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Delaying Kindergarten Entrance by Participating in Pre-Kindergarten and Academic Achievement in Elementary School: Red-Shirting and Achievement Scores

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DELAYING KINDERGARTEN ENTRANCE BY PARTICIPATING IN PRE-KINDERGARTEN AND ACADEMIC ACHIEVEMENT IN ELEMENTARY SCHOOL: RED-SHIRTING AND ACHIEVEMENT SCORES

by

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The purpose of this ex post facto causal comparative study is to examine the academic achievement of students entering the educational system, that is, kindergarten, either through pre-kindergarten or no pre-kindergarten. Allowing me to examine "red shirting," a practice of giving children an additional year, in pre-kindergarten, to mature physically, socially, and academically before entering kindergarten. This study is important to school district personnel and parents whom need to make informed decisions concerning pre-kindergarten programs.

In this study, I compare the elementary academic achievement of students through 3rd grade, who delayed kindergarten entrance with those who did not delay. In an additional analysis, I break the two groups into two more groups: a group whose parents followed the recommendation of the kindergarten entrance readiness assessment proctor, and those who did not.

Overall, a review of the literature regarding school readiness decisions can be divided into the following four themes: (a) kindergarten history (Bryant & Clifford, 1992; Cuban, 1992; Ross, 1976), (b) delaying kindergarten (Aliprantis, 2014; Deming & Dynarski, 2008; Graue & DiPerna, 2000), (c) the impact of pre-kindergarten participation (Datar, 2006; Gormley, Granger, Phillips, & Dawson, 2005), and (d) differences in academic achievement of students who delay and do not delay the start of kindergarten

(Aliprantis, 2014; Buntaine & Costendbader, 1997; Magnuson, Ruhm, & Waldfogel, 2007; Raffaele Mendez et al., 2014). None of the studies examined local longitudinal data from a pre-kindergarten program. Also, none compare students who were and were not recommended for pre-kindergarten.

There is a statistically significant difference between the two main groups in the fall and spring of kindergarten. After kindergarten from 1st grade through 3rd grade there is no difference in test scores. There is a difference between all four of the groups during kindergarten in the fall and the spring. But the achievement data from the spring of 1st grade shows no difference between the students who were recommended for kindergarten by the kindergarten readiness screener, regardless of their participation in pre-kindergarten or not. In spring of third grade there is no difference noted between students who were recommended for pre-kindergarten by the kindergarten screener, regardless of their participation in pre-kindergarten or not.

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CHAPTER 1

INTRODUCTION

Americans, have grown up hearing common sayings such as, “the early bird gets the worm,” “bigger is better,” and “practice makes perfect.” All of these sayings suggest that the earlier you start something, the more you get of something, or the more time you have to practice, the better off or more successful you will be. Is this really the case when it comes to education, specifically pre-kindergarten programming? As an elementary principal, I am frequently confronted with this question by concerned parents naturally wanting to make the best choice for their children.

Every spring in the school district under study, a teacher proctor uses a universal screening tool to evaluate each potential kindergarten student’s school readiness. The screener is used to assess basic kindergarten skills, such as letter recognition, picture naming, and visual memory. The results of that screening are the basis of a recommendation made to each parent on whether or not a child should attend pre-kindergarten or kindergarten. This is a common practice in most West Michigan schools. Frequently, after receiving the results, parents want to discuss the recommendation and their decision with more than just the teacher who screened their child, and that is when I, as the school principal, am brought into the conversation.

Over the years, early childhood educators seemed to believe that many children would benefit from a year of pre-kindergarten participation before starting kindergarten (Graue & DiPerna, 2000). Yet, outside the world of early childhood educators, the advice seems to be mixed (Broson, 2009; Weil, 2007), leaving me wondering what really is best for kids. This is an important decision for parents and their children. Many

factors, beyond just the universal screener recommendation, should be considered by families, by early childhood educators, and by policy makers. I wanted to have more information to help guide parents in this decision for their child. Therefore, for this study, I looked into the "gift of time," otherwise known as "red shirting," and how this practice can impact students both as they begin school and throughout early elementary grades. The gift of time is a term commonly used by early childhood educators when they promote giving children more time in an early childhood pre-school or pre-kindergarten program before they enter the traditional K-12 school (Graue & DiPerna, 2000). I also looked at how parents' decisions about delaying or not delaying kindergarten participation might have impacted their child in the future.

To understand my study there is some key terminology related to this topic. *Pre-school* refer to programs that children attend and participate in prior to becoming eligible for entering the K-12 education system; pre-school generally serves 3 and 4-year-old children. When students are age 5 and wait to start kindergarten, even though they are eligible based on their age, they often participate in a *pre-kindergarten* program; such pre-kindergarten programs have many different names (i.e., Young Fives, Developmental Kindergarten, or Transitional Kindergarten), but for the purpose of this study, I refer to all of these programs as pre-kindergarten programs. As noted previously, voluntarily delaying the start of kindergarten for a year has become known as *red-shirting*, or occasionally termed *the gift of time*, in the education field (Graue, 2000).

Background

Kindergarten was first started in Germany in 1837 by Friedrich Froebel, when Froebel gave his school, which served children age 3 through 7, the name "Kindergarten," which literally means "children's garden" (Ross, 1976). Private schools

started offering kindergarten programs in the United States soon after Froebel, but the first public kindergarten program was not offered in the United States until 1873 (Bryant & Clifford, 1992).

The initial public kindergarten programs were established with the intent of being a solution to grave urban problems; many advocates of kindergarten sold the program as a way to develop ethical, healthy, industrious children out of unhealthy and neglected 4 to 6 year olds (Cuban, 1992). Kindergarten teachers would work with the children in the morning and then do home visits in the afternoon, speaking with parents about the importance of cleanliness and citizenship (Cuban, 1992). These initiatives were successful in serving children and families, and this success helped kindergarten become a respected part of a school district's educational offerings.

Initial kindergartens in the United States followed Froebel's philosophy of educating children using play, outdoor experiences, music, and movement (Bryant & Clifford, 1992). As public kindergarten programs became more common, they joined the traditional 1st through 6th grade buildings, often just serving 5-year olds. This connected kindergarten teachers and students more closely with early elementary educators and students, resulting in a slight shift in expectations for both kindergarten and first grade. In the first half of the 20th century, as more immigrants came to the United States and urban areas continued to grow with the industrial advances, kindergarten programs became an integral part of the public school system (Cuban, 1992).

During the history of kindergarten in the United States, there have been shifts in priorities and curriculum. These shifts swing back and forth between being a child-centered, active learning experience, to having a rigorous focus on academic skills, independence, and sitting still (Cuban, 1992). In the 1960s, schools came under new

pressure with the launch of Sputnick, the publishing of *Why Johnny Can't Read*, and a new societal focus on children in poverty and creating equality. All school programs, including kindergarten, experienced new reforms (Bryant & Clifford, 1992). It was during this time that President Johnson declared war on poverty when he took office in 1963, and Johnson used many of the same arguments that first supporters had made for kindergarten back in the late 1800s to promote Head Start, a pre-school program, for 3 and 4 year olds, aimed at providing support to children and families (Vinovskis, 2005). Looking at it from a historical perspective, pre-school programs, specifically Head Start, were being implemented to solve the same societal issues kindergarten was originally created to solve -- neglected children, and poor parenting skills.

Changes to the education system, under the leadership of President Johnson, continued during the 1960s. In 1965, President Johnson signed the Elementary and Secondary Education Act (ESEA), viewed as the most sweeping education bill up to that time to ever come before Congress (Reed, 2016). The ESEA first impacted schools with its focus on greater racial equity in education and its Title I funding supports for high poverty schools, and was the first major legislation that started public schools in the United States down a road of accountability and standardization through federal mandates and financial carrots (Reed, 2016). In the 1970s, the ESEA and Congress focused on educating special needs and handicapped students. Then in the 1980s, the *A Nation at Risk* report (1983) was released putting the focus back on improving academics and performance for all students. This trend towards accountability and more oversight for schools continued with the passing of The No Child Left Behind (NCLB) bill by Congress in 2001, later signed into law by President Bush in 2002. NCLB mandated the implementation of statewide accountability and annual standardized testing of students in

mathematics and reading, NCLB was succeeded by the *Every Student Succeeds Act (ESSA) of 2015*, continuing the focus on accountability.

Such historical legislation, along with the increase in pre-school participation by students, lead to changes in kindergarten programs and curriculum (Goldstein, 2007). The increase in accountability for the public schools by the government, and focus on student achievement measured by standardized tests, has put pressure on schools and teachers. Kindergarten students are experiencing less free play in their day and students are being instructed on more complex academic skills (Goldstein, 2007). Instead of kindergarten teachers working to prepare students to start to learn how to read in 1st grade, kindergarten instructors work to teach students how to read before 1st grade. The rigor has changed the educational experience of kindergarten students.

Since schools are given the task to educate all students -- minority, poor, and the disabled -- many schools started offering pre-kindergarten programs to help meet the additional expectations and mandates. Such pre-kindergarten programs for young 5-year-old students, or socially, academically, or emotionally immature 5-year-old students, have been gaining in popularity. A National Center for Education Statistics 2010-2011 survey found that 12% of children age 5 to 6 had delayed kindergarten school entry or were planning to delay (NCES, 2013). A survey from 2007 found that in some more affluent areas the percentage was as high as 25% (Bronson, 2009).

This shift in the curriculum expectations for kindergarten has resulted in an ongoing debate among stakeholders (National Association for the Education of Young Children, 2002). Even with the support for early childhood education programs by many stakeholders, the gradual change in early childhood education curriculum - from school readiness to rigorous academics - over the last few decades has caused many to speak out

(Cannon, Jackowitz, & Painter, 2006; Graue, Kroeger, & Brown, 2003; Goldstein, 2007). Child development experts, teachers, and parents question if the current academic expectations in kindergarten are appropriate for young children under the age of 6. This debate has helped promote pre-kindergarten programs, essentially introducing the social readiness for school curriculum originally provided in kindergarten, with an extra year of schooling prior to kindergarten. But the questions still remain if the benefits children and communities experience from pre-school programs are also experienced for pre-kindergarten programs, and what happens when students delay by one-year entry into kindergarten programs.

Problem Statement

Parents today want to do everything they can to help set their children up for success. A quick internet search reveals this concern: What sunscreens are best for our kids? What should we feed our children? How much sleep is enough? How much screen time is too much? Each of these issues is important to parents. The stakes are even higher with the decision of when a child should begin their K-12 educational experience.

As with most states, once a student turns five years old in Michigan, they have the opportunity to move into a universally provided K-12 public education system. In addition to kindergarten programming, many districts offer pre-kindergarten programs to families. In Michigan during the 2017-2018 school year, just over 44,000 students were enrolled in pre-kindergarten programs with about 116,000 students enrolled in kindergarten (Michigan Center for Educational Performance and Information [mischooldata], 2018). Many school districts give incoming kindergarten students a screening, or assessment, to help determine their school readiness. Using information

from a universal screener, the district provides parents with a recommendation on whether their child should participate in kindergarten or a pre-kindergarten program. Despite the recommendation made, I am seeing a trend where many parents are choosing to delay their students' kindergarten entry by choosing to attend a pre-kindergarten program, some in support of the screening recommendations and some contrary to the recommendations. When they delay their child's school entry in the suburban district in which I am the principal, parents can choose to have their child attend a prekindergarten program, and then enter kindergarten a year later.

Such red shirting has become an increasingly popular strategy over the past 40 years, for a variety of reasons. Some families red-shirt their child so that he/she will have a competitive advantage when starting school, as the child will be smarter, bigger, and faster than classmates (Albanesi, 2017; Graue & DiPerna, 2000; Weil, 2007). Others decide to red-shirt because they feel their child is not mature or developed enough to master the kindergarten curriculum, as kindergarten has become more academically focused (Diamond et al., 2000; Marshall, 2003; Shepard & Smith, 1986). Many parents are concerned that other parents are delaying the start of kindergarten for their child, so if they choose not to delay, their child will be the youngest, and therefore smaller and less capable, even though technically they started on time (Weil, 2007). Another factor that motivates parents, specifically parents of boys, is how being older or younger will affect their child's success in sports (Wiel, 2007). In the late 1960s most six-year-olds were enrolled in first grade, with 96% of them in 1st grade or above. In 2005, the percentage of six-year-olds in 1st grade was down to 84% because a significant number of six-year-olds had been red shirted and attended pre-kindergarten (Deming & Dynarski, 2008, p. 71). The change in the percentage of six-year-old 1st grade students illustrates a large increase

in the number of students who are delaying their start in the K-12 education system (National Center for Education Statistics [NCES], 2013).

Previous research has documented the benefits of early childhood education, which by definition is from the ages of birth to 8 years of age (Cox, 2009; Heckman, 2011; Henry, Gordon, & Rickman, 2006; Muennig et al., 2009). Many studies have shown children who participate in a quality early childhood program before entering the K-12 system are better prepared for school and are able to be more successful as they start their school career (Fitzpatrick, 2008; Henry et al., 2006; Muenning et al., 2009; Valdes, 2011; Xiang & Schweinhart, 2011). Students who have attended a pre-school program also perform better on initial academic tasks and adapt more quickly to classroom and school routines and expectations (Datar, 2006; Gormley, Granger, Phillips, & Dawson, 2005). Research supports that any pre-school program, state supported or private, better prepares students for kindergarten and positively impacts student's achievement in kindergarten (Henry et al., 2006).

Yet research has shown that as students continue in school, the boost gained by having been in pre-school and/or being one year older slowly fades away (Aliprantis, 2014; Deming & Dynarski, 2008; Lincove & Painter, 2006; Martin, 2009; Oshima & Domaleski, 2006; Raffaele Mendez et al., 2014). In fact, research does not support academic achievement gains beyond those realized during early elementary as a result of delaying the start of school (Buntaine & Costendbader, 1997; Knifflin & Hank, 2015; Magnuson, Ruhm, & Waldfogel, 2007, Schanzenbach, 2017).

In addition to not showing positive academic gains, research is showing negative long-term effects of delaying the start of kindergarten (Martin, 2009). Some have noted that students who delay their school start and participate in pre-kindergarten can begin

their school career actually feeling like a failure (Graue, 1993). When researchers looked at behavioral data, and not academic, they found that students who participated in pre-kindergarten, rather than starting kindergarten as a 5-year-old, had a higher incident of office referrals and more documented behavioral incidents than students who did not attend pre-kindergarten (Byrd, Weitzman, & Auinger, 1997; Magnuson et al., 2007). When comparing IQ, life-long earnings, and educational attainment, students who delay kindergarten and attend prekindergarten programs instead, do not fair as well as students who attended kindergarten on time (Deming & Dynarski, 2008). Therefore, looking at the benefits and costs of this decision is important not just at the individual student level but to society as a whole.

Overall, a review of the literature regarding school readiness decisions can be divided into the following four themes, with more details to come within Chapter 2: (a) kindergarten history (Bryant & Clifford, 1992; Cuban, 1992; Ross, 1976), (b) delaying kindergarten (Aliprantis, 2014; Deming & Dynarski, 2008; Graue & DiPerna, 2000), (c) the impact of prekindergarten participation (Datar, 2006; Gormley, Granger, Phillips, & Dawson, 2005), and (d) differences in academic achievement of students who delay and do not delay the start of kindergarten (Aliprantis, 2014; Buntaine & Costendbader, 1997; Magnuson, Ruhm, & Waldfogel, 2007; Raffaele Mendez et al., 2014).

Despite such research, there are two main deficiencies in previous studies. First, none of the studies looked at local longitudinal data from a pre-kindergarten program that is open to all families regardless of income, or birth month. Second, none addressed using a common kindergarten screener and screening tool, and comparing students who were and were not recommended to delay the start of kindergarten. Considering many schools use a screener, looking at the effectiveness of its results and a parent's ultimate

decision to follow or not follow the school's recommendation is important.

Purpose Statement and Research Questions

The purpose of my ex post facto causal comparative study was to examine the elementary school academic achievement (kindergarten through third grade) of students entering the educational system through either pre-kindergarten and then kindergarten, or through kindergarten with no pre-kindergarten. This allowed me to examine the benefits of red-shirting, the practice of giving children an additional year to mature physically, socially, and academically before entering the K-12 school system. In this study, red-shirting was operationalized to mean students who delay the start of kindergarten to attend a pre-kindergarten program, based on the choice of the parents, despite having received a recommendation from the school and kindergarten readiness screener to begin kindergarten.

This study compared the elementary academic achievement of students through 3rd grade, who delayed kindergarten entrance with those who did not delay, resulting in two main groups to compare. The study went on to break down those two main groups based on parents who followed the recommendation of the kindergarten entrance readiness assessment proctor, and those who did not. The readiness assessment, or screener, is a common tool all incoming kindergarten students take to help determine their readiness for kindergarten. Students rated by the screener as less ready are recommended by the school district to attend pre-kindergarten, thereby delaying kindergarten until the following school year. This created four sub groups of students to compare: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and

went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

My specific research questions were:

1. Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

   (a) students who attended pre-kindergarten, and

   (b) students who did not attend pre-kindergarten and attended kindergarten?

2. Is there a statistically significant difference in such academic achievement between four sub groups of students:

   (a) students who were recommended for pre-kindergarten and went to pre-kindergarten,

   (b) students who were recommended for pre-kindergarten but went to kindergarten,

   (c) students who were recommended for kindergarten and went to kindergarten, and

   (d) students who were recommended for kindergarten but went to pre-kindergarten?

3. Can academic achievement on the 3rd grade M-STEP math and/or reading assessment be predicted from following the screener recommendation to delay or not delay the start of kindergarten, when holding constant kindergarten DIBELS achievement, age, gender, and free and reduced lunch eligibility?

This study will be significant to all school districts, as well as to parents, when making

the decision to offer a prekindergarten program or have their children attend a prekindergarten program.

Conceptual Framework and Narrative

In Michigan, when a child turns five years of age parents have the opportunity to enroll them in the public K-12 school system. Due to the fact that schools do not enroll students on an ongoing basis, the state has a cut off birth date for entry into kindergarten each school year. Michigan's cut off date when data was collected for this study was December 1.

It is believed that in early grades, age makes a large impact on performance. The *Relative Age Effect Theory* (RAE) states that children in the same grade, or calendar year, can have their performance impacted by their relative age within that grade, or year (Barnsley, Thompson, & Legault, 1992). If we were to look at children in the same grade in a Michigan school, some are born in November right before the December 1 cut off, and some students are born in December right after the December 1 cut off date. The students born in November would be almost a full year younger than students born after the cut off date. According to RAE, the November birthday students may perform below the December birthday students on many tasks solely due to the difference in age. In fact, some studies support the RAE theory, demonstrating that older students within the same grade during early childhood perform better on achievement tests and are identified less often for needing interventions and supports (Campbell, 2014; Dheuy & Lipscomb, 2010). Other studies, such as the red-shirt studies cited earlier (Buntaine & Costendbader, 1997; Byrd, Weitzman, & Auinger, 1997; Magnuson, Ruhm, & Waldfogel, 2007; Martin, 2009) found that any benefit fades over time.

In addition to academic-focused research, the RAE has been studied often in the

world of sports (Gladwell, 2008). Malcolm Gladwell, in his book *Outliers*, explains how in the world of junior elite hockey almost 40% of the players will have been born between January and March, and only 10% are born between October and December. This demonstrates a clear advantage to junior hockey players born at the beginning of the year having an older relative age compared to junior hockey players born at the end of the year (Gladwell, 2008). Studies by Allen and Barnsley (1993) also support Gladwell showing RAE impacted selection in the National Hockey League draft. Yet, what impact does RAE have on students as they enter school?

My study examined the results of a system by which incoming students progress through one West Michigan school district. Students who enter the K-12 education system in this district can be separated into four groups based on a common universal screener to determine readiness to enter kindergarten: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

Figure 1 illustrates my study in which two main groups of students were compared: those who attended prekindergarten before entering kindergarten, and those who attended kindergarten without having attended prekindergarten. Within those two main groups there are two subgroups each: children whose parents followed the screener recommendation and those who did not, making four groups of students. Groups "1" and "4" are those who could have entered kindergarten but delayed and enrolled in pre-kindergarten instead; they are considered red-shirted students, or those who were age 6 when finally attending kindergarten. Groups "2" and "3" are those whose parents choose

not to delay the start of kindergarten, thus starting kindergarten on time or at the age of 5.

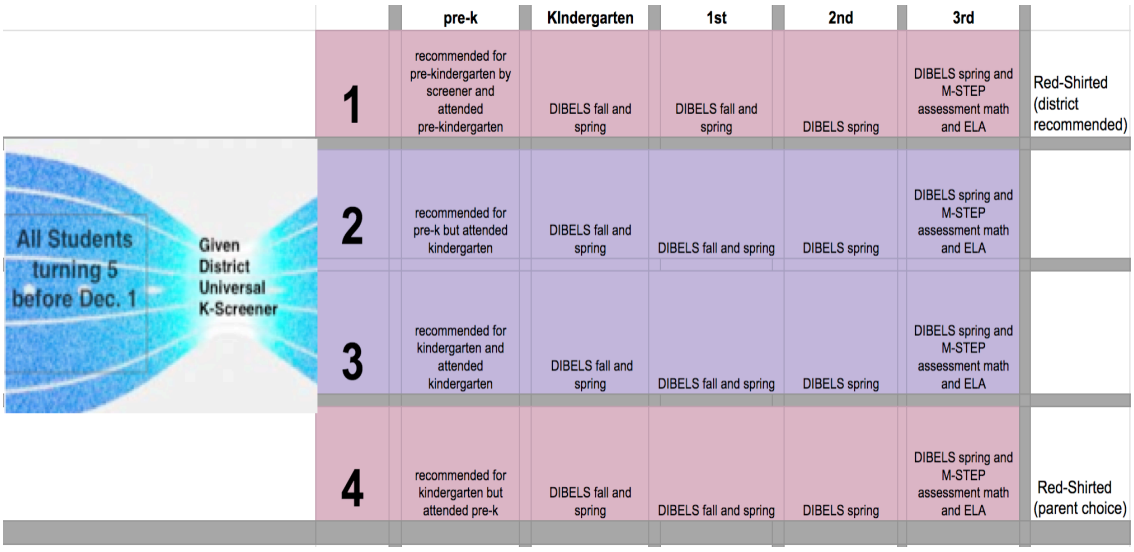

Figure 1. Conceptual framework (Postle-Brown, 2019).

Methods Overview

This is an ex post facto causal comparative, quantitative study. Ex post facto causal comparative research seeks to find a relationship between an independent and dependent variable after an event, action, or treatment has occurred (Creswell, 2014). Such research is common in the field of education, since providing a treatment or denying students a possible opportunity would often be unethical to the students or research participants: Ex post facto is from a Latin term that means, from a thing done afterwards; in research design it indicates a study in which the independent variables represent actions already taken and have not been manipulated by the researcher (Field, 2013). All data was extracted from existing data bases maintained by the school district. This study examined data for approximately 1,479 students.

For my study, the treatment or independent variables were the age at which students started a kindergarten program, and whether the parents followed the district

recommendation or not. These independent variables were determined for four separate groups: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

The dependent variable in this study is the academic achievement of the students in groups 1, 2, 3, and 4 based on the results of their spring DIBELS benchmark assessment in kindergarten, 1st grade, 2nd grade, 3rd grade and their third grade M-STEP math and English language arts assessments. These students were assessed at every grade level using DIBELS, which helps determine a student's early literacy and reading skills. All students also took the state mandated assessment, the Michigan Student Test of Educational Progress, or the M-STEP starting in third grade. Using these assessments, the academic achievement scores for these students from each of the four groups were compared.

Quantitative data was analyzed using two statistical tests: a one-way ANOVA and a multiple regression. Field (2013) recommended an ANOVA when comparing several means from groups that come from the same entities, where multiple regression is used to build a model that can predict the outcome of a dependent variable based on more than one independent variables. Using several ANOVAs, the relationship between academic achievements for each of the four groups of students was examined. A multiple regression model was also developed to try to predict success on the M-STEP test in both reading and math from the following variables: DIBELS achievement in kindergarten, delaying or not delaying kindergarten, age, gender, and free and reduced lunch eligibility.

From this study, I wanted to determine if delaying and participating in a pre-kindergarten program or not delaying kindergarten is connected to later academic achievement. I was also seeking to find if there is any difference in the achievement of the student groups based on if they followed or not the recommendation of the screener. This study also looked to see if a predictive model for academic achievement using kindergarten programming and other demographic variables could be built.

Chapter I Closure

This chapter has offered an overview of my study on the issue. The literature review in the next chapter will provide a summary of the current research on the topic, where chapter 3 will offer details on my methods.

CHAPTER II

LITERATURE REVIEW

The literature review of this topic starts with a look at the history of kindergarten and how kindergarten curriculum has shifted over time. The literature review continues with the focus on kindergarten looking at the change from a half-day program to a full day program, and the philosophy differences between educators who believe kindergarten should be ready for all students, or that all students should be ready before beginning kindergarten. The theory explored for this study is the Relative Age Effect theory. Discussing the historical and current trends in red shirting, or delaying kindergarten entry for students is another key aspect of this literature review. The final section of this literature review, takes a closer look at research on the academic achievement and social emotional development of students who attended pre-kindergarten programs and delay kindergarten entry.

History of Kindergarten

As stated in Chapter 1 a Germany educator, Fredriech Froebel, was the first to introduce kindergarten educational programs (Ross, 1976). Froebel had a school for children ages 3 to 7 years old. Froebel had a very specific teaching method. His philosophy was to educate through play, music, movement, outdoor experiences, creativity and independence. Froebel believed after the age of three a child should be overseen by a properly trained teacher. This view differed from his mentor who believed a child's mother should be the child's sole influencer until the child is 6 or 7 years old (Bryant & Clifford, 1992). Froebel developed the first kindergarten curriculum with teaching resources he referred to as "gifts." The curriculum series had 10 objects or "gifts," which Milton Bradley first manufactured on the commercial market in 1871.

An educational pamphlet in 1856 by *The American Journal of Education* first published Froebel's ideas in the United States (Bryant & Clifford, 1992). Later that same year one of Froebel's students opened a kindergarten program in Wisconsin for her own daughter and a few of her friends. Private schools continued to open kindergarten programs across the United States. Elizabeth Peabody, publisher of the *Kindergarten Messenger*, and Froebel fan was a major advocate of play-based kindergarten (Ross, 1976). Peabody communicated with Torrey Harris, Superintendent of St. Louis Public Schools and after much back and forth convinced Harris to establish the first public kindergarten program in 1873. St. Louis was the first city but many other public school systems followed suite in the years to follow. Along with Peabody a young woman named Susan Blow who studied kindergarten education under Maria Boelte, a mentee of Froebel, also promoted a kindergarten program to Harris. Susan Blow taught in the St. Louis kindergarten program during the inaugural year of 1873; after that Blow opened a public school training system in St. Louis for kindergarten educators.

Kindergarten programs continued to grow and hundreds of public kindergartens were established by the 1880s. During this time Henry Barnard was the U.S Commissioner on Education and wrote many articles in support of kindergarten (Barnard, 1881). Having Barnard as a major supporter not only helped kindergarten programs grow in numbers it also helped keep inline with Froebel's original philosophy of creative play and exploration.

Even in the late 1800s kindergarten struggled with its identity. When kindergarten joined the public school system, teachers in grades above pressured kindergarten teachers to help prepare students for their grades by teaching students how to sit and pay attention, and by pushing back on the philosophy of free play (Ross, 1976).

Froebel followers advocated for a whole child approach supporting each student's creativity and spontaneity, and a debate soon began on where the priorities of kindergarten should fall; on free play or on structure and preparation for future grades.

Patti Hill, a former kindergarten teacher and professor at Teachers College, had a large voice in the kindergarten debate (Bryant & Clifford, 1992). Hill was an advocate for whole child education, with priorities on play and gross motor activities. Hill's answer to how to help 1st grade teachers was to lighten the responsibility in 1st grade and make it more like kindergarten. Hill thought that one of the best aspects of adding kindergarten to our public schools was the addition of new ideas and new teaching strategies that kindergarten brought to the schools.

Prompted by strong whole child educational advocates like Hill, kindergarten programs stayed very student centered. Children were encouraged to play, move, sing songs, and express themselves. This philosophy created a curriculum where students in kindergarten programs learned actively by doing and experiencing, not by sitting and listening to lectures (Bryant & Clifford, 1992).

Overall, kindergarten is evidence that institutions can successfully reform and lasting changes can be made (Cuban, 1992). Kindergarten started in the United States as an additional program offered at a small number of private schools in the mid 1800's, growing to a select number of public schools in the late 1800's, and by World War II kindergarten was a main stay in most public school systems. The traditional elementary school went from a 1-6 grade school building to a K-6 school building. Cuban (1992) suggests the reform of kindergarten lasted because society saw it as one of the only initiatives that had the capacity to save families and improve poverty and urban decay. Cuban states, "kindergartens sought to rescue children and their parents from poverty and

ignorance and bring them into full-fledged citizenship" (p. 173).

Shifts in Curriculum

Throughout the history of kindergarten, the pendulum has swung between free play and creativity and preparing students for the rigorous demands of future schooling (Clifford & Bryant, 1992; Ross, 1976). Kindergarten has been used to educate children out of poverty and support parents in poverty by providing assistance and resources. These goals were clearly illustrated in the initial kindergartens in San Francisco (Cuban, 1992). Advocates for kindergartens in San Francisco started pointing out the benefits of investing in the program early on, highlighting the change agent kindergarten could be. Race was also a factor that influenced the early adoption of kindergarten programs. In the South there was a movement to save young black children from poverty and criminal activity by continuous early training through a kindergarten program. Advocates of kindergarten stated that they believed chain gangs that were full of young black men could be abolished completely by enrolling young African American children in kindergarten programs (Cuban, 1992).

Along with supporting the children kindergarten programs and teachers were also playing a large role with families. After direct instruction to children in the morning, in the afternoon kindergarten teachers would do home visits and offer informational sessions for parents on cleanliness and citizenship. Cuban (1992) described the goals of kindergarten in the late 1800's as ones that could still be true; uplift the illiterate, build solid citizens, relax the uniformity of elementary schooling. Many proponents for kindergarten programs hoped the learning by doing and the creative aspect of kindergarten would filter into the 1-6 grade classrooms.

As kindergarten programs became more popular in the early 1900's the role of the

teacher shifted. Many schools reorganized their schedules so kindergarten teachers no longer had time to meet with families and do home visits in the afternoons (Cuban, 1992). Also pressure increased for kindergarten to prepare 5-year-old students for first grade, shifting the focus from social and societal supports to academic and student compliance.

Over the years the requirements for kindergarten teachers increased going from needing no formal training, to 1-2 years of training, to a full four-year degree, depending on the state time lines varied (Cuban, 1992; Ross, 1976). This change in teacher credentials played an important role in the shifts in priorities in kindergarten, since such teachers were being trained in a similar fashion to other 1-6 grade instructors, and they also lost much of the time they had to make connections with families. These changes created an environment where the original goals and ideals of Froebel were easily being lost.

Legislative mandates that started with the 1965 Elementary and Secondary Education Act, ESEA, shifted more pressure on educators and school districts to make kindergarten more rigorous and academic in focus (Reed, 2016). The legislative mandates have continued, with the goal of improving student achievement and later life success. After ESEA, President Bush signed, The No Child Left Behind Bill, in 2001, NCLB, (No Child, 2002). The push for more accountability was further promoted by President Obama in 2009 with the introduction of his Race to the Top grant funding; many states competed to receive a piece of the 4.5-billion-dollar grant funding, including Michigan (USDE, 2010). Then in 2015 President Obama signed the *Every Student Succeeds Act (ESSA)*. All of these Acts impacted kindergarten curriculum and continued the shift from an exploration and welcome to school program to an academic program

focused on getting students reading and doing arithmetic sooner.

Every generation has felt the pull of the pendulum in kindergarten from play based to academic focused. Shepard and Smith (1988) noted the increase in academic demands in kindergarten compared to 20 years earlier. In addition to the past reasons for the shift Shepard and Smith shared new reasons perpetuating the shift: screening of students, delaying entry, kindergarten retention, and the increase in entrance age causes the typical kindergarten student to be older and more prepared so teachers create more demanding work and the cycle continues. In 1988 Shepard and Smith were surprised that almost 18% of principals noted that their school taught reading to all kindergarten students; while today in 2018, reading is required to be taught in kindergarten based on the common core literacy standards (Common Core Standards Initiative, 2010). Additional reasons for the change in academic demands within kindergarten during the 1980s were; increases in pre-school participation, Sesame Street, and parent demand (Shepard & Smith, 1988).

In recent years many kindergarten instructors continue to feel a pull between implementing developmentally appropriate practices into their daily classroom activities and meeting the demands of the grade level standards and preparing their students for future high stake tests (Goldstein, 2007). In 2007, Goldstein shared her qualitative study focused on two kindergarten instructors and how they felt about the changes in the curricular expectations in their classrooms. The study highlighted a dilemma facing many kindergarten teachers illustrating how hard it is to ensure students are receiving developmentally appropriate instruction while still meeting the high expectations being placed on them by their school district, and state and federal mandates. Goldstein noted:

> We are really building a foundation for the kids, and [to do that]

> we need to let them be five years old and not expect them to be ten years old in the classroom. 5-year-olds have different needs than 10-year-olds would have as far as the amount of time they can stay on a task. They need some play time because that's how they learn best. And they need to experiment with things (p. 46)

She also noted: one teacher "experiencing 'this pressure to do, do, do' that she had never felt before, adding 'I don't see how I could make them do much more than we do [already]!'" (p. 48).

Two common sources of pressure for kindergarten teachers beyond legislative mandates and their district expectations are the parents of their students and the 1st grade teachers, and other upper elementary grade instructors (Goldstein, 2007). Many parents believe that rigorous closed ended activities, like worksheets, demonstrate a high level of achievement in contrast to open-ended play, creation, and problem solving. At times parents even push to have homework sent home for their kindergarten students. Trying to meet the expectations of parents has caused many classrooms and school districts to shift their instructional focus in kindergarten.

Teachers in 1st grade and beyond have high pressure placed on them as well. When students enter their classrooms without the mastery teachers believe they should have from previous grades it causes stress and anxiety (Goldstein, 2007). Often that stress motivates teachers in upper grades to request more academic focused instruction in kindergarten and to work on standards that are beyond what would be developmentally appropriate to expect for a kindergarten student.

Moving from Half Day to Full Day Kindergarten

As outlined in the previous paragraphs, when the idea of kindergarten was first introduced; the focus was on helping introduce parents and students to public schooling and to service families in the areas of ethics, citizenship, and cleanliness. The half-day kindergarten program was perfect for these goals, providing instructors time with students and time for home visits with families (Cuban, 1992). As legislation mandates continued and society's focus on student achievement was promoted, the goals of kindergarten started to shift towards preparing children for first grade and academic performance. This continued shift to academically focused kindergarten curriculum lead to the push for full-day kindergarten programs over half-day programs (Cannon, Jackowitz, & Painter, 2006). Full-day kindergarten programs were implemented partially based on the perceived benefits for learning and future academic achievement (Cannon et al., 2006). In Michigan, many districts started full-day programs on their own, but then in 2012, the Legislature changed kindergarten-funding laws requiring districts to provide full day kindergarten in order to receive full day funding for such students. This created a major shift across the state, largely increasing the number of full-day kindergarten programs and greatly reducing the number of half-day kindergarten programs (McNally, 2011). Although kindergarten participation is not mandated in most states, almost all students attend a formal kindergarten program, and most kindergarten students are attending full day courses, not half days as they previously were (Ferguson, 2015). Based on recent census data currently 76 percent of kindergarten students nationally were in full day programs compared to 24 percent in half-day programs (Dietzer, 2017).

School districts moved to full days over half-days to provide more time for academic curriculum during kindergarten (Canon et. al, 2006). There was support on

both sides by child development experts for the move to full day kindergarten programs; some felt more time would allow teachers to slow down their pace and offer more free play, others were afraid more time would increase amount of work and academic demands to a level that would not be appropriate for young children. There was a lack of research evidence to support full day kindergarten. For example, Cannon et al. (2006) examined the effects of students attending full day kindergarten compared to half day kindergarten. This study used a longitudinal data set from the National Center for Education Statistics (NCES) and looked at academic achievement during Kindergarten, 1st grade, 2nd grade, and 3rd grade. Attending full day kindergarten made a statistically significant impact on math and reading achievement in kindergarten, but by the end of first grade the difference in reading achievement was gone and the difference in math achievement was greatly reduced. By 3rd grade there was no difference found between full day kindergarten and half-day kindergarten in math or reading achievement. No statistically significant differences in behavioral incidents were found between the students attending half-day and full day programs either. Cooper et al. (2010) and the Community Preventive Services Task Force (2014) reported the same findings in that any academic achievement boosts gained from attending full day kindergarten as compared to half-day kindergarten wore off prior to 3rd grade.

Readiness for Kindergarten: Change the Child or Change the Program

In 1995 the National Educational Goals Panel stressed the importance for young children to be ready for school and kindergarten (Diamond et al., 2000). Diamond et al. (2000) described two schools of thought. One school of thought put the burden of readiness on the child and recommended an extra year of time for any student who was not ready to learn, and another school of thought espoused the belief that all children are

always ready to learn as long as the content is taught in a developmentally appropriate manner that met each individual student needs. Marshall (2003) expanded on the idea of school readiness and stated that the only ethical screener to use to keep a child out of kindergarten is their chronological age. When children are red-shirted they come to kindergarten with more skills; when teachers have a group of children with more skills they increase their expectations, creating a cycle (Graue et al., 2003; Marshall, 2003)

Marshall (2003) stated that having an extra year with a "dumbed down" curriculum and attaining an older age had no positive benefit on academic achievement beyond 1 year. Her literature review article discussed some reasons for recommending red-shirting students and gave early educators advice on how to answer questions on delaying kindergarten. She suggested advocating for more developmentally appropriate kindergartens and sharing the research that demonstrates there is no academic gain beyond third grade and the social emotional effects to the child are generally negative. Graue and DiPerna (2000) conducted a study reviewing over 8,000 student records that was a representative sample from Wisconsin school districts. They looked at patterns of school entry, delay, and retention as well as academic achievement. Graue and DiPerna asked the reader to start thinking of the gift of time as the theft of opportunity, since a majority of the research supports not delaying school entry.

When schools sort students into two groups one ready for kindergarten and one not ready for kindergarten, they are actually saying the school/teacher is not ready to teach those students (Gruae et al., 2003; Marshall 2003). When screening and sorting does begin to happen, educators rate listening, feeling confident, and following directions as important school readiness skills, whereas parents rated math, reading, and writing as the important school readiness skills. This difference in priority between what educators

feel students need to be ready and what parents feel students need to be ready creates more confusion when it comes time for parents to make a decision on starting kindergarten. Gruae et. al (2003) discussed the idea that "being young" is used as a negative term by kindergarten teachers. When the teachers describe a child as young they believe the child is often not ready for kindergarten, immature, and not as capable as their peers. Often students are viewed through the lens of the next year expectations; if student A cannot sit quietly and complete work independently she will never be ready for 1st grade so she will need more time in kindergarten or need to delay kindergarten.

Owen et al. (2015) examined kindergarten readiness screeners in one school district with 252 incoming K students. Owen et al. (2015) were interested in studying if in addition to academic screening and teacher observations if adding a parent questionnaire to the kindergarten screener could help better identify at risk students. Owen found that academic screeners alone were not as accurate as when a parent questionnaire that focused on social and emotional development was added to the screening tool in predicting future academic struggles. Owen makes a case for districts to use a parent questionnaire as a screener to provide early interventions for social and emotional skills and not use it to sort kids for delayed school entry.

Graue et al. (2003) pointed out that often students are seen as not ready for kindergarten based on preconceived developmental benchmarks of the kindergarten teachers. Graue (2000) suggested that if teachers took on the mind set that students who are not ready for certain tasks need to be taught differently instead of held back all students would have a better kindergarten experience.

Relative Age Effect

Relative Age Effect, RAE, refers to the difference in ages by birth date for

individuals grouped in the same year or age cohort (Barnsley & Thompson, 1985). For example, if the cut off date for school entry is September 1, a child who enters with the birth date of August 31 is almost a full year younger then the child whose birth date is Sept. 2. As children grow and engage in more experiences they learn more and mature physically, mentally, and emotionally; therefore, as a student increases in age they also increase in ability (Barnsley et al., 1992). For this reason, when trying to group children age is often used. Within an age group in sports or in school generally the students who are relatively younger in the group do not perform as well. Barnsley et al. (1992) found statistically significant evidence that in youth hockey and youth football leagues relative age impacts a child's success. Due to the RAE recommendations for changes in how the youth sports leagues group students such as combining students born in the same quarter of the year together, a similar recommendation can be made for elementary school class groupings (Juan-Jose et al., 2015).

Barnsley and Thompson (1985) discussed why it is necessary to have a strict cut off age when setting policies for school entry. The logistics of trying different methods of grouping and determining readiness for children are limiting for full-scale implementation. Also due to children changing so rapidly at this young age, having students assessed using a kindergarten readiness screener, months before school starts, could give inaccurate results; what a student could do six months prior is not what they can do today. Barnsley and Thompson (1985) reported that younger students are more often identified as students with learning disabilities, and that these students with learning disabilities share some of the same disadvantages of younger students without learning disabilities when compared to older peers (Barnsley & Thompson, 1985).

In 2008 Malcolm Gladwell published, *Outliers The Story of Success*, in which he

tells the stories of outliers who have found success, and he attempts to share their secrets. Gladwell shares and replicates, Dr. Roger Barnsley's work with elite hockey in Canada stating that a majority of the players are born in the first quarter of the year right after the cut off age of January 1. Gladwell (2008) goes on to state that most people believe the RAE goes away after a few years but he argues that it does not and should be an issue that the educational system looks into (Juan-Jose et al., 2015). Gladwell also shared Bedard and Dhuey's (2006) work on ability grouping and how the RAE sets up a situation where the oldest kids are grouped together getting more challenging work keeping them in the higher ability group as they go through school. This phenomenon is referred to as a cycle of accumulative advantage.

Delaying Kindergarten

Red-shirting is when a student is old enough to start kindergarten but is held back from starting kindergarten for a year; the term comes from the practice of holding American university athletes out of competition for a year (Deming & Dynarski, 2008). Bassok and Reardon (2013) found that nationally about 5-12% of children are red-shirted and delay their school entry. The number of students who delay entry to kindergarten fluctuate greatly at the local level with schools that serve high income white students having much higher rates than the national percentage, some as high as 25% (Datar, 2006). Morrison from the University of Michigan explains the phenomenon, "There is this idea—and it seems to be taking hold more and more—that you never want your child to be behind the curve. Parents want their child to be the best bike rider, the best football player, the best reader," as cited in Weil (2007, p.47). States and school districts have also been increasing the age at which students enter school as a way to increase student achievement; currently 43 states require a child's fifth birthday to be before September 1

to start school and six more states require the fifth birthday to be before August 1 (National Center for Education Statistics, 2015). Even with states moving up the cut off age for kindergarten entry, families are still choosing to red shirt their children, delaying their first year of kindergarten (Elder & Lubostky, 2009; Raffaele Mendez et al., 2014).

Boys are more likely to be red-shirted than girls, many educators and parents noting that boys develop slower than girls and present as immature compared to their female peers (Albanesi, 2017; Bassok & Reardon, 2013; Bellisimo, Sacks, & Megendoller, 1995; Malone et at., 2000; Raffaele Mendez et al., 2014). Other reasons noted for boys to be red-shirted more often then girls are parents wanting their male children to be larger in size than their peers and have more athletic ability and opportunities (Weil, 2007).

Positive Outcome Studies

There have been a few positive outcome studies that have shown positive academic achievement gains correlated with pre-kindergarten participation in elementary school and beyond. In 1986 Schwienhart researched specific prekindergarten curriculum models and found all three better-prepared students for kindergarten compared to non-attendance. A surprising finding from this study showed that the Distar curriculum model, which was more academically focused than the other two models, resulted in much poorer social and emotional outcomes for the students in their teenage years (Schwienhart et al., 1986)

The Solomon Islands developed a universal pre-kindergarten program in the mid 1990's for any students who wanted to attend. Research from 2000 showed higher academic achievement for the students that attended prekindergarten in later elementary school than compared to the students who did not attend the prekindergarten program

(Guild, 2000). Although this was a prekindergarten study, the difference in setting makes it difficult to apply the findings to students in developed countries.

Fortner and Jenkins (2017) used three panels of recent statewide data from North Carolina to investigate the impact delaying school entry has on 3rd grade achievement. They found that there is a slight positive impact for non-disabled students from delaying kindergarten on the third grade achievement. The study also found that a higher percentage of disabled students are selected for delaying kindergarten entry and there was a negative impact on delaying school entry for a disabled student on their third grade achievement (Forter & Jenkins, 2017).

No Impact Beyond Early Elementary

Contrary to the above studies the remainder of the research that could be found has shown common results for pre-kindergarten programs and delaying school entry: academic achievement gains above peers at the beginning of kindergarten, academic achievement differences wear off prior to 3rd grade, an increase in social emotional issues for students participating in pre-kindergarten. (Aliprantis, 2014; Barnard-Brak & Albright, 2017; Crothers et al., 2010; Graue et al., 2003; Datar, 2006; Deming & Dynarski 2008; Lincove et al., 2006; Magnuson & Waldfogel, 2007; Marshall, 2003; Martin, 2009, Schanzenbach, 2017).

Graue et al. (2003) compared three groups of students; those who delayed kindergarten entry and were red shirted, those who were young but entered kindergarten, and those who were retained and did kindergarten twice. They found that affluent non-minority students were the ones who were more often red-shirted and delayed entry, while low-income minority students were more often retained in kindergarten attending a second year (Raffaele Mendez et al., 2014). The study found that red-shirting students

gave them an initial academic boost, which wore off by third grade, while retaining students in kindergarten for a second year did not close the achievement gap for those students. Looking at behavioral and social emotional outcomes both groups of students, red-shirted and retained, had a higher frequency of behavioral issues than typical peers even after the intervention of the additional year (Graue et al., 2003)

Datar (2006) studied why states were looking at increasing the age requirements for entering kindergarten. The study looked to determine whether being a year older in kindergarten impacts academic achievement. Datar found that it does have a positive impact on test scores in kindergarten and in the following year, but this study only looked at the first two years of schooling. The Datar study cautioned using the research beyond the first two years of schooling, and recommends more research be done.

Similar to the above studies, Deming and Dynarski (2008) found little research supporting academic achievement gains from delaying the start of school, but did find data that data showed negative long term affects on delaying the start of kindergarten. When comparing IQ, life long earnings, and educational attainment, students who attend pre-kindergarten programs did not fair as well as students who do not (Deming & Dynarski, 2008).

In 1997 Buntaine and Costendbader completed a study looking at a prekindergarten program in a suburban upper middle class area and found when comparing the students who attended prekindergarten with the students who did not, that there was no academic difference after the third grade. These findings are interesting considering the prekindergarten students had an extra year of instruction and also were a year older than the non-participants when data was compared.

In 2007 Magnuson, Ruhm, and Waldfogel used rich data from the Early

Childhood Longitudinal Study to compare student achievement in students who attended prekindergarten with those who did not attend. They also found that although prekindergarten students were better prepared for kindergarten, any gains in academic achievement over non-participants dissipated by the end of 1st grade (Magnuson et al., 2007). Aliprantis (2014) used longitudinal data as well to look at the effects of being relatively older for a student's grade from delaying kindergarten entry and found that for the oldest children in a cohort their achievement actually decreases as their age relative to their classmates' increase.

Raffaele Mendez et al. (2014) used a cohort of 6,841 students to compare the differences between three groups of students; students who delay entry to kindergarten, students who are retained in kindergarten, and students who enter kindergarten on time. When specifically looking at comparing the delayed entry students with the students who enter on time they found that the delayed entry students had slightly lower achievement at third grade and that they had a higher incidence of special education identification during their school careers. Raffaele Mendez notes that if a parent delays school entry to prevent the needs for special education services that is not an effective intervention. Parents and schools need to identify specific interventions beyond delayed school entry.

Taking into account the above studies, a more recent study investigated if using pre-kindergarten for students with a disability, such as ADHD would be an effective intervention. Barnard-Brak and Albright (2017) found that there was no advantage to red-shirting students with ADHD as compared with just starting them in kindergarten; there were no differences in academic achievement between the students who had attended pre-kindergarten with ADHD and those who had not attended pre-kindergarten with ADHD over time.

After exploring academic achievement data, a few researchers went on to look at social emotional skills of students who participated in pre-kindergarten programs. Magnuson et al., (2007) found that students who participated in prekindergarten had much greater behavioral issues as measured by office referrals than non-prekindergarten students. Byrd, Weitzman, and Auinger (1997) also found increased behavior problems associated with delayed school entry and delayed school progress, not just in early elementary but later in adolescents as well, indicating a need to look at the data beyond the elementary years. Along these same lines Deming and Dynarski (2008) noted that

> there is little evidence that being older than your classmates has any long-term, positive effect on adult outcomes such as IQ, earnings, or educational attainment. By contrast, there is substantial evidence that entering school later reduces educational attainment (by increasing high school dropout rates) and depresses lifetime earnings (by delaying entry into the labor market) (pp. 72-73).

Another interesting study looking at social emotional skills focused on bullying behavior by students who were old for their grade or delayed school entry (Crothers et al., 2010). The study used data from 16 schools and 276 students. Two hundred nine (209) students were appropriate age for the grade and 67 students were considered old for their grade. Crothers et al. (2010) found that students who were old for their grade had significantly more bullying behavior and victim behavior compared to their age appropriate peers. The research cautions educators from using delayed school entry as an intervention for social and emotional problems based on the results of their study and their literature review.

Chapter II Closure

Kindergarten programs started as an optional program to support students and

families with their transition into the school system (Cuban, 1992; Ross, 1976). As society shifted the kindergarten program shifted moving from an introduction to school to a program focused on academics (Cuban, 1992). Some districts started offering pre-kindergarten programs to fill the role kindergarten had formerly filled, and to help intervene with needy families. To gain an edge above other kids many parents started red-shirting their children and delaying their entry into kindergarten, selecting a pre-kindergarten program instead (Bronson, 2009; Datar, 2006; Deming & Dynarski, 2008; Raffaele Mendez et al., 2014).

Current research reveals pre-kindergarten programs give students an academic boost at the start of kindergarten, but pre-kindergarten programs do not show any academic gain beyond early elementary and actually shows negative long term effects for social and emotional skills and life long earnings (Barnard-Brak, & Albright, 2017; Crothers et al., 2010; Datar, 2006; Deming & Dynarski 2008; Graue et al., 2003; Lincove et al., 2006; Magnuson & Waldfogel, 2007; Marshall, 2003; Martin, 2009). Let us now move into chapter 3 which offers a detailed methods review for my study.

CHAPTER III

METHODS

The purpose of my ex post facto causal comparative study was to examine the elementary school academic achievement (kindergarten through third grade) of students entering the educational system through either pre-kindergarten and then kindergarten, or through kindergarten with no pre-kindergarten. This study compared the elementary academic achievement of students through 3rd grade, who delayed kindergarten entrance with those who did not delay, resulting in two main groups to compare. The study went on to break down those two main groups based on parents who followed the recommendation of the kindergarten entrance readiness assessment proctor, and those who did not.

My specific research questions were:

1. Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

    (a) students who attended pre-kindergarten, and

    (b) students who did not attend pre-kindergarten and attended kindergarten?

2. Is there a statistically significant difference in such academic achievement between four sub groups of students:

    (a) students who were recommended for pre-kindergarten and went to pre-kindergarten,

    (b) students who were recommended for pre-kindergarten but went to kindergarten,

(c) students who were recommended for kindergarten and went to kindergarten, and

(d) students who were recommended for kindergarten but went to pre-kindergarten?

3. Can academic achievement on the 3rd grade M-STEP math and/or reading assessment be predicted from following the screener recommendation to delay or not delay the start of kindergarten, when holding constant kindergarten DIBELS achievement, age, gender, and free and reduced lunch eligibility?

Research Design and Rationale

This study was a quantitative causal-comparative research study. Creswell (2008) states a quantitative study "describes trends and explains relationships among variables found in the literature. The investigator specifies narrow questions, locates or develops instruments to gather data to answer the questions, and analyzes numbers from the instruments using statistics" (p. 645). Creswell further notes that a causal-comparative study is when two groups are compared in terms of an independent variable that has already occurred, and the researcher tries to determine to what extent the independent variable impacted the dependent variable (Creswell, 2008). Per Creswell there are steps that must be followed when conducting a quantitative research study: first the problem of the study must first be indentified; second the researcher must go on to describe the relationship between the variables of the study; third the researcher must conduct a through review of the literature; fourth the researcher must develop a tightly constructed, succinct purpose statement, research questions that are measurable and observable; and the fifth and final steps are analyzing the data and interpreting the results.

This study could also be considered a non-experimental ex post facto study, in

that the data was drawn from existing data bases as housed in one school district's student records. The participants in the study have been selected based on convenience; parents made the choice if they wanted to delay their child's entrance into kindergarten and attend transitional kindergarten or if they had their child go directly into traditional kindergarten. Individuals were not randomly selected for the study. A non-experimental or causal comparative research design is common in educational research due to the many ethical questions that surround offering or limiting services, programs, or resources to children solely for the sake of research (Field, 2014). The district routinely collects the achievement and demographic data for all its students and stores the information in a data warehouse. I, as the researcher, analyzed this pre-existing data. This study used data collected from cohorts across five years making it a longitudinal research study (Field, 2014). Field (2014) explains that with any non-experimental research trying to infer causation is difficult, and therefore this study sought to find relationships.

Population, Sample and/or Site

The research setting for this study was one suburban school district in West Michigan. Based on the demographic data found in the MI School Data warehouse the average student enrollment over the past five years for this district was 4,706 students. The percentage of students who have been indentified as having a disability is about 8%. A majority of the students are Caucasian at 85%, while multi-racial students account for 4% of the student population, Hispanic 7%, Asian 2.5%, and African American at 1.5%. Economically disadvantaged students account for 25% of the total student population. There was a pretty even balance between genders with about 50% for females and males. The district has one Early Childhood Center that has 7-9 sections of pre-kindergarten offered each year, and 5 elementary schools that each have between 2 and 4 sections of

kindergarten offered each year.

The sample for the study includes an N size of 1,489 total students who were enrolled in school between the years of 2011 and 2014. Table 1 illustrates the number of students in each cohort.

Table 1

Description of Student Cohorts

Kindergarten Entry Year	Number of Students
2011-2012	403
2012-2013	393
2013-2014	350
2014-2015	343

In this study, all 5-year olds seeking to start kindergarten in this district are given the same kindergarten readiness assessment under the same conditions. This kindergarten readiness assessment was created in district by district staff over 30 years ago. The assessment consists of nine different categories; manipulation skills, reasoning, visual memory, basic concepts, sound identification, picture naming, auditory sequencing, visual motor, and drawing. Based on the student's performance families were given a recommendation to delay the start of traditional kindergarten and attend a pre-kindergarten program or to go directly into traditional kindergarten. The final choice on program participation was always the parent's decision. Neither the researcher nor the school district mandated the decision or placed students in one of the programs.

The data set was divided into four main groups; (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who

were recommended for kindergarten but went to pre-kindergarten. These four main groups were one of the independent variables in the study. The control variables that were considered are: gender, free and reduced lunch eligibility, and ethnicity. Creswell (2008) states that control variables play an important role in quantitative research as special independent variables that are controlled through statistical analysis to minimize potential impact to the dependent variable. The dependent variable was the student achievement on DIBELS and the M-STEP assessment.

Instrumentation

There were two sources of student achievement data used as the dependent/outcome variables examined in this study: DIBELS data for grades K, 1, 2, and 3, and the state M-Step for grade 3 in Math and English Language Arts.

DIBELS

DIBELS is an acronym for Dynamic Indicators of Basic Early Literacy Skills ("Official DIBELS homepage," n.d.). In this district the DIBELS benchmark assessment is given to each student three times during each school year from kindergarten through sixth grade, once in the fall, once in the winter, and once again in the spring. The test is composed of seven measures: Letter Naming, First Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency that yields 2 scores including Correct Letter Sounds and Whole Words Read, and Oral Reading Fluency, that yields 3 scores including Correct Words Read per Minute, Accuracy of Decoding Percent and a Retell score that is a measure of comprehension. The DIBELS assessment is a universal screener designed to indicate students who are at risk for learning the basic principals of literacy. Based on these DIBELS indicators intervention specialists, school psychologists, and teachers can determine if further diagnostic assessment is warranted

and /or if strategic or intensive intervention is required for each student to mast the "big ideas" of reading. DIBELS is an example of a Curriculum –Based Measurement that was first developed at the University of Minnesota in the 1970s. DIBELS, as a universal screener was developed by Kaminiski and Good (1996) at the University of Oregon in the 1980s. Since the 1980s, the University of Oregon has continued collecting data and conducting research studies on the DIBELS assessment verifying its validity and reliability. Many research studies have demonstrated the effectiveness of using DIBELS as a universal screener to predict student academic success on future literacy assessments (e.g., Burke, Hagan-Burke, Kowk, & Parker, 2009; Goffreda, DiPerna, & Pedersen, 2009; Shapiro, Solari & Petscher, 2008).

Response to Intervention is a model of instruction that creates tiers and systems of supports for struggling learners (Daly et al., 2007). One of the key factors to implementing a Response to Intervention, (RTI) system is use of a universal screener. The universal screener needs to be able to monitor progress and measure growth (Daly et al., 2007). DIBELS is used as one of the universal screeners and progress monitoring systems by the educational site of this research study.

During the DIBELS benchmark assessment students are assessed one on one with a trained teacher that usually takes between 5-10 minutes per student to proctor. Students in Kindergarten and 1st grade are assessed using letter naming, first sound fluency, Phoneme Segmentation Fluency, Non-Sense Word Fluency including scores for Correct Letter Sounds and Whole Words Read, and beginning in January of first grade Oral Reading Fluency including scores for Correct Words Read per Minute, and Accuracy of Decoding percent, and a Retell score. These subtest scores are combined together to create a composite score. The composite scores are sorted into three main categories;

intensive, strategic, and core. For this study, DIBELS composite scores from fall and spring of the student's Kindergarten year will be analyzed, and then spring scores from 1st, 2nd, and 3rd grades.

Schilling et al. (2007) studied the correlation of DIBELS with the Iowa Test of Basic Skills and found that the DIBELS oral reading fluency (ORF) had a 0.69 correlation in the winter of 1st grade and a 0.74 correlation in the spring of first grade. Riedel (2007) also looked at the correlation of the DIBELS to a standardized comprehension assessment and found similar findings to Schilling (2007) with r scores of between 0.59 and 0.67. A more recent study by Morris et al. (2017) found that DIBELS ORF and a standardized assessment called the grPass were both moderately strong predictors of future reading comprehension.

M-STEP

The Michigan Student Test of Educational Progress (M-STEP) has been used to measure student achievement for Michigan students since the spring of 2015. Every spring students in grades 3-8, and 11 attending public schools and charter academies are required to take a standardized assessment. The M-STEP test is a computerized assessment that assesses English Language Arts, and Mathematics. The data from the M-STEP test is used to provide student level data on mastery of content and enables parents and educators to compare students on a standardized assessment. School districts and individual schools also use grade level and building level M-STEP data to determine if schools are making adequately yearly progress and to make data driven decisions on curriculum resources and instruction.

The M-STEP test utilizes a scaled score for each content area and grade level. The range of scores possible for the 3rd grade English Language Arts test ranges from

1,203 or lower up to 1,357. The scores possible for the 3rd grade Math test range from 1,217 or lower up to 1,361. The scores for both tests are separated into quartiles with the descriptors of: not proficient, partially proficient, proficient, and advanced. This study will use the student scaled scores to rank student achievement.

Data Collection Procedures

A majority of the data required for analysis in this study is stored in a data warehouse, "ourschooldata.org." The data set was downloaded for each cohort of students and then merged together to make one large data set with demographic, DIBELS, and M-STEP data for each student who initially was enrolled in the school district during the years of 2011, 2012, 2013, 2014, and 2015. The kindergarten readiness assessment that is used as a screener for the district is stored for each individual student in his or her school CA60 file and had to be pulled to add to the data set. Before merging the data set into a SPSS file, student names and numbers were removed from the data set to ensure confidentiality. This data was deemed to be non-human study research so a human studies review was not necessary (see Appendix 1).

Table 2

Data Collection by Cohort Years

Year	Cohort 11-12	Cohort 12-13	Cohort 13-14	Cohort 14-15
11-12	K DIBELS fall and spring composite scores			
12-13	1 DIBELS spring composite scores	K DIBELS fall and spring composite scores		
13-14	2 DIBELS spring composite scores	1 DIBELS spring composite scores	K DIBELS fall and spring composite scores	
14-15	3 DIBELS spring composite scores, M-STEP ELA & Math scale scores	2 DIBELS spring composite scores	1 DIBELS spring composite scores	K DIBELS fall and spring composite scores
15-16		3 DIBELS spring composite scores, M-STEP ELA & Math scale scores	2 DIBELS spring composite scores	1 DIBELS spring composite scores
16-17			3 DIBELS spring composite scores, M-STEP ELA & Math scale scores	2 DIBELS spring composite scores

Data Analysis

In order to address the research questions of this study, the data set was analyzed with descriptive statistics as well as inferential statistics. For all tests conducted the level of statistical significance was set at <0.5. Descriptive statistics was used to describe important demographic information for the data set including, ethnicity, free and reduced lunch eligibility, gender, special education eligibility, and if the student participated in the pre-kindergarten program. The first research question used a t test to determine if there was a statistically significant difference of achievement on either the DIBELS or M-STEP assessments between students who attended pre-kindergarten and those that did not. For the second research question an ANOVA was used to determine if there were any statistically significant differences on academic achievement among the four groups

of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten, on either the DIBELS or M-STEP assessments. For the third research question a multiple regression was calculated to see if a predictive model could be built to determine the odds of a student being proficient on his/hers M-STEP assessment.

Operationalization of Variables

Recommendation for pre-kindergarten. A student is categorized as recommended or not recommended for pre-kindergarten based on the results of their kindergarten readiness assessment screener. The variable is dichotomous and is coded as 1=recommended for pre-kindergarten, or 0=non recommended.

Pre-kindergarten participation. A student is categorized as a pre-kindergarten participant if they attended a year of pre-kindergarten prior to moving into kindergarten. The variable is dichotomous and is coded as 1=attended pre-kindergarten, or 0= did not attend pre-kindergarten.

Disability. A student who is identified as qualifying for special education is classified as having a disability. This is a dichotomous variable and is classified as 1=qualifies for special education, or 0=does not qualify for special education.

SES. A student is classified as low SES if they qualify for free and reduced lunch services. This is a dichotomous variable, with 1=qualifies for free and reduced lunch, or 0= does not qualify for free and reduced lunch.

Gender. Gender is a dichotomous and is coded as 1=female or 0=male.

DIBELS Composite. DIBELS composite is used as a discrete variable with a range of 0-500 dependent on the student's grade level and reading achievement.

M-STEP ELA. The M-STEP ELA scaled score is used as a discrete variable with a range of 0-1357 depending on the student's achievement.

M-STEP Math. The M-STEP math scaled score is used as a discrete variable with a range of 0-1361 depending on the student's achievement.

Statistical Analysis

The data for this study was analyzed through a variety of statistical methods matching each research question.

The first research question was looking to determine if there was a mean difference in student achievement between students who attended pre-kindergarten and students who did not attend pre-kindergarten. An independent samples t test was conducted to determine if the mean student achievement for students who attended pre-kindergarten differed from students who did not attend pre-kindergarten. The assumption of normality was tested for the distributional shape of the dependent variable (student achievement). A review of the S-W test for normality and skewness was conducted. Boxplots were created to check for relative normal distribution. Also Q-Q plots and histograms were completed to look from normality. And finally Levene's test was conducted to check the homogeneity of variance assumption.

The second research question was seeking to find out if there was a mean difference between four groups of students (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were

recommended for kindergarten but went to pre-kindergarten. The data will be analyzed using an ANOVA, or analysis of variance model. A one-way ANOVA was conducted to determine if the mean student achievement differed between four groups of students. The assumption of normality, skewness, and kurtosis was reviewed for normality. A boxplot was conducted to look at the distributional shape. The Q-Q and histogram was reviewed for normality. And finally Levene's test was conducted to check the homogeneity of variance assumption.

The third and final research question was seeking to find if proficiency on the 3rd grade M-STEP could be predicted from delaying or not delaying kindergarten entry and kindergarten DIBELS achievement. A multiple linear regression model was conducted to determine if proficiency on the 3rd grade M-STEP test could be predicted from delaying or not delaying kindergarten. The data was screened for missingness and violation of assumptions prior to analysis. The following was reviewed prior to the multiple regression; linearity, normality, independence, homogeneity of variance, and multicollinearity. Table 3 illustrates a summary of my statistical analysis.

Table 3

Data Analysis Cross-Walk Table

Research Question	Variables	Statistical Analysis
1) Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students: (1) students who attended pre-kindergarten, and (2) students who did not attend pre-kindergarten and attended kindergarten?	Dependent: DIBELS composite scores K fall, K spring, 1st spring, 2nd spring, 3rd spring. M-STEP ELA scale score 3rd grade. M-STEP math scale score 3rd grade. Independent: attending pre-kindergarten, or not attending pre-kindergarten	t test
2) Is there a statistically significant difference in such academic achievement between four sub groups of students.	Dependent: DIBELS composite scores K fall, K spring, 1st spring, 2nd spring, 3rd spring. M-STEP ELA scale score 3rd grade. M-STEP math scale score 3rd grade. Independent: recommendation from the kindergarten readiness screener, attendance in pre-kindergarten	ANOVA
3) Can academic achievement on the 3rd grade M-STEP math and/or reading assessment be predicted from following the screener recommendation to delay or not delay the start of kindergarten, when holding constant kindergarten DIBELS achievement, age, gender, and free and reduced lunch eligibility?	Dependent: M-STEP ELA scale score 3rd grade. M-STEP math scale score 3rd grade. Independent: following the recommendation for the kindergarten readiness screener, Spring Kindergarten DIBELS achievement, age, gender, SES	Multiple linear regression

Limitations and Delimitations

One major delimitation of this study is it only analyzes data from one suburban West Michigan school district; therefore, it cannot be generalized to a larger population. One major limitation of this study is differences in instruction, curriculum, and teacher effectiveness that occur with in the pre-kindergarten program that may impact elementary student achievement differently.

Chapter III Closure

To examine the elementary school academic achievement (kindergarten through third grade) of students entering the educational system through either pre-kindergarten and then kindergarten, or through kindergarten with no pre-kindergarten. In this study, I compared the elementary academic achievement of students through 3rd grade, who delayed kindergarten entrance with those who did not delay, resulting in two main groups to compare. The study went on to break down those two main groups based on parents who followed the recommendation of the kindergarten entrance readiness assessment proctor, and those who did not. This research study used previously collected data from the data warehouse "ourschooldata.org" and kindergarten readiness assessment screener data that was available in the student's school file. All of the data used was from one suburban West Michigan school district. The data was analyzed using both descriptive and inferential methods.

CHAPTER IV

RESULTS

Chapter 4 describes the statistical analysis of my three main research questions and sub questions. Question 1 uses a t-test seeking if there is a statistically significant difference between academic achievement with students who attended pre-kindergarten and students who did not attend. Question 2 uses an ANOVA to determine if there is a statistically significant difference among the four sub groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten. Finally question 3 uses a multiple regression to determine if achievement on the math or ELA M-STEP could be predicted from the kindergarten readiness screener and attendance in a pre-kindergarten program.

Research Questions 1 and 2

Research question 1 seeks to determine if there is a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

Research question 2 takes question 1 a step further seeking to determine if there is a statistically significant difference in such academic achievement between four sub groups of students:

(a) students who were recommended for pre-kindergarten and went to pre-kindergarten,

(b) students who were recommended for pre-kindergarten but went to kindergarten,

(c) students who were recommended for kindergarten and went to kindergarten, and

(d) students who were recommended for kindergarten but went to pre-kindergarten?

Since research question 2 builds off from question 1 I plan to discuss the analysis of both questions in this section.

Fall Kindergarten

A t-test, at an alpha level of 0.05, is used to determine if there is a statistically significant difference in the mean fall DIBELS composite between students who attended pre-kindergarten prior to kindergarten, and students who started right in kindergarten. In this analysis, the independent variable is the kindergarten program and the dependent variable is the DIBELS composite score. Table 4 shows the mean and standard deviations DIBELS composite score for both groups of students.

Table 4

Means and Standard Deviation of the T-Test for Kindergarten Fall DIBELS Composite

Student Groups	n	M	SD	p-value
Attended Pre-Kindergarten	345	77.2	20.9	<0.0001
Did Not Attend Pre-Kindergarten	540	46.2	23.7	

DIBELS benchmark expectation for fall kindergarten is 26+, well above is 38+

The distribution of the fall kindergarten DIBELS composite score is examined to determine the assumption of normality is met for both groups of students. For students who attended pre-kindergarten skewness (0.210) and kurtosis (-0.241) suggest that normality is a reasonable assumption. Similar results are found for students who did not attend pre-kindergarten suggesting that normality is a reasonable assumption. Visually, a relative bell-shape, or unimodal distribution displayed in the histogram, also you can see symmetry in the boxplot for both groups suggesting evidence of normality.

A t-test is conducted at an alpha level of 0.05 to answer the research question: Is there a statistically significant difference in the mean academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

Table 4 depicts there is a mean student achievement score on the DIBELS of 77.2 with a standard deviation of 20.9 for students who attended pre-kindergarten, and there is a mean student achievement score on the DIBELS of 46.2 with a standard deviation of 23.7 for students who did not attend pre-kindergarten. The independent t-test indicates that

there is a statistically significant difference in the mean kindergarten fall DIBELS benchmark, between students who attended pre-kindergarten and students who did not attend pre-kindergarten ($t=-19.85$, $df=883$, p-value<0.0001). The results provide evidence that students who attended pre-kindergarten have higher mean composite scores on the fall DIBELS benchmark assessment.

A one-way ANOVA is conducted to examine if there is a difference in the mean fall DIBELS composite score among four groups: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten. The least squares, means, standard deviations, and n size are listed in Table 5.

Table 5

Means and Standard Deviations for the Four sub groups on Fall DIBELS Composite

Student groups	1 recommended pre-k and attended M 75.6 SD 21.4 (n 282)	2 recommended pre-k never attended M 33.8 SD 22.5 (n 91)	3 not recommended pre-k never attended M 48.7 SD 23.1 (n 449)	4 not recommended pre-k attended M 84.2 SD16.8 (n 63)
1 recommended pre-k and attended M 75.6 SD 21.4 (n 282)		p <0.0001 difference in M=41.8	p <0.0001 difference in M=26.9	p <0.05 difference in M=8.6
2 recommended pre-k never attended M 33.8 SD 22.5 (n 91)	p <0.0001 difference in M=41.8		p <0.0001 difference in M=14.9	p <0.0001 difference in M=50.4
3 not recommended pre-k never attended M 48.7 SD 23.1 (n 449)	p <0.001 difference in M=26.9	p <0.001 difference in M= 14.9		p <0.0001 difference in M=35.5
4 not recommended pre-k attended M 84.2 SD 16.8 (n 63)	p <0.05 difference in M=8.6	p <0.0001 difference in M= 50.4	p <0.0001 difference in M=35.5	

DIBELS benchmark expectation for fall kindergarten 26+, well above is 38+

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect all scores with a p-value of less than 0.05, making all of the groups statistically significantly different from each other. These

results demonstrate that when students entered kindergarten they have higher mean composite scores on the DIBELS assessment if they have attended pre-kindergarten regardless of the original screening recommendation. The group that achieved the highest was the students who were recommended to attend kindergarten and parents instead selected for them to attend a year of pre-kindergarten first. The students who achieved the lowest score are the group that was screened and recommended to attend a year of pre-kindergarten and instead went straight to kindergarten.

Spring Kindergarten

This same statistical analysis is completed using data from spring during the kindergarten year.

Table 6

Means and Standard Deviation of the T-Test for Kindergarten Spring DIBELS Composite

Student Groups	n	M	SD	p-value
Attended Pre-Kindergarten	326	185.5	43.9	<0.0001
Did Not Attend Pre-Kindergarten	490	167.7	39.8	

DIBELS benchmark expectation for spring kindergarten 119+, well above is 152+

A t-test is conducted at an alpha level of 0.05 to answer the research question: Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

Table 6 depicts there is a mean composite score on the DIBELS of 185.5 with a standard deviation of 43.9 for students who attended pre-kindergarten, and there is a mean

composite score on the DIBELS of 167.7 with a standard deviation of 39.8 for students who did not attend pre-kindergarten. The independent t-test indicates that there is a statistically significant difference in the mean kindergarten spring DIBELS benchmark composite score, between students who attended pre-kindergarten and students who did not attend pre-kindergarten ($t=-5.99$, $df=814$, $p\text{-value}<0.0001$). The results provide evidence that students who attended pre-kindergarten are observed to have higher mean composite scores on the spring DIBELS benchmark assessment.

A one-way ANOVA was conducted to determine if there is a difference in the means of the four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten, on their spring DIBELS achievement.

Table 7

Means and Standard Deviations for the Four sub groups on Spring DIBELS Composite

Student groups	1 recommended pre-k and attended M 182.3 SD 43.4 (n 266)	2 recommended pre-k never attended M 153.4 SD 32.6 (n 86)	3 not recommended pre-k never attended M 170.8 SD 40.6 (n 404)	4 not recommended pre-k attended M 199.8 SD 43.7 (n 60)
1 recommended pre-k and attended M 182.3 SD 43.4 (n 266)		p <0.0001 difference in M=28.9	p <0.05 difference in M=11.5	p <0.05 difference in M=17.5
2 recommended pre-k never attended M 153.4 SD 32.6 (n 86)	p <0.0001 difference in M=28.9		p <0.05 difference in M=17.4	p <0.0001 difference in M=46.4
3 not recommended pre-k never attended M 170.8 SD 40.6 (n 404)	p <0.05 difference in M=11.5	p <0.05 difference in M= 17.4		p <0.0001 difference in M=29
4 not recommended pre-k attended M 199.8 SD 43.7 (n 60)	p <0.05 difference in M=17.5	p <0.0001 difference in M= 46.4	p <0.0001 difference in M=29	

DIBELS benchmark expectation for spring kindergarten 119+, well above is 152+

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect all scores with a p-value of less than 0.05, making all of the groups statistically significantly different from each other. These

results demonstrate that when students were in the spring of their kindergarten year they have higher mean composite scores on the DIBELS assessment if they have attended pre-kindergarten regardless of the original screening recommendation. The group that achieved the highest were the students who were recommended to attend kindergarten and parents instead selected for them to attend a year of pre-kindergarten first. The students who achieved the lowest score was the group that was screened and recommended to attend a year or pre-kindergarten and instead went straight to kindergarten. The difference in the means is smaller than it was in the fall yet still significant.

Spring 1st Grade

This same statistical analysis is completed using data from spring during the 1st grade year.

Table 8

Means and Standard Deviation of the T-Test for 1st Spring DIBELS Composite

Student Groups	n	M	SD	p-value
Attended Pre-Kindergarten	329	228.0	70.7	>0.05
Did Not Attend Pre-Kindergarten	499	230.4	68.5	

DIBELS benchmark expectation for spring of 1st grade is 155+, well above is 208+

A t-test is conducted at an alpha level of 0.05 to answer the research question: Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended

kindergarten?

Table 8 depicts there is a mean composite score on the DIBELS of 228.0 with a standard deviation of 70.7 for students who attended pre-kindergarten, and there is a mean composite score on the DIBELS of 230.4 with a standard deviation of 68.5 for students who did not attend pre-kindergarten. The independent t-test indicates that the means for students who attended pre-kindergarten and students who did not attend pre-kindergarten on their 1st grade spring DIBELS benchmark are not statistically significantly different (t=0.49, df=826, p-value=0.6215). The results provide evidence that students who attended pre-kindergarten are have similar mean composite scores on the spring DIBELS benchmark assessment in the spring of their 1st grade year as students who did not attend pre-kindergarten.

A one-way ANOVA was conducted to determine if there was a difference in the means on their 1st grade spring DIBELS achievement of the four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

Table 9

Means and Standard Deviations for the Four sub groups on 1st grade Spring DIBELS Composite

Student groups	1 recommended pre-k and attended M 222.6 SD 70.9 (n 269)	2 recommended pre-k never attended M 196.2 SD 70.0 (n 86)	3 not recommended pre-k never attended M 237.6 SD 66.0 (n 413)	4 not recommended pre-k attended M 252.2 SD 65.2 (n 60)
1 recommended pre-k and attended M 222.6 SD 70.9 (n 269)		p <0.0001 difference in M=26.4	p <0.05 difference in M=15	p <0.05 difference in M=29.6
2 recommended pre-k never attended M 196.2 SD 70.0 (n 86)	p <0.05 difference in M=26.4		p <0.0001 difference in M=41.4	p <0.0001 difference in M=56.0
3 not recommended pre-k never attended M 237.6 SD 66.0 (n 413)	p <0.05 difference in M=15	p <0.0001 difference in M= 41.4		p >0.05 difference in M=14.6
4 not recommended pre-k attended M 252.2 SD 65.2 (n 60)	p <0.05 difference in M=29.6	p <0.0001 difference in M= 56.0	p >0.05 difference in M=14.6	

DIBELS benchmark expectation for spring of first grade is 155+, well above is 208+

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect that only some of the scores had a p-value of less

than 0.05, making some the groups statistically significantly different from each other. The difference between groups 3 and group 4 had a p-value greater than 0.05, making these two groups not statistically significantly different from each other. Therefore, if students were recommended for kindergarten and attended kindergarten or were recommended for kindergarten and attended pre-kindergarten their achievement on their 1st grade spring DIBELS achievement was similar. The other groups are all statistically significantly different from each other with p-values of <0.0001, 0.0143, and 0.0307. These results demonstrate that when students are in the spring of their 1st grade year they have higher achievement scores on the DIBELS assessment if they were originally screened and recommended to attend kindergarten regardless of if they attended pre-kindergarten first or not. The next highest achievement is with the group of students who were recommended for pre-kindergarten and attended pre-kindergarten, and the lowest achievement is with the group that was recommended for pre-kindergarten and did not attend instead choosing to start right in kindergarten.

Spring 2nd Grade

This same statistical analysis is completed using data from spring during the 2nd grade year.

Table 10

Means and Standard Deviation of the T-Test for 2nd grade Spring DIBELS Composite

Student Groups	n	M	SD	p-value
Attended Pre-Kindergarten	386	305.8	77.1	>0.05
Did Not Attend Pre-Kindergarten	617	313.1	70.2	

DIBELS benchmark expectation for spring of 2nd grade is between 238 and 287

A t-test is conducted at an alpha level of 0.05 to answer the research question: Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

Table 10 depicts there is a mean student achievement score on the spring 2nd grade DIBELS of 305.8 with a standard deviation of 77.1 for students who attended pre-kindergarten, and there is a mean student achievement score on the spring 2nd grade DIBELS of 313.1 with a standard deviation of 70.2 for students who did not attend pre-kindergarten. The independent t-test indicates that the mean composite scores on their 2nd grade spring DIBELS benchmark are not statistically significantly different for students who attended pre-kindergarten and students who did not attend pre-kindergarten (t=1.53, df=1001, p-value=0.1274). The results provide evidence that students who attended pre-kindergarten are have similar mean composite scores on the spring 2nd grade DIBELS benchmark assessment as students who did not attend pre-kindergarten.

A one-way ANOVA was conducted to determine if there was a difference in the mean 2nd grade spring DIBELS achievement between four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

Table 11

Means and Standard Deviations for the Four sub groups on 2nd grade Spring DIBELS Composite

Student groups	1 recommended pre-k and attended M 296.9 SD 77.5 (n 313)	2 recommended pre-k never attended M 270.8 SD 76.8 (n 98)	3 not recommended pre-k never attended M 321.0 SD 66.0 (n 519)	4 not recommended pre-k attended M 344.1 SD 62.4 (n 73)
1 recommended pre-k and attended M 296.9 SD 77.5 (n 313)		p <0.05 difference in M=26.1	p <0.0001 difference in M=24.1	p <0.0001 difference in M=47.2
2 recommended pre-k never attended M 270.8 SD 76.8 (n 98)	p <0.05 difference in M=26.1		p <0.0001 difference in M=50.2	p <0.0001 difference in M=73.3
3 not recommended pre-k never attended M 321.0 SD 66.0 (n 519)	p <0.0001 difference in M=24.1	p <0.0001 difference in M= 50.2		p >0.05 difference in M=23.1
4 not recommended pre-k attended M 344.1 SD 62.4 (n 73)	p <0.0001 difference in M=47.2	p <0.0001 difference in M= 73.3	p >0.05 difference in M=23.1	

DIBELS benchmark expectation for spring of 2nd grade is 238+, well above is 287+

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect that only some of the scores had a p-value of less than 0.05, making some the groups statistically significantly different from each other.

The difference between groups 3 and group 4 had a p-value of 0.054, making these two groups marginally statistically significantly different from each other. Therefore, the mean 2nd grade spring DIBELS composite score of students who were recommended for kindergarten and attended kindergarten or were recommended for kindergarten and attended pre-kindergarten are only marginally different. The other groups are all statistically significantly different from each other with p-values of <0.0001, <0.0001, and 0.0088. These results demonstrate that when students are in the spring of their 2nd grade year they had higher mean composite scores on the DIBELS assessment if they were originally screened and recommended to attend kindergarten regardless of if the attended pre-k first or not. The next highest achievement is with the group of students who were recommended for pre-kindergarten and attended pre-kindergarten, and the lowest achievement is with the group that was recommended for pre-kindergarten and did not attend.

3rd Grade Spring

This same statistical analysis is completed using data from spring during the 3rd grade year.

Table 12

Means and Standard Deviation of the T-Test for 3rd grade Spring DIBELS Composite

Student Groups	n	M	SD	p-value
Attended Pre-Kindergarten	289	432.7	105.4	>0.05
Did Not Attend Pre-Kindergarten	456	437.3	91.2	

DIBELS benchmark expectation for spring of 3rd grade is 280+, well above is 330+

A t-test was conducted at an alpha level of 0.05 to answer the research question:

Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

Table 12 depicts there is a mean student achievement score on the3rd grade spring DIBELS of 432.7 with a standard deviation of 105.4 for students who attended pre-kindergarten, and there is a mean student achievement score on the spring 3rd DIBELS of 437.3 with a standard deviation of 91.05 for students who did not attend pre-kindergarten. The independent t- test indicates that the means on their 3rd grade spring DIBELS benchmark are not statistically significantly different for students who attended pre-kindergarten and students who did not attend pre-kindergarten (t=0.64, df=743, p-value=0.5211). The results provide evidence that students who attended pre-kindergarten have mean composite scores on the spring 3rd grade DIBELS benchmark assessment as students who did not attend pre-kindergarten.

A one-way ANOVA was conducted to determine if there was a difference in the mean composite scores on their 3rd grade spring DIBELS benchmark among four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

Table 13

Means and Standard Deviations for the Four sub groups on 3rd grade Spring DIBELS Composite

Student groups	1 recommended pre-k and attended M 418.7 SD 104.2 (n 232)	2 recommended pre-k never attended M 385.1 SD 83.3 (n 71)	3 not recommended pre-k never attended M 447.0 SD 89.2 (n 385)	4 not recommended pre-k attended M 489.5 SD 91.1 (n 57)
1 recommended pre-k and attended M 418.7 SD 104.2 (n 232)		p >0.05 difference in M=33.6	p <0.05 difference in M=28.3	p <0.0001 difference in M=70.8
2 recommended pre-k never attended M 385.1 SD 83.3 (n 71)	p >0.05 difference in M=33.6		p <0.0001 difference in M=61.9	p <0.0001 difference in M=104.4
3 not recommended pre-k never attended M 447.0 SD 89.2 (n 385)	p <0.05 difference in M=28.3	p <0.0001 difference in M= 61.9		p <0.05 difference in M=42.5
4 not recommended pre-k attended M 489.5 SD 91.1 (n 57)	p <0.0001 difference in M=70.8	p <0.0001 difference in M= 104.4	p <0.05 difference in M=42.5	

DIBELS benchmark expectation for spring of 3rd grade is 280+, well above is 330+

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect that only some of the scores had a p-value of less than 0.05, making some the groups statistically significantly different from each other.

The difference between groups 1 and group 2 have a p-value of 0.0504, making these two groups marginally statistically significantly different from each other. Therefore, the mean 3rd grade spring DIBELS achievement of students who were recommended for pre-kindergarten and attended pre-kindergarten or were recommended for pre-kindergarten and never attended pre-kindergarten are only marginally different. The other groups are all statistically significantly different from each other with p-values of <0.0001, 0.0088, and 0.0018. These results demonstrate that when students are in the spring of their 3rd grade year they have higher achievement scores on the spring 3rd grade DIBELS assessment if they were originally screened and recommended to attend kindergarten. The highest mean composite score is with the group of students who were recommended for kindergarten and attended pre-kindergarten, the second highest was with the students who were recommended for kindergarten and attended kindergarten, and the lowest achievement is with the two groups that were recommended for pre-kindergarten.

3rd Grade M-STEP Analysis

3rd Grade M-STEP ELA

In the spring of a students 3rd grade year in addition to the building level benchmark assessment that is conducted with the DIBELS test the state of Michigan mandates students take the state test assessment the M-STEP.

A one way ANOVA was conducted to determine if there was a difference in the means on the 3rd grade M-STEP achievement on the English Language Arts assessment among four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended

for kindergarten but went to pre-kindergarten.

Table 14

Means and Standard Deviations for the Four sub groups on 3rd grade ELA M-STEP Scale Score

Student groups	1 recommended pre-k and attended M 1305.76 SD 22.4 (n 230)	2 recommended pre-k never attended M 1301.75 SD 21.7 (n 71)	3 not recommended pre-k never attended M 1313.74 SD 21.65 (n 384)	4 not recommended pre-k attended M 1322.53 SD 17.7 (n 57)
1 recommended pre-k and attended M 1305.76 SD 22.4 (n 230)		p >0.05 difference in M=4.01	p <0.001 difference in M=7.98	p <0.0001 difference in M=16.77
2 recommended pre-k never attended M 1301.75 SD 21.7 (n 71)	p >0.05 difference in M=4.01		p <0.0001 difference in M=11.99	p <0.0001 difference in M=20.78
3 not recommended pre-k never attended M 1313.74 SD 21.65 (n 384)	p <0.0001 difference in M=7.98	p <0.0001 difference in M= 11.99		p <0.05 difference in M=8.79
4 not recommended pre-k attended M 1322.53 SD 17.7 (n 57)	p <0.0001 difference in M=16.77	p <0.0001 difference in M= 20.78	p <0.05 difference in M=8.79	

M-STEP ELA Proficiency Scale Score is 1300

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect that only some of the scores had a p-value of less

than 0.05, making some the groups statistically significantly different from each other. The difference between groups 1 and group 2 have a p-value of 1.0, making these two groups not statistically significantly different from each other. Therefore, if students were recommended for pre-kindergarten and attended pre-kindergarten or were recommended for pre-kindergarten and never attended pre-kindergarten their achievement on their 3rd grade M-STEP ELA achievement is not statistically different. The other groups are all statistically significantly different from each other with p-values of <0.0001, 0.0001, and 0.0259. These results demonstrate that when students are in the spring of their 3rd grade year they have higher achievement scores on the spring 3rd grade ELA M-STEP assessment if they were originally screened and recommended to attend kindergarten. The highest mean scale score is with the group of students who were recommended for kindergarten and attended pre-kindergarten, the second highest was with the students who were recommended for kindergarten and attended kindergarten, and the lowest achievement is with the two groups that were recommended for pre-kindergarten.

3rd Grade M-STEP Math

An ANOVA was conducted to determine if there is a difference in the means on the 3rd grade Math M-STEP among four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten.

Table 15

Means and Standard Deviations for the Four sub groups on 3rd grade Math M-STEP Scale Score

Student groups	1 recommended pre-k and attended M 1305.71 SD 20.8 (n 230)	2 recommended pre-k never attended M 1300.37 SD 19.5 (n 71)	3 not recommended pre-k never attended M 1313.75 SD 20.0 (n 384)	4 not recommended pre-k attended M 1322.53 SD 18.8 (n 57)
1 recommended pre-k and attended M 1305.71 SD 20.8 (n 230)		p >0.05 difference in M=5.34	p <0.001 difference in M=8.04	p <0.0001 difference in M=16.82
2 recommended pre-k never attended M 1300.37 SD 19.5 (n 71)	p >0.05 difference in M=5.34		p <0.0001 difference in M=13.38	p <0.0001 difference in M=22.16
3 not recommended pre-k never attended M 1313.75 SD 20.0 (n 384)	p <0.0001 difference in M=8.04	p <0.0001 difference in M= 13.38		p <0.05 difference in M=8.78
4 not recommended pre-k attended M 1322.53 SD 18.8 (n 57)	p <0.0001 difference in M=16.82	p <0.0001 difference in M= 22.16	p <0.05 difference in M=8.78	

M-STEP Math Proficiency Scale Score is 1300

After using the Bonferroni adjustment for multiple comparisons the least squares means for the one-way ANOVA reflect that only some of the scores had a p-value of less than 0.05, making some the groups statistically significantly different from each other.

The difference between groups 1 and group 2 have a p-value of 0.3030, making these two groups not statistically significantly different from each other. Therefore, if students were recommended for pre-kindergarten and attended pre-kindergarten or were recommended for pre-kindergarten and never attended pre-kindergarten their achievement on their 3rd grade M-STEP Math achievement is not statistically different. The other groups are all statistically significantly different from each other with p-values of <0.0001, <0.0001, and <0.0001. These results demonstrate that when students are in the spring of their 3rd grade year they have higher achievement scores on the spring 3rd grade ELA M-STEP assessment if they were originally screened and recommended to attend kindergarten. The highest mean scale score is with the group of students who were recommended for kindergarten and attended pre-kindergarten, the second highest was with the students who were recommended for kindergarten and attended kindergarten, and the lowest achievement is with the two groups that were recommended for pre-kindergarten.

Research Question 3

A multiple linear regression model was conducted to determine the scaled score on the 3rd grade M-STEP test for ELA or for Math could be predicted from delaying or not delaying kindergarten attendance. A model was built using kindergarten programming (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten), gender, free and reduced lunch eligibility, previous DIBELS achievement, and a student's birthdate. The n size was 596 the coefficient of

determination (R^2) was 0.242, adjusted (R^2) was 0.232 and the p-value was <.00001. The data was screened for missing-ness and violation of assumptions prior to analysis.

Table 16

Multiple Regression Estimate and P-value for 3rd grade M-STEP ELA

Parameter	β Estimate	SE	t value	p-value
Intercept	1432.15	44.73	32.02	<0.0001
Not recommended for Pre-K but attended	-1.16	3.27	-0.36	>0.05
Recommended for Pre-K and attended	-11.25	1.95	-5.78	<0.0001
Recommended for Pre-K never attended	-8.70	2.81	-3.10	<0.05
Not recommended for Pre-K and never attended	0.000			
Gender Male	-1.31	1.65	-0.80	>0.05
Gender Female	0.000			
Free Lunch	-7.37	2.06	-3.57	<0.05
Reduced Lunch	-4.85	3.07	-1.58	>0.05
Not Eligible for Free or Reduced Lunch	0.000			
DIBELS Composite grade 1 Spring	0.20	0.02	9.89	<0.0001
Birth Date	-0.009	0.003	-3.33	<0.05

Table 16 gives all of the parameters for the multiple regression along with their β estimates, standard error, t value, and p-values. The parameters that are statistically significant in predicting the achievement of a student on the third grade ELA test are the kindergarten program attendance, free lunch eligibility, the previous 1st grade DIBELS achievement and the student's birth date. Based on the regression analysis students who were recommended for pre-kindergarten and went to pre-kindergarten would have a lower ELA M-STEP achievement by a coefficient of -11.25, with all other factors held equal, similarly students who were recommended for pre-kindergarten and did not attend pre-kindergarten would also have their M-STEP achievement score negatively impacted

by a coefficient of -8.70. The recommendation to attend pre-kindergarten has more of an impact to a student's ELA M-STEP score than free lunch eligibility coefficient of -7.37. Results indicate that all of which have significant p-values in this regression.

Table 17

Multiple Regression Estimate and P-value for 3rd grade M-STEP Math

Parameter	β Estimate	SE	t value	p-value
Intercept	1451.36	41.31	35.13	<0.0001
Not recommended for Pre-K but attended	-0.705	3.02	-0.23	>0.05
Recommended for Pre-K and attended	-12.62	1.80	-7.02	<0.0001
Recommended for Pre-K never attended	-11.75	2.60	-4.53	<0.0001
Not recommended for Pre-K and never attended	0.000			
Gender Male	7.34	1.52	4.82	<0.0001
Gender Female	0.000			
Free Lunch	-6.40	1.91	-3.35	<0.05
Reduced Lunch	-4.68	2.83	-1.65	>0.05
Not Eligible for Free or Reduced Lunch	0.000			
DIBELS Composite grade 1 Spring	0.17	0.09	9.07	<0.0001
Birth Date	-0.009	0.002	-4.04	<0.0001

Table 17 gives all of the parameters, with their β estimates, standard error, t value, and p-values for the multiple regression that is built to predict a student's achievement on the M-STEP Math assessment. The parameters that are statistically significant in predicting the achievement of a student on the third grade M-STEP Math test are the kindergarten program attendance, gender, free lunch eligibility, the previous 1st grade DIBELS achievement and the student's birth date. Based on the regression analysis students who were recommended for pre-kindergarten and went to pre-kindergarten would have a negative impact on their Math M-STEP achievement by a coefficient of -

12.62, with all other factors held equal, similarly students who were recommended for pre-kindergarten and did not attend pre-kindergarten would also have their M-STEP achievement score negatively impacted by a coefficient of -11.75. The recommendation to attend pre-kindergarten has more of an impact to a student's Math M-STEP score than gender with males having a positive coefficient of 7.34, and free lunch eligibility with a coefficient of -6.38. Results indicate that all of the above mentioned parameters have significant p-values in this regression.

Summary of All Statistical Analysis

Multiple statistical analysis tests were done to look at the data set from kindergarten through third grade. The shifts in the data are significant and provide us with important information to consider. The t-test looking at achievement differences between students who attended pre-kindergarten and students who went straight to kindergarten was not statistically significant past spring of the kindergarten year.

Using the one-way ANOVA comparing the means of the four different groups we found that there was also a change in the significance of the data during the spring of 1st grade similar to the t-test. The ANOVA illustrates that all groups are significantly different from each other, except for the students who were recommended for kindergarten and attended pre-kindergarten and the students who were recommended for kindergarten and did not attend pre-kindergarten during spring of their 1st and 2nd grade years. During spring of their 3rd grade year the statistical significance shifts again showing all groups different from each other, except for the students who were recommended for pre-kindergarten and attended kindergarten and the students who were recommended for pre-kindergarten and attended pre-kindergarten. Indicating that the recommendation from the screener helps predict student achievement even after the

intervention for pre-kindergarten is provided. Once students start taking the M-STEP test in 3rd grade the trend continues that there is not statistically significant difference between the achievement scores on ELA or Math for students who were recommended for pre-kindergarten regardless if they attended pre-kindergarten or opted to go straight to kindergarten.

Chapter IV Closure

In chapter 4 statistical analyses for each of the research questions was explained. The analysis included t-test, ANOVA, and multiple regressions. Each test helped present important information from the data set and increased our understanding.

Table 18, below summarizes the results of research question 1. The values in the chart represent the average composite score on the benchmark assessment for each group of students during that time frame. In the firs row of the chart it illustrates that, the expected benchmark composite score for a student would be greater than 26, a score that is well above benchmark would be greater than38, students in fall of their kindergarten year who attended pre-kindergarten had a mean scale score of 77.2 on their DIBELS assessment, the students who did not attend pre-kindergarten had a mean scale score of 46.2 on their fall kindergarten DIBELS benchmark assessment. When students are compared based on if they attended pre-kindergarten or did not attend pre-kindergarten they have significant achievement differences during kindergarten. Starting at spring of 1st grade the achievement between students who attended pre-kindergarten and those who did not attend pre-kindergarten are similar.

Table 18

Summary of Findings for T-Test DIBELS Composite Score Analysis by Grade Level

Findings	Benchmark Expectation/Above Benchmark Expectation	Students who Attended Pre-Kindergarten Mean DIBELS Composite	Students who did not Attend Pre-Kindergarten Mean DIBELS Composite
Fall Kindergarten	26/38	77.2	46.2
Spring Kindergarten	119/152	185.5	167.7
Spring 1st Grade	155/208	228.0	230.4
Spring 2nd Grade	238/287	305.8	313.1
Spring 3rd Grade	280/330	432.7	437.3

Table 19 summarizes the results for research question 2. Which illustrates how student achievement differs between the four groups of students from the study. Students were separated into the four groups using the recommendation made from the kindergarten readiness screener and the participation in pre-kindergarten or not attending pre-kindergarten. The four groups of students: (a) group 1-students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) group 2-those who were recommended for pre-kindergarten but went to kindergarten, (c) group 3-those who were recommended for kindergarten and went to kindergarten, and (d) group 4-those who were recommended for kindergarten but went to pre-kindergarten. This table uses similar values as table 18, with the mean scale score of the benchmark assessment noted for each of the four separate groups. Similar to research question 1, in kindergarten all four groups have achievement that is statistically different from each other with the students who attended pre-kindergarten and were not recommended for it scoring the highest and the students who attended pre-kindergarten and were recommended for it scoring the

second highest. Also similar to research question 1, in the spring of first grade we see a shift in the significance of the data with the two groups of students who were recommended to attend kindergarten, both groups had similar achievement, it didn't matter that one group started right in kindergarten and one did pre-kindergarten before attending kindergarten. The results seen in spring of 1st grade are replicated in 2nd grade. These results shift slightly in 3rd grade, on the DIBELS benchmark assessment and on both M-STEP ELA and Math assessments showing no statistical difference between students who were recommended for pre-kindergarten and attended pre-kindergarten or students who were recommended for pre-kindergarten and attended kindergarten. Out of the four groups of students, group 4 and group 3, those who were recommended for kindergarten had the highest mean DIBELS composite scores and similar achievement starting in 1st grade. With, group 1 and 2, the students recommended for pre-kindergarten; those who attended and those who didn't attend having the lowest achievement and similar achievement between each other starting in 3rd grade.

Table 19

Summary of Findings for One-Way ANOVA Analysis of DIBELS Composite Score and M-STEP Scale Score by Grade Level

Findings	Benchmark Expectation/ Above Benchmark Expectation	Group 1 Recommended Pre-K and attended Pre-K Mean	Group 2 Recommended Pre-K and did not attend Pre-K Mean	Group 3 Recommended K and attended Mean	Group 4 Recommended K and did not attend K Mean
Fall Kindergarten DIBELS Composite	26/38	75.60	33.77	48.74	84.17
Spring Kindergarten DIBELS Composite	119/152	182.26	153.36	170.78	199.75
Spring 1st Grade DIBELS Composite	155/208	222.61	196.20	237.57	252.20
Spring 2nd Grade DIBELS Composite	238/287	296.92	270.84	321.04	344.12
Spring 3rd Grade DIBELS Composite	280/330	418.70	385.10	446.96	489.46
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3rd Grade ELA Scale Score	Proficiency 1300	1305.76	1301.75	1313.74	1322.53
3rd Grade Math Scale Score	Proficiency 1300	1305.71	1300.37	1313.75	1322.53

CHAPTER V

Discussion

Chapter 4 answers each of the research questions for this study.

1. Is there a statistically significant difference in the academic achievement (i.e., grade k, 1, 2, & 3 DIBELS; grade 3 ELA; and math M-STEP) between two groups of students:

(a) students who attended pre-kindergarten, and

(b) students who did not attend pre-kindergarten and attended kindergarten?

The t-test demonstrated that there is a statistically significant difference between the two groups in the fall and spring of kindergarten. After kindergarten from 1st grade through 3rd grade there is not a statistically significant difference in the mean student achievement on the DIBELS assessment between students who attended pre-kindergarten and students who did not.

2. Is there a statistically significant difference in such academic achievement between four sub groups of students:

(a) students who were recommended for pre-kindergarten and went to pre-kindergarten,

(b) students who were recommended for pre-kindergarten but went to kindergarten,

(c) students who were recommended for kindergarten and went to kindergarten, and

(d) students who were recommended for kindergarten but went to pre-kindergarten?

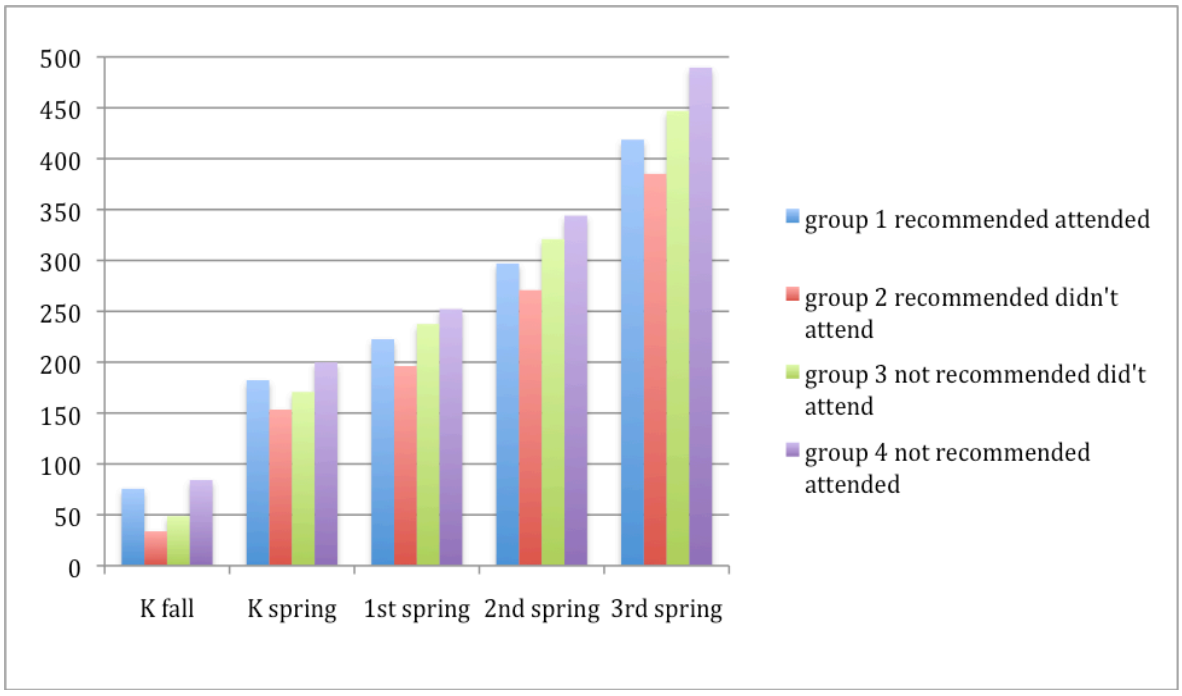
There is a statistically significant difference between all 4 of the groups of students during kindergarten in the fall and the spring. The achievement data from the spring of 1st grade shows no statistically significant difference between the students in groups 3 and 4. The students in group 3 were recommended for kindergarten and attended kindergarten, and the students in group 4 were recommended for kindergarten and attended pre-kindergarten. If students were recommended for kindergarten, regardless of their attendance in pre-kindergarten or not, there was not a statistical difference in means of student's composite scores on the DIBELS benchmark in 1st or 2nd grade. The achievement data from the spring of 3rd grade shows no statistically significant difference between the students in groups 1 and 2. The students in group 1 were recommended for pre-kindergarten and attended pre-kindergarten, and the students in group 2 were recommended for pre-kindergarten and attended kindergarten. If students were recommended for pre-kindergarten, regardless of their attendance in pre-kindergarten or not, there was not a statistical difference in means of student's composite scores on the DIBELS benchmark or on the M-STEP ELA or Math in the spring of 3rd grade Therefore, if districts are providing and recommending pre-kindergarten to students in an attempt to increase academic performance, this research data does not support it. The analysis of the data demonstrates that the students who are recommended for pre-kindergarten will do the same on future academic assessments no matter if they attended an additional year of school with the pre-kindergarten program or not.

3. Can academic achievement on the 3rd grade M-STEP math and/or reading assessment be predicted from following the screener recommendation to delay or not delay the start of kindergarten, when holding constant kindergarten DIBELS achievement, age, gender, and free and reduced lunch eligibility?

The multiple regression models were significant for both 3rd grade M-STEP tests, ELA and Math. The parameters that were significant in predicting achievement was (a) students' recommendation for pre-kindergarten or kindergarten on the screener p-value = 0.0001, and (b) free lunch eligibility p-value = 0.0004 and 0.0009.

Figure 2 below represents the findings from research question 2, using the DIBELS benchmark assessment in a column graph. It is important to note that in first and second grade there was a not a statistically significant difference between groups 3 and 4 even if the mean DIBELS composite score is slightly different between the two groups. And that in third grade there was not a statistically significant difference between groups 1 and 2, even though the mean DIBELS composite score is slightly different between groups 1 and 2.

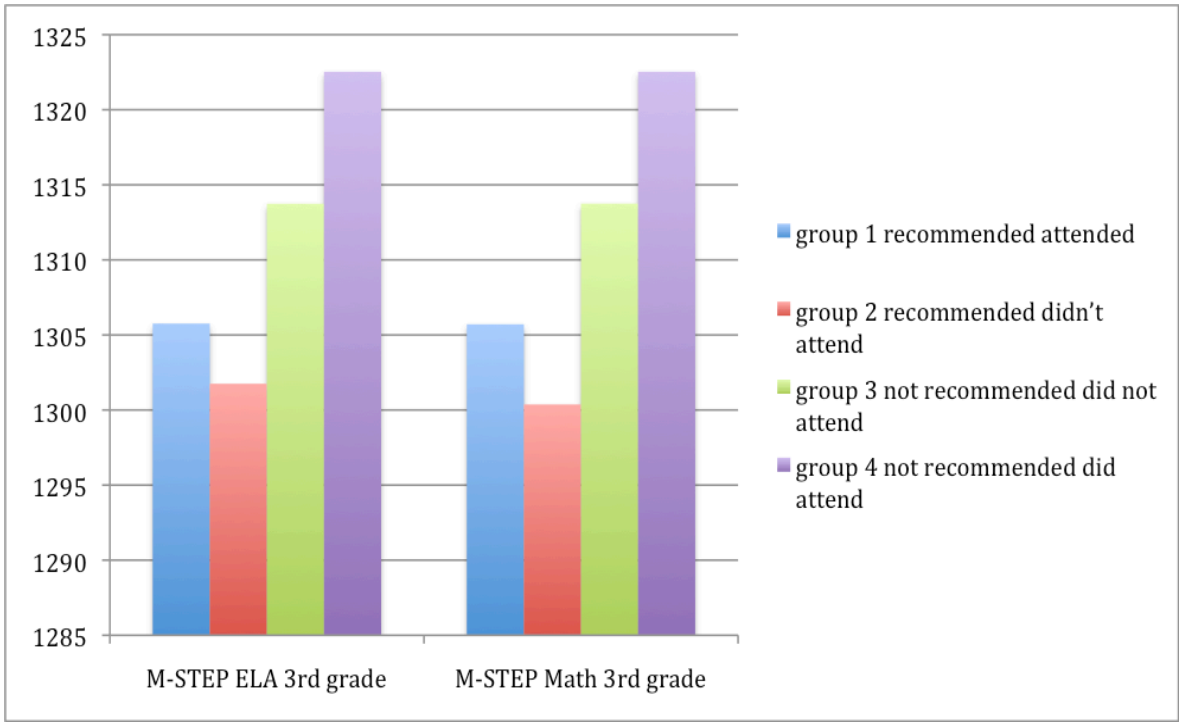
Figure 2



Graph of Findings for Research Question 2 Mean DIBELS Composite Scores Postle-Brown, 2019

Figure 3 also represents the findings from research question number 2, but it shows the mean M-STEP achievement values for each of the four student groups. Again it is important to note that there is not a statistically significant difference between groups 1 and 2, even though there is a slight difference in the mean M-STEP achievement scores.

Figure 3



Graph of Findings for Research Question 2 Mean M-STEP Achievement Postle-Brown, 2019

Relationship of Results to Existing Studies

Table 20

Comparison of Research

Comparison Summary between Postle-Brown (2018) and Previous Research	Previous Research
The difference in academic achievement between students who attended pre-kindergarten and students who did not attend pre-kindergarten	
• There is difference between the achievement of students who attended pre-kindergarten and students who did not during the fall and spring of their kindergarten years. Students who attended pre-kindergarten had a higher mean achievement score both in the fall of kindergarten and in the spring. • Once students move into 1st grade there is not a statistically significant difference in their academic achievement • No statistically significant difference is found in 2nd or 3rd grade on DIBELS or on M-STEP between students who attended pre-kindergarten and students who did not attend pre-kindergarten	Affirms: • Pre-kindergarten programs better prepare children for kindergarten (Fitzpatrick, 2008; Henry et al., 2006; Muenning et al., 2009; Valdes, 2011; Xiang & Schweinhart, 2011) • Students who attend pre-kindergarten do better on initial academic tasks (Datar, 2006; Gormley, Granger, Phillips, & Dawson, 2005). • The initial boost to student achievement wears as students continue in early elementary school (Aliprantis, 2014; Deming & Dynarski, 2008; Lincove & Painter, 2006; Martin, 2009; Oshima & Domaleski, 2006; Raffaele Mendez et al., 2014) Adds to: • How early the boost to student achievement from attending pre-kindergarten wears off (Buntaine & Costendbader, 1997; Knifflin & Hank, 2015; Magnuson, Ruhm, & Waldfogel, 2007, Schanzenbach, 2017), my study finds that no difference can be shown past spring of kindergarten (Postle-Brown, 2018).

Table 20 – Continued

	Differs from: • Relative Age Effect (Barnsley & Thompson, 1985; Bedard & Dhuey, 2006; Gladwell, 2008; Juan-Jose et al., 2015) • Two studies found a positive impact to third grade achievement from attending pre-kindergarten (Fortner & Jenkins, 2017; Guild, 2000), my study found no impact to student achievement past spring of kindergarten (Postle-Brown, 2018)
The difference in academic achievement between four groups of students; (a) students who were recommended for pre-kindergarten and went to pre-kindergarten, (b) students who were recommended for pre-kindergarten but went to kindergarten, (c) students who were recommended for kindergarten and went to kindergarten, and (d) students who were recommended for kindergarten but went to pre-kindergarten? • There is a difference on the academic achievement on benchmark testing between all four groups of students in fall and spring of their kindergarten year. • Once students moved into spring of their first grade year there is no longer a statistically significant difference between groups c and d, the students who were recommended for kindergarten and attended pre-kindergarten or the students who were recommended for kindergarten and attended kindergarten. • There is a statistically significant difference between the other groups; a to c, a to d, b to c, b, to d, and a to b. • The results from 1st grade continue on into 2nd the DIBELS.	Adds to: • All of the following studies by looking at students in four groups based on the screening results and recommendations. • Pre-kindergarten programs better prepare children for kindergarten (Fitzpatrick, 2008; Henry et al., 2006; Muenning et al., 2009; Valdes, 2011; Xiang & Schweinhart, 2011) • Students who attend pre-kindergarten do better on initial academic tasks (Datar, 2006; Gormley, Granger, Phillips, & Dawson, 2005). • The initial boost to student achievement wears as students continue in early elementary school (Aliprantis, 2014; Deming & Dynarski, 2008; Lincove & Painter, 2006; Martin, 2009; Oshima & Domaleski, 2006; Raffaele Mendez et al., 2014)

Table 20 – Continued

• In 3rd grade there is not a statistically significant difference between groups a and b on the DIBELS composite or the M-STEP ELA or Math assessment.	Differs from: • Relative Age Effect (Barnsley & Thompson, 1985; Bedard & Dhuey, 2006; Gladwell, 2008; Juan-Jose et al., 2015) • Two studies found a positive impact to third grade achievement from attending pre-kindergarten (Fortner & Jenkins, 2017; Guild, 2000), my study found that when you look at students in the 4 groups, groups 1 and 2, who were recommended for pre-kindergarten regardless if they attended pre-kindergarten or not had a lower mean academic achievement then the students who were not recommended for pre-kindergarten (Postle-Brown, 2018).
Can academic achievement on the 3rd grade M-STEP test can be predicted based on a student's kindergarten screener and their choice of pre-kindergarten participation? • The kindergarten screener and recommendation to attend pre-kindergarten is a parameter that can help districts predict academic achievement on the M-STEP test, for both English Language Arts and for Math.	Adds to: • All of the following studies by using the M-STEP data specifically and also by creating a predictive model with a regression. • The initial boost to student achievement wears as students continue in early elementary school (Aliprantis, 2014; Barnard-Brak & Albright, 2017; Deming & Dynarski, 2008; Lincove & Painter, 2006; Martin, 2009; Oshima & Domaleski, 2006; Raffaele Mendez et al., 2014)

Table 20 – Continued

	Differs from: • Relative Age Effect (Barnsley & Thompson, 1985; Bedard & Dhuey, 2006; Gladwell, 2008; Juan-Jose et al., 2015) • Two studies found a positive impact to third grade achievement from attending pre-kindergarten (Fortner & Jenkins, 2017; Guild, 2000), my study found that when

Impacts Kindergarten Readiness

Previous research has illustrated the positive effects of early childhood education (Cox, 2009: Heckman, 2011; Henry, Gordon, &Rickman, 2006; Muenning et al., 2009). This research study aligns with the results of the previous studies with analysis demonstrating that students who attended pre-kindergarten had higher academic achievement in the fall and spring of kindergarten compared to students who did not attend pre-kindergarten. This study supports having children participate in early childhood and pre-kindergarten programs to improve readiness for kindergarten.

This study along with many other studies has shown that children who participate in a quality early childhood program before entering the k-12 system are better prepared for school and are more successful during their kindergarten year. This is illustrated in this study by showing students who participated in pre-kindergarten score statistically significantly higher on the benchmark DIBELS assessment, which assesses literacy skills in both the fall and spring of kindergarten (Fitzpatrick, 2008; Henry et al., 2006; Muenning et al., 2009; Valdes, 2011; Xiang & Schweinhart, 2011).

Boost Fades Away after Early Elementary School

A majority of the studies in the literature review in chapter 2 do not support any

increase in academic achievement from delaying kindergarten and attending pre-kindergarten past early elementary school (Aliprantis, 2014; Barnard-Brak & Albright, 2017; Crothers et al., 2010; Gaue et al., 2003; Datar, 2006; Deming & Dynarski, 2008; Lincove et al., 2006; Magnuson & Waldfogel, 2007; Marshall, 2003; Martin, 2009, Schanzenbach, 2017). My study has found similar with no statistical difference in achievement found past spring of 2nd grade when comparing students who attended pre-kindergarten to students who did not attend pre-kindergarten.

The Relative Age Effect theory, RAE, refers to the difference in ages by birth date for individuals grouped in the same year or age cohort (Barnsley & Thompson, 1985). RAE would suggest that the students who were a year older due to attending pre-kindergarten would continue to out perform the students who are younger in the same grade level, this study indicated that after 2nd grade that was not the case when looking at academic achievement. RAE has been studied most often in relation to athletic achievements it is possible that the students who are a year older within the same grade do achieve more success in athletics but that would need to be investigated in an additional study.

Deficiencies in Previous Studies

Despite all of the previous research that was reviewed there were two main deficiencies indentified. First, none of the studies looked at local longitudinal data from a pre-kindergarten program that was open to all families regardless of income, or birth month. Second, none addressed using a common kindergarten screener and screening tool, and comparing students based on the recommendations from the screener results. Many people argue that if you simply sort students into 2 categories; those who attended pre-kindergarten and those who did not attend pre-kindergarten and started in traditional

kindergarten your data will be skewed by the fact that you do not know how the students who did not attend pre-kindergarten would have done in the future with out the intervention or pre-kindergarten. This study helps to address that argument by comparing the students who were recommended for the pre-kindergarten program based on the results of the screener and comparing those who followed the recommendation and attended pre-kindergarten and those who did not follow the recommendation and attended kindergarten. With both groups of students, they were identified as not being kindergarten ready when they were initially screened before they started their school careers. Some of the students attend pre-kindergarten and receive one full additional year of schooling even with that additional year and being 1 year older when they were in each grade once students move into 3rd grade there is not a statistically significant difference in academic achievement between the two groups.

Implications for Future Research

Based on the findings in this study and the previous research there are many more questions that could be answered to add to the knowledge base. This study was done in one suburban school district a replication study could be conducted in multiple school districts if they all used a screening tool in a similar fashion and also made their pre-kindergarten program open to all who are interested in attending.

Other possible studies from this data set would be to continue to follow the students and compare their student achievement on the PSAT, and later on the SAT to see if any statistically significant differences arise later on in a student's K-12 experience. Previous studies indicated that students who attend pre-kindergarten programs have more behavioral, and social emotional issues that those who do not attend (Byrd, Weitzman, & Auinger, 1997; Magnuson et al., 2007). Using this data set a researcher could compare

the number of office referrals for students within the four identified groups to determine if there is a statistically significant difference between them. Another possible study with this same data set would be to give instructors a survey to complete on each student that identifies how successful students are on soft skills such as; collaboration, communication, emotional regulation, etc. and seek to see if there are statistically significant differences among the 4 groups of students.

This study along with numerous other studies demonstrated that students who attended pre-kindergarten did have an initial boost in academic achievement during kindergarten (Fitzpatrick, 2008; Henry et al., 2006; Muenning et al., 2009; Valdes, 2011; Xiang & Schweinhart, 2011). A study could be conducted to see if the students who attended pre-kindergarten who had the initial boost in performance were provided specialized supports and interventions during kindergarten and throughout early elementary school, if those continued interventions would impact later academic success. Another study could also look at the effectiveness of the pre-kindergarten instructor and if that impacts the later academic achievement of students.

When reviewing the history of kindergarten previous studies concluded that kindergarten had originally been a half day program that provided instructors the opportunities to support families and communities in the half of their days when they did not have students (Cuban, 1992; Graue, 2000; Ross, 1976). If a pre-kindergarten program focused more on supporting the family and helping families meet the basic and developmental needs of their children, would that support have more of an impact on their future academic achievement, compared to more the academic pre-kindergarten programs currently do?

Concluding Thoughts

The results of this study should be important to policy makers, school districts, and families as they review pre-kindergarten programs and who should participate in them. Policy makers have the ability to review funding procedures; currently pre-kindergarten programs in Michigan are funded the same as kindergarten programs providing district with a full foundation allowance for each pre-kindergarten student. Policy makers may want to provide funding incentives for districts to provide additional interventions to students during their k-12 school career in place of the additional year of pre-kindergarten.

Districts will want to review the number of students participating in pre-kindergarten and what their goals are for the students who do participate, if they are seeking to have improved academic achievement beyond kindergarten they will want to review other options for supports and interventions. Districts will also want to review their process for recommending pre-kindergarten and the conversations they are having with families in relation to the results that pre-kindergarten can have on student achievement.

Families will want to do their own research and review their reasons for having their children attend pre-kindergarten. If their goals are to increase academic achievement they will want to invest their time in other interventions and programs.

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Appendix A

HSIRB Approval Letter

WESTERN MICHIGAN UNIVERSITY

Institutional Review Board
FWA00007042
IRB00000254

Date: July 24, 2018

To: Sue Poppink, Principal Investigator
Rachael Postle-Brown, Student Investigator for dissertation

From: Daryle Gardner-Bonneau, Ph.D., Vice Chair
Daryle J. Gardner-Bonneau

Re: IRB Project Number 18-07-25

This letter will serve as confirmation that your research project titled "The Connection of Delaying Kindergarten Entrance and Participating in Pre-Kindergarten to Academic Achievement in Elementary School" has been **approved** under the **exempt** category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes to this project (e.g., ***you must request a post-approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study"***). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **July 23, 2019**

Office of the Vice President for Research
Research Compliance Office
1903 W. Michigan Ave., Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276
WEBSITE: wmich.edu/research/compliance/hsirb

CAMPUS SITE: 251 W. Walwood Hall

Appendix B

Jenison Public Schools Screening Information

JENISON PUBLIC SCHOOLS
SCREENING INFORMATION SHEET

Child's Name: _____ DOB: _____ Gender: M / F

Active IEP? No / Yes _____ Age at Screening: _____

Preschool Program/Experience *(if applicable)*: _____

Readiness Checked By: _____ Date: _____

											Average Range							
1. Manipulation Skills						1	2	3	4	5	6	7	8					
2. Reasoning(SP)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
3. Visual Memory						1	2	3	4	5	6	7	8	9				
4. Basic Concepts(SP)					1	2	3	4	5	6	7	8	9	10	11			
5. Sound Identification	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
6. Picture Naming	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
7. Auditory Sequencing & Memory(SP)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18+	
8. Visual Motor						1	2	3	4	5	6	7	8	9	10			
9. Drawing					1	2	3	4	5	6	7	8	9	10	11	12	13	

At-Risk Factors:

_____ Speech (Articulation, Voice & Fluency) _____ Language (Comprehension & Expression)

_____ Difficulties Focusing _____Perceptual Difficulties _____ Separation Problems

_____ Very Quiet/Unresponsive _____ Other _____

Parent Concerns: _____

_____ Discussed these concerns with parent. _____ A phone call is requested _____

Comments _____

_____

Placement Recommendation:	Tester	Parent
Transitional-Kindergarten		
*Undecided		
Kindergarten		

Final Placement: Transitional-Kindergarten _____ Kindergarten _____

*If you leave the screening undecided about the final placement, please contact Lorri at 457-8839 or via email at Lgierman@JPSonline.org with your decision by 3:00 p.m. the Monday following the screening.

White – Student CA-60 Yellow – Special Education Pink – Parent rev. Jan 2018