a significant

predictor of social-emotional skill growth, reduced participation in classroom learning activities has been associated with low academic achievement indicating children with lower social-emotional skills may be more at risk for poor academic or behavioral outcomes and potential special education placement (Bierman, 2009; Raver, 2004). It is important to note that the student level predictors did not account for any additional variance in social-emotional growth compared to the null model, indicating that perhaps other student level variables would be more appropriate for the model.

In general, the social-emotional growth of children who attended DK compared to those who did not attend DK was not statistically different. It is important to note that based on the raw scores provided in Table 18, from a practical standpoint, the social-emotional scores of both groups were equivalent across time. The stability of the results of social-emotional scores across time found in this study are consistent with the findings of Bornstein et al. (2010) that indicated social competence in kindergarten was correlated with social competence in later years.

The third hypothesis was that the kindergarten screening measure would predict academic and social-emotional growth trajectories due to the stability of demographic risk factors associated with low school readiness skills at kindergarten entry. This hypothesis was not supported. The kindergarten screening measure predicted literacy outcomes at the end of second and third grade at a statistically significant level. Results were not significant for the kindergarten, first, fourth, and fifth grade cohorts.

The kindergarten screening measure predicted social-emotional outcomes at a statistically significant level at the end of kindergarten and first grade but not for subsequent grade cohorts. These results are congruent with kindergarten teachers' long-standing perception that social-emotional skills at the time of kindergarten entry are more relevant than a student's academic

skills at the time of kindergarten entry (Lin et al., 2003). The difference in predictive validity over time may be due to the evolution of social expectations over time that are measured differently as children grow older. For example, whereas many of the social-emotional skills measured on the kindergarten screener assess a child's peer interactions that are contingent upon reciprocal involvement with the child and others in his environment, as children grow older social-emotional measures on the report cards often measure a child's ability to complete work, manage materials, and advocate for themselves. Although many of the social skills overlap across time, the shift from extrinsic to intrinsic motivators to meet expectations. The overall predictive validity of the kindergarten screener used in this study was less than the results of the meta-analysis of 70 longitudinal studies done by LaParo & Pianta (2000). However, results of this study are consistent with the overall notion that kindergarten readiness measures, whether standardized or unstandardized, tend to lack validity and reliability (Graue, 2010; La Paro & Pianta, 2000; Snow, 2010) in predicting later outcomes.

The lack of predictive validity across time of the kindergarten screener may be due in part to the absence of key components of reading (i.e. phonemic awareness, phonics, and fluency, vocabulary, and text comprehension) identified by the National Early Literacy Panel (2000) on the kindergarten screener. Close examination of the kindergarten screener indicates that skills related to phonemic awareness, phonics, and fluency are not directly measured by the screener and may affect the overall validity of the screener. In contrast, the kindergarten screener accounted for attention throughout the screening process, a documented mediator of behavioral outcomes (Dice & Schwanenflugel, 2012; Razza et al., 2012).

It may be that the outcome variables associated with this study do not adequately capture the skills that the kindergarten screener is designed to measure. For example, perhaps the

kindergarten screener is more predictive of mathematics scores across time or the number of visits to the principal's office or suspensions. It is also plausible that intensive intervention efforts being implemented systematically such as Response to Intervention (RtI) or Reading Recovery may be effective in diminishing the initial school readiness gap and leveling the academic playing field. School-wide programs to intensively target social-emotional skills are often less likely to be implemented, which may be a reason why the kindergarten screener was predictive of students' social-emotional skills at the end of kindergarten and first grade.

It is also possible that the kindergarten screening measure in this study was not as strong of a predictor of academic or social and emotional growth because of the demographics of the majority of children included in this study. Risk factors for school readiness skills are most strongly associated with poverty including factors such as inconsistent parental work opportunities, low parental education, low parental pay, and limited English proficiency (Harriet et al., 2006; Hernandez et al., 2007). The majority of children all children included in this sample had a school readiness score within one standard deviation of the mean, indicating that only a small percentage of children in the sample lacked basic school readiness skills. In other studies, approximately half of children have lacked necessary school readiness skills prior to kindergarten entry due to factors associated with poverty (Rimm-Kaufman, 2000).

Implications

Although academic, cognitive, or social-emotional gains of an early intervention program may fade over time, strong arguments have been made against interpreting the lack of long-term academic or cognitive gains of children who attended early intervention programs as a reason to discontinue a particular early intervention program. First and foremost, the long-term academic outcomes can vary greatly based on the outcome measure used. Moreover, the long-term

“success” of an early intervention program may not be best measured by academic, social-emotional, or overall cognitive ability. For example, perhaps a more relevant long-term outcome of an early intervention is high school completion, employability, avoiding incarceration, or overall physical health instead of a standardized academic achievement score or cognitive ability score at some point in middle school or high school. Although the Abecedarian Preschool Program was not associated with cognitive gains when children in the intervention and control group reached middle school and high school, children in the intervention group were physically healthier on several outcomes than children in the control group (Campbell, 2014).

James Heckman, a Nobel-prize winning economist, has published extensive work that unequivocally indicates early interventions (interventions occurring from ages zero to five) have a much higher economic return than interventions that target later stages in the lifespan (Heckman, 2000). Heckman, as well as other proponents of early education and intervention, would argue that the sleeping elephant of this overall study is the fact that children from this community who experienced difficulty with aspects of the kindergarten screener did not have access to high quality early intervention until they were age-eligible for kindergarten, and the greatest window of opportunity for intervention was missed. Even after acknowledging the sleeping elephant in the room, interpreting the results of this study for the intended audience – school staff members, parents, and members of the community – is a difficult endeavor.

First and foremost, the study used for this sample is at much lower risk than the samples often used in early intervention program. Results of this study of typically developing children living in an advantaged community indicate that attending the DK program does not appear to change the literacy or social-emotional growth of children across time, but it is important to note that the two groups were nearly equal on literacy and social-emotional measures at the end of

kindergarten. Given the methodology of the study, it is not possible to determine the growth the children who attended the DK intervention experienced during the intervention year that may have placed them on a more equal playing field with their peers who did not attend the intervention. Moreover, given the large gaps in raw scores on the 5th grade MEAP test between the intervention and control group, it is possible that the intervention group's scores would have remained equivalent to or surpassed the non-intervention group's scores if they had continued to receive intensive intervention during the elementary years.

For the students in this sample, providing children with the “gift of time” or the opportunity to mature by delaying kindergarten entry does not appear warranted based on the outcome measures used for this study. However, it is important to note that if other cognitive (i.e. a standardized intelligence test) or non-cognitive measures (e.g. motivation, persistence, charisma) were used as outcome measures, the implications of the study might have been different. The results of this study are congruent with the larger body of research indicating that overall, the age at kindergarten entry is not associated with later long-term effects on academic or social-emotional skills (Lincove & Painter, 2006; Stipek & Byler, 2001) and children who are young-for-grade stand to benefit from attending school with their older peers (Cascio & Schanzenbach, 2007).

Arguably, given the demographic factors of the school district, the typically developing children included in this sample are not at the same risk that children in other communities may be, influencing the overall effect of the DK intervention. This study further reinforces the differential effects of early childhood programs based on a child's socioeconomic status found in other studies (Barnett, 2013; Bumgarner & Lin, 2014; Peisner-Feinberg & Schaaf, 2007; Tucker-Drob, 2012; Winter & Klein, 1970). If children from more at-risk communities had access to this

same DK intervention and their literacy skill growth were later compared to children in their same community who did not attend DK, the growth patterns of the DK versus non-DK groups may be different than the growth patterns found in this study.

The implications of this study may be less related to literacy and social-emotional growth trajectories and more related to the ability of a school district to improve the outcomes of children who are at-risk when a small percentage of children in the district are at risk. The overall percentage of children receiving FRPL in this sample of children was 10% while the overall state average was 48%. Not only do children from disadvantaged backgrounds learn more when they are learning alongside children from advantaged backgrounds, early childhood programs in affluent communities are typically associated with more enriching activities and overall high levels of quality than early childhood programs in less affluent communities (Early et al., 2010; Hatfield et al., 2014).

Although the results of this study do not lend support for DK programs for children from advantaged backgrounds, it is important to note that children from disadvantaged backgrounds receive maximum benefits from early childhood programs when they attend integrated programs with children from a variety of socioeconomic backgrounds (Hogden, 2007; Neidell & Waldofoel, 2010; Schechter & Bye, 2007). Research indicates that the most at-risk children are typically placed with other at-risk children in the poorest Pre-K quality classrooms (LoCasale-Crouch et al., 2007). Moreover, children tend to demonstrate growth relative to their baseline skills in academic and social-emotional skills, and growth is often a function of the skill level of other children in the classroom (Skibbe et al., 2012; Vallatoun & Ayoub, 2011). Thus, when children are given the opportunity to rise to the skill level of other children around them, they often do.

Focus on the community-level variables at play in this study is particularly important, as school socioeconomic status has been shown to be just as important as student level socioeconomic status in achievement growth (Rumberger & Palardy, 2005). It is the author's belief that the larger implication of this study is not the individual growth trajectories of children who did versus did not attend DK, but the effects of strong general instruction, additional remedial instructional supports, and the high density of resources available to children across time may have been strong contributors to the literacy and social-emotional growth of the typically developing children including in this study that reduced the effect of student level predictors typically associated with school failure.

Although it is clear that early childhood is clearly a foundational and critical component of human development across the lifespan (Shonkoff & Phillips, 2000), the current research base and knowledge of the specific programs, mechanisms, instructional strategies, dosage effects, and broad policies pertaining to young families designed to foster early childhood development is still evolving. Analyzing the influence of early childhood interventions on later outcomes is often a politically-charged endeavor, with both proponents and opponents having closely held ties and direct and indirect personal stakes in the debate. Large-scale, comprehensive early childhood programs such as the High/Scope Perry Preschool, Carolina Abecedarian Project, Head Start, and Chicago-Child-Parent Centers all serve as examples of intensive early childhood programs designed to enhance the quality of life of children and families involved in the programs. Although, for example, the Chicago-Parent Center Preschool program is associated with higher rates of high school completion and reductions in special education placement and grade retention (Reynolds, 2000) these outcomes may or may not be directly related to the literacy growth of these children in early childhood.

Future research is warranted to better understand the effect of DK attendance on the academic and social-emotional growth trajectories of children identified with developmental delays prior to kindergarten entry. Traditional statistical techniques, in conjunction with ethical guidelines, make it difficult to compare trajectories of children who did versus did not receive an educational intervention. Recent studies have demonstrated that the design quality of a study is correlated with the outcomes of the study; as the design quality of a study increases, the negative effects of retention decrease (Allen, Chen, Willson, & Hughes, 2009; Lorence, 2006).

Propensity scores, a relatively new statistical technique, allow researchers to compare groups of children with different experiences in a manner that closely mimics a randomized, controlled study. For example, Im et al (2013) compared the academic and behavioral trajectories of retained versus promoted students using propensity scores and determined that in the middle school years, the academic and behavioral trajectories of retained students were the same as the academic and behavioral trajectories of their promoted peers. Wu, West, and Hughes (2008) used propensity scores to analyze the difference in growth trajectories of first grade students who were promoted versus retained and found that the effect of retention differed based on several moderator and outcome variables. Analyzing the data used for this study using propensity scores would allow each student who attended DK to be matched to a similar student who did not attend DK and may yield more causal inferences between the literacy and social-emotional trajectories of children in the two groups.

Limitations

There are several limits to the internal validity of this study. Although educators who administer the kindergarten screener at schools across the district have several years of experience working with children and are very familiar with the instrument and use it year after

year, the district does not have a standardized training or scoring system in place for the kindergarten screener. Moreover, the kindergarten screener is not a standardized measure of school readiness. Despite these drawbacks, given the utility of the kindergarten screener in predicting later literacy and social-emotional outcomes, it would have been useful to have measured the school readiness skills of children who attended DK prior to the start of the kindergarten year to better quantify influence of DK programming on school readiness skills.

In addition, the dependent variables of this study (MEAP scores and DIBELS scores) are not ideal measures of academic achievement. The measures lack the reliability and validity of other standardized measures such as the *Wechsler Individual Achievement Test – Third Edition* or the *Iowa Test of Basic Skills*. Despite this limitation, the outcome measures used in this study are influential in high stakes decisions such as a child's eligibility for special education services as a student with a specific learning– making these dependent variables appropriate measures to use for this particular study.

The internal validity of this study is also threatened by the lack of a standardized DK curriculum across schools and the subsequent instruction that children received after DK. The longitudinal nature of this study prohibits the analysis of the classroom level variable due to the exponential number of classroom combinations over such a long period of time. However, the two level structure of the methodology used in this study is typical of longitudinal educational studies (Peugh, 2012); it is expected that students will have different teachers over time, making it very difficult to control for teacher effects (S. Konstantopoulos, personal communication, April 16, 2013).

There are also several limits to the external validity of this study. The suburban population used for this study has a low percentage of minority students, and many of the

minority students who attend school in this district attend the district through Michigan's school of choice program. Consequently, they did not meet the inclusion criteria of the study because many of them had attended school in another school district or missed the kindergarten screening date because they had not been selected at that time to attend school in the district. This means that only students who presented with substantial stability in school attendance were included within this study. The school is also part of a small group of schools in the state that is known for academic excellence. This label suggests that students receive excellent instruction in each grade level, which may diminish the effects of an early intervention such as DK compared to school districts that are not recognized for academic excellence. It is difficult to generalize the results of this particular study to samples of children who are at greater risk.

Regardless of school readiness skills or subsequent academic achievement scores, all students in this sample were part of non-mobile families who remained in the same school district. This is a protective factor that all students in the sample share and family stability may have a positive effect on later academic outcomes. Moreover, children attend DK for a variety of reasons such as low school readiness skills in academic and/or social areas, a late birthday, or a small physical stature. Some children attend DK due to parent request, while others attend due to the suggestion of educators and other professionals. Each DK student brings a unique set of strengths and skills to the classroom and each student has different needs. It is difficult to isolate the ability of the experiences in a DK classroom to meet those individual needs and set the stage for later academic success.

APPENDICES

Appendix A – Kindergarten Screener

Name _____

Expressive/Receptive Language

1. Why shouldn't you play in the street?
2. What do doctors do?
3. Why do you go to the grocery store?
4. Why do you have a car?
5. What kind of clothes do you wear in the winter?
6. What do you do with money?

+ = Yes
- = No
/ = Prompt Given

Speech Language concerns(+ - /)

- ☐ Receptive
☐ Expressive
☐ Articulation

Tray Comments (number, color, etc.):

Social Play (Home center, blocks, playdoh):

Gross Motor (Activities/bean bag song) :

Fine Motor (Draw a picture, sign name)

Overall Comments:

Appendix B – Kindergarten Screener Rubrics

Early Literacy Skills Rubric

Concepts of Print (Hand book to child upside down/backwards)

NELP Domain: Concepts of Print/Print Knowledge

- + - Show me the title or name of this book
- + - Find a page that you like
- + - Show me the top of the page
- + - Show me the bottom of the page
- + - Tell me what's happening on this page (choose one)
- + - Show me where the words are in the book
- + - If you were going to read these words, where would you start?

2 5 or more +

1 2 – 4 +

0 0 – 1+

Comprehension (Student responses recorded)

What is this story about?

Who gave Sam the chair?

Why do you think Sam was happy to get the chair?

2 2 or more +

1 1 +

0 0 answered correctly

Expressive/Receptive Language

NELP Domain: Oral Language

- + - Why shouldn't you play in the street?
- + - What do doctors do?
- + - Why do you go to the grocery store?
- + - Why do you have a car?
- + - What kind of clothes do you wear in the winter?
- + - What do you do with money?

2 All answered correctly

1 All but one question answered correctly

0 Two or more questions answered incorrectly

Speech Language Concerns**NELP Domain: Oral Language**

- + - Receptive
- + - Expressive
- + - Articulation

2 All 3 +

1 1 area noted as a concern

0 2 or more areas noted as a concern

Tray Comments (Number, Color, etc.)**NELP Domain: RAN of Digits and Colors (Highly Correlated)**

2 No concerns noted *(identified all digits and numbers correctly; able to categorize objects)*

1 Some concerns noted *(identified 3 or more digits or numbers, but unable to identify all numbers accurately; categorized objects with some support)*

0 Serious concerns noted *(named 2, 1, or 0 digits or numbers; unable to categorize objects with support)*

Fine Motor (Draw a picture, sign name)**NELP Domain: Writing One's Name**

2 Able to write full name without prompting or difficulty *(common reversals are counted as correct; name is spelled correctly; shortened names are counted as correct [e.g., "Sam" for "Samuel"])*

1 Able to write some letters of one's name, but not all

0 Able to write one or zero letters of name

Overall Comments (located on front of kindergarten screener)

2 No early literacy concerns noted

1 Some early literacy concerns noted *(References to a lack of some academic readiness skills, but open to placement in DK or kindergarten)*

0 Serious early literacy concerns noted *(Reference to overall lack of academic readiness skills, inability to identify any letters, inability to write name, inability to categorize objects, or a reference to a combination of these; reference to an overall struggle in kindergarten)*

Score Range: 0 - 14

Social-emotional Skills Rubric

Book-Story Reading-Listening Behavior

- + - Eyes on book?
- + - Restrain impulsive behavior?
- + - Physical?

- 2 All “+”
- 1 2 – 3 “+”
- 0 0 or 1 “+” *(Additional notes referencing child’s inability to pay attention, focus, or sit still during the story)*

Social Play (Home center, blocks, playdoh)

- 1 No negative social-emotional comments noted
- 0 Negative social-emotional comments noted *(reference to playing alone, parallel play, not interacting with other children, refusal to share with other children, or negative interactions with other children)*

Gross Motor (Activities/bean bag song)

- 1 No negative social-emotional comments noted
- 0 Negative social-emotional comments noted *(child did not participate in activity, child reluctant to join the circle with other children, refusal to follow song directions, did not respond to teacher’s redirection)*

Overall Social-emotional Comments *(noted on the screening cover page)*

- 2 No social-emotional concerns noted
- 1 Some social-emotional concerns noted
(Reference to being shy, initial difficulty separating from caregiver, mild attention difficulties that did not interfere with overall performance)
- 0 Serious social-emotional concerns noted
(Reference to strongly recommending DK to parents, needing the “gift of time,” attention difficulties that interfered with performance, or overall immaturity; difficulty separating from caregiver that remained throughout screening process; lack of interaction with other children; need for constant prompting, reassurance, or redirection from teacher)

Score Range: 0 - 6

Appendix C
Information Obtained from CA-60 Files

Front of CA-60 File

School History (Exclude child if child attended another district)

Child Name

Month and Year of birth

Gender

CA-60 Insert

Grade Level History

Grade attended, year attended, teacher name

MEAP Scores (affixed to back of insert)

Academic Achievement

DIBELS Scores

End of Year Report Card Scores

Additional Educational Information

Special Education Eligibility Documentation

Response to Intervention Documentation

Kindergarten Screening Informational Sheet

Age of Mother at birth of first child (calculated in combination with birth certificate)

Preschool Attendance

Kindergarten Screener

School Readiness Variables

Appendix D
End of Year Developmental Kindergarten Progress Report

ATTITUDES AND PRACTICES THAT AFFECT LEARNING

EXHIBITING SELF-CONTROL
SHOWING ACTIVE INVOLVMENT IN THE LEARNING PROCESS
SHOWING RESPECT FOR ADULTS AND CHILDREN
FOLLOWING DIRECTIONS
WORKING COOPERATIVELY
ORGANIZING SELF, MATERIALS, AND BELONGINGS
USING TIME WISELY
USING GOOD JUDGEMENT IN ASKING FOR HELP
DOING PERSONAL BEST ON CLASSROOM WORK

PHYSICAL DEVELOPMENT

PERFORMS SELF DRESSING TASKS
DEMONSTRATES SMALL MUSCLE CONTROL (CRAYONS, PENCILS, SCISSORS)

LITERACY

LISTENS ATTENTIVELY TO STORIES (FICTION/NON-FICTION)
SPEAKS IN SENTENCES USING AGE APPROPRIATE LANGUAGE
PARTICIPATES IN LANGUAGE ACTIVITIES
DEMONSTRATES CONCEPTS ABOUT BOOK (COVER, TITTE, FRONT TO BACK,
TOP AND BOTTOM)
RECOGNIZES RHYMES
RECOGNIZES FIRST NAME
WRITES FIRST NAME
IDENTIFIES LETTERS IN FIRST NAME IN RANDOM ORDER
INCREASING RECOGNITION O FUPPER CASE LETTER NAMES

MATH DEVELOPMENT

COUNT FORWARD 0 – 10
COUNTS FORWARD 0 – 20
USES 1 TO 1 CORRESPONDENCE TO 10
NAMES GEOMETRIC SHAPES (CIRCLE, SQUARE, TRIANGLE)
NAMES GEOMETRIC SHAPES (OVAL, RECTANGLE)
NAMES GEOMETRIC SHAPES (STAR, HEART, DIAMOND)
SORTS 4 OBJECTS BY SIZE
EXTENDS A TWO PART PATTERN
CREATES A TWO PART PATTERN
SORTS OBJECTS BY COLOR
SORTS OBJECTS BY SHAPE
RECOGNIZES COINS: PENNY
RECOGNIZES COINS: NICKEL
RECOGNIZES COINS: DIME

Appendix E
Social-emotional Measures from Kindergarten through Fourth Grade Report Cards

EXHIBITING SELF-CONTROL
SHOWING ACTIVE INVOLVEMENT IN THE LEARNING
PROCESS
SHOW RESPECT FOR ADULTS AND CHILDREN
FOLLOWING DIRECTIONS
WORKING COOPERATIVELY
ORGANIZING SELF, MATERIAL, AND BELONGINGS
USING TIME WISELY
USING GOOD JUDGEMENT IN ASKING FOR HELP
DOING PERSONAL BEST ON CLASSROOM WORK

Social-emotional Skills Rubric (for each statement)

- 3: Excellent
- 2: Acceptable
- 1: Not acceptable/Needs Improvement

Appendix F
Descriptive Statistics for Level 2 Factors

Table 21

Second Grade Descriptive Statistics

	<i>N</i>	Mean	SD	Minimum	Maximum
Level 2					
DK Attendance ^b	201	0.30			
Male ^b	201	0.49			
Age at K Entry ^a	201	0	1		
FRPL ^b	201	0.11			
Special Education ^b	201	0.06			
Attended Preschool ^b	201	0.51			

^a Continuous variables converted to *z* scores

^b Dichotomous variables where mean indicates proportion of participants

Table 22

Third Grade Descriptive Statistics

	<i>N</i>	Mean	SD	Minimum	Maximum
Level 2					
DK Attendance ^b	194	0.31			
Male ^b	194	0.50			
Age at K Entry ^a	194	0	1		
FRPL ^b	194	0.06			
Special Education ^b	194	0.03			
Attended Preschool ^b	194	0.88			

^a Continuous variables converted to *z* scores

^b Dichotomous variables where mean indicates proportion of participants

Table 23

Fourth Grade Descriptive Statistics

	<i>N</i>	Mean	SD	Minimum	Maximum
Level 2					
DK Attendance ^b	131	0.31			
Male ^b	131	0.49			
Age at K Entry ^a	131	0	1		
FRPL ^b	131	0.06			
Special Education ^b	131	0.03			
Attended Preschool ^b	131	0.88			

^a Continuous variables converted to *z* scores

^b Dichotomous variables where mean indicates proportion of participants

Table 24					
Fifth Grade Descriptive Statistics					
	<i>N</i>	Mean	SD	Minimum	Maximum
Level 2 predictors					
DK Attendance ^b	154	0.37			
Male ^b	154	0.45			
Age at K Entry ^a	154	0	1		
FRPL ^b	154	0.04			
Special Education ^b	154	0.04			
Attended Preschool ^b	154	0.81			

^a Continuous variables converted to *z* scores

^b Dichotomous variables where mean indicates proportion of participants

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