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December 2022

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THE EFFECT OF MATERNAL EDUCATION ON CHILDREN'S ACADEMIC GROWTH AND ATTAINMENT IN ELEMENTARY SCHOOL

A Dissertation

by

JEFF UTSINGER

Submitted to the School of Graduate Studies
Western Illinois University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

December 2022

Major Subject: Educational Leadership

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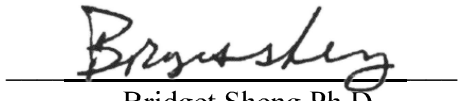

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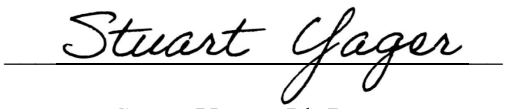

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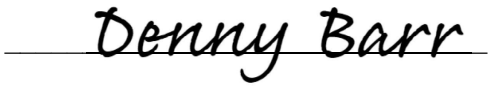

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December 2022

ABSTRACT

THE EFFECT OF MATERNAL EDUCATION ON CHILDREN'S ACADEMIC GROWTH AND ATTAINMENT IN ELEMENTARY SCHOOL

(December 2022)

Jeff Utsinger, B.S., Illinois State University; M.S., Bradley University;

Ed.S., Western Illinois University; CSBO, North Illinois University

Dissertation Chair: Dr. Bridget Sheng

The purpose of this quantitative study was to analyze the ECLS-K:2011 longitudinal study to determine the impact the mother's education has on her child's kindergarten academic performance, growth and attainment from kindergarten through fifth grade, and the background characteristics that affect child academic development. This study employed a complex correlational design utilizing descriptive statistics, ANOVA, *t*-test, and regression analysis.

The results of the study showed that a mother's education attainment level had a significant relationship to her child's academic performance in kindergarten and through fifth grade. Students whose mothers had higher levels of education scored higher than students whose mothers had lower levels of educational attainment. Overall, the ANOVA results found that 15.1% to 21.9% of the student assessments results on the reading, math, and science spring assessments could be explained by the mother's education level. Although there were several consecutive education categories with no statistical significance, the overall trend showed the performance of the students on all

assessments were higher for children whose mothers' had higher levels of education. Regression analyses revealed that the race of the child could explain 8.1% to 10.7% of the assessment results for reading, 10.3% to 15% for math, and 14.1% to 19.4% for science. When including the level of the mother's education level as a variable, the results displayed that 9% to 10.9% of the reading assessment data could be explained *beyond* the impact race had on the assessment, 8.5% to 9.3% could explained beyond the impact of race on the math assessment, and 8.8% to 10.5% of the results on the science assessment could be explained beyond the impact of race. Overall, the largest combined impact that race and mother's education level on the reading assessment occurred at the fourth grade with 21.5%, occurred at the fifth grade level with 24.3% for math, and occurred at the kindergarten level with 28.2% for science.

ACKNOWLEDGMENTS

Completing my dissertation has always been a life-long goal of mine since I was young. This has been a long daunting task for the past several years. Soon after starting my EdD classes, I decided to earn my CSBO (Chief School Business Official) certification, therefore I placed my dissertation on hold. I became the Assistant Superintendent/CSBO at a district near my hometown, which caused our family to move ninety miles down the road. After treading water for a while, I decided to regain focus on the dissertation and set out to complete this monumental task. Many times throughout the writing process I wanted to change my topic, wanted to give up, but I finally focused on this dissertation to fully complete an ambition of mine to become a "Doctor". I would go a full year without touching this dissertation and then one day, it finally clicked, and I spent non-stop researching and writing to complete this dissertation.

I wanted to thank my wife, Lori, for ensuring that I had time to write the dissertation and entertaining our five-year-old as I was in the basement office spending hours writing and researching. She has been extremely supportive and positive throughout the whole dissertation process, especially the weekends I spent in classes. I also wanted to thank my dissertation chair, Dr. Sheng, for helping me along the way and keeping me motivated to actually finish. I also wanted to give a thanks to my friends and former colleagues, Dr. Nick Sutton and Dr. Adam Brumbaugh, for the positive motivation and guidance over years.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

I have been asked multiple times why I have an interest in a topic concerning the mother's educational level and the academic success of her children. I grew up in a farming family with three older brothers and one older sister. More precisely, I am a triplet of three boys, of which I am the youngest. When we were born in 1978, my parents already had a five-year-old son and a seven-year-old daughter. All three of us triplets were raised exactly the same, but we went through different routes in education throughout our lives. I graduated top of my class and was the first family member to earn a bachelor's degree. I then went on to earn several more degrees and enjoy every aspect of education. Conversely, my other triplet brothers decided to join the workforce immediately after high school to work in factories. When growing up, I spent a lot of time being educated by my mother, but my brothers gravitated more towards my father. When I was in college, I noticed that a variety of students around me seemed to be much above my skill level at that time. I would think about this daily on how this came to be. Was it because they had more money, attended better schools, had more life experiences, or was parental education a factor? My own experiences and questions have directed me to the focus of this dissertation.

I have served as a coach, mentor, high school math teacher, and administrator throughout my 20-year career. I have seen, researched, and experienced a great variety of educationally related items throughout the years, but one item that I have always noticed is that mothers' educational levels had a direct effect on the academic success of

her children. That is, the more education the mothers had, the better their kids performed in school. But an issue I realized about this statement is the fact I have only been around high school students and parents throughout my career. After talking to other administrators, they did not see the same high level of correlation that I have seen in relation to the younger students. Therefore, this has greatly piqued my interest in this topic.

Background of the Problem

Due to the importance of schooling in today's society, much exploration and analysis have been performed on a variety of topics in relation to schooling and academics (Boonk, Gijselaers, Ritzen, & Brand-Gruwel, 2018). According to research by Gibbons (2021), approximately 86.4 billion dollars a year is spent on research and development from academic institutions in the United States. This research also showed that the number of women in academia doubled from the early 1990s to the late 2010s. With the increase in research, as well as the number of women working for advanced degrees, it is more important than ever to focus on the maternal education level and how this reflects on the academic success of her children.

The magnitude to which the mothers' education level affects her children's academic attainment and growth throughout school has rarely been studied using a longitudinal nationally represented survey (Augustine, 2017). A series of early childhood longitudinal studies were performed by the U.S. Department of Education to help shed light on the various factors involved with early childhood education using direct testing and surveys (Rock & Pollack, 2002). These ECLS (Early Childhood Longitudinal Studies) became the defining longitudinal studies used to investigate a wide variety of

topics in relation to early childhood schooling. Although these longitudinal studies have been previous analyzed, the long-term effects of maternal education level on children's academic progress/trajectory has not been the focus, especially when various demographic variables are included. Therefore, this researcher believes there is an inconsistent and inadequate breadth of research on how a mother's education level affects her child during the first part of their academic lives.

One of the most groundbreaking longitudinal research studies, in relation to predicting child educational success, was performed in 1960 as the researchers interviewed 856 third graders in a rural county in New York and then had follow-up interviews when the students were 19, 20, and 48 years old (Eron, Walder, & Lefkowitz, 1971). This study was generated to determine the level of the student's educational and occupational success at age 48 when comparing their parent's educational levels. This research study concluded that the parent's educational level greatly predicted the education occupation for the child 40 years later, but "the structural models showed that parental education level had no direct effect on a child's educational level or occupational prestige but had significant indirect effects that were independent of the other predictor variable affects" (Dubow, Boxer, & Huesmann, 2009, p. 249). Thus, while in this study, the effects of parental education level were indirect, they were still there and important.

Research involving parental education and how this provides more stimulating cognitive, physical, and emotional environment, which led to more accurate beliefs about their own academic achievement, have been studied in previous smaller longitudinal studies. But these studies are very brief and did not fully investigate the family structure such as socioeconomic (SES) stress and ethnicity (Davis-Kean, 2005; McLoyd, 1998).

These studies were very limited and did not find that SES levels affected the child's outcome because of negative family interactions; rather, the value of actual housing and parent's educational beliefs had a much greater impact.

Magnuson (2007) found there was a link to a mother's educational attainment and her child's overall outcomes when it comes to academic achievement. The researcher first analyzed an extension longitudinal study to first show a mother's educational attainment does have a positive effect on children. Second, Magnuson declared that when a mother with low to moderate educational attainment increases their educational attainment during childhood, the child shows growth in all aspects of academics. They also provided evidence that reading skill improved the most for children whose mothers were gaining more education through their childhood.

Maternal education studies have focused on a variety of topics, not just academic growth and attainment of children, but also areas of development, birth weight, obesity, aspirations for future schooling, gifted programming, and socioemotional development (Crosnoe, Johnston, & Cavanagh, 2021; Kantomaa, Tammelin, Demakakos, Ebeling, & Taanila, 2010). OECD (2001) analyzed a youth longitudinal survey to determine that a mother's educational level has more impact on her child's academic performance than a father's educational attainment. McLeod and Kaiser (2004) also used the mother's educational attainment in their research, instead of the father's, because they determined most childhood and adolescence outcomes correlated with the mother's level of education. They also articulated that children of mother's with higher educational attainment had almost four times higher levels of physical activity, higher academic performance, more advanced plans for post-high school education, and fewer behavior

problems. Godah et al. (2021) performed a meta-analysis of cross-sectional and cohort studies to inspect the association between a child's birth weight and the maternal education level. They determined there is a 33% higher probability to have birthweight in the normal range for children of higher education mothers when compared to low educated mothers. Dollaghan et al. (1999) analyzed the effect a mother's education has on her child's early speech and language skills by inspecting data from preschool assessments. Their analysis showed that mother's with higher education had children that scored higher in all language areas assessment when compared to children whose mothers had lower levels of education.

The overall effects a mother's education has on her children is extremely important in also creating impactful social policies (Davis-Kean, 2005). Davis-Kean (2005) found that an increase in maternal education would have positive effects on supplemental income programs because of the implication of improving the lives of their children. Magnuson and McGroder (2001) also unearthed those specific interventions would lead to more maternal education but did show relatively small increases in the short-term benefits on children's achievement. Furthermore, results from various other public policy intervention studies with the focus of enhancing the economic well-being of families, will also shed light on policy creation when it pertains to parent and child educational levels (Magnuson, 2004; Morris & Muchalopoulos, 2003; Nomaguchi & Milkie 2020).

Statement of the Problem

The ECLS (Early Childhood Longitudinal Studies) created by the U.S. Department of Education is the first set of nationally represented studies of childhood

development and education in the United States (West, 2017). Numerous researchers have analyzed these studies in order to explore a variety of findings, but in reviewing these studies, it is apparent that there is a deficiency in the research related to demographic controlled variables when it pertains to parental educational levels, specifically the mother's educational levels (Abuya & Ciera, 2012). The newly released ECLS-K:2011 survey improved on the previous ECLS studies by allowing cross-cohort comparisons of nationally represented kindergarten classes experiencing different educational policies and demographic environments (West, 2017).

In reviewing previous non-ECLS studies, there are numerous studies that focus on young child nutrition, child academic perceptions, and overall child development, but only utilize non-longitudinal, static data sources for children. Sewell and Shah (1968) was one of the first studies to examine the effect the parent's educational level has on their high school senior when it related to their college aspirations and achievements. This study followed the 10,318 high school seniors for seven years as they entered post-high school life. They researchers found parental encouragement is a powerful intervening variable between socioeconomic class background and intelligence of the child and his educational aspirations. Zhao and Yiyue (2018) studied the effects the mother's education level has on their college student's depression level. This study was focused on college students from Beijing and used no other controlling variables other than mother's education level. The study found that the mother's educational level has significant negative effect on college students' depression but positive effect on family function. Lastly, studies by Abuya and Ciera (2012), Chen and Li (2009), Thomas, Strauss, and Henriques (1991), all used the mother's education level as a controlling

variable in relation to only the child's health, such as nutrition, height, and obesity. These studies showed the correlation of higher maternal education resulting in healthier children.

We have an unquenchable thirst to determine what is the best way to help all children in society. Although research has been performed for decades about what causes childhood school success, few studies have looked into how just the mother's educational levels related to her children's growth and attainment when using a national longitudinal study that has been properly tracked for several years. In order to fully create a plan of action in relation to the mother's educational levels, the topic needs to be systematically analyzed by isolating and then studying the impact certain demographic variables (income, race, gender, etc.) have on the academic growth and attainment of her children.

Purpose of the Study

The purpose of this quantitative study was to examine the correlation between the level of a mother's education to that of her children's academic level in kindergarten and overall growth through schooling up to fifth grade, and also examined the controlling variables that may affect student academic progress. Using the 2010-2011 Kindergarten Class Early Childhood Longitudinal Study (ECLS-K:2011) from the National Center for Education Statistics (NCES) within the institute of Education Sciences (IES) of the U.S. Department of Education, statistical analysis was performed on over 18,000 student information sets. The ECLS-K:2011 is third in a series of longitudinal studies from the NCES, with a fourth study projected to start in 2022 (NCES, 2020). The ECLS-K:2011 survey includes assessment scores, questionnaires, and perception surveys, but for the purpose of this study, only the assessments scores are utilized to answer the study's

research questions. The ECLS-K:2011 directly examines child academic development, early school academic experiences, and school readiness using direct testing data.

Research Questions

The three research questions for this study help to examine the effects a mother's educational attainment has on her child's academic attainment and growth. The first research question sought to examine the entry level academic performance of children in their first year of schooling based on the mother's education level. The second research question is a longitudinal analysis of the effect of mother's education on the academic outcomes of children from kindergarten through fifth grade. It should be noted that the ECLS-K:2011 study followed students through eighth grade, but the data is not available at this current time for these later grades. The third research question aimed to examine how the mother's educational level influences children's academic performance after taking in consideration (controlling for) the effects of children's demographic and background variables.

1. What effect does the mother's education have on educational performance in kindergarten?
2. What effect does a mother's education have on her children's academic development from kindergarten through fifth grade?
3. How do background characteristics impact the children's academic development when in relation to the mother's education?

Significance of the Study

This quantitative study is important because it analyzes the relationship between the mother's educational level and the educational achievement of her children and the

growth throughout the early grades. Findings of the study will build upon existing research about the various aspects to schooling as well as the mother's impact on the academic performance of her child.

The results of the study will contribute to a better understanding of the significance of the mother's education attainment level has on her children with the aid of a variety of controlling variables. The use of a national data set of longitudinal data allowed this researcher to study the long-term effects of the mother's educational level on the children by isolating the demographic and background influences. By utilizing an already completed national longitudinal study, the results of this study shed light on the overall longitudinal growth of the students throughout schooling. The study is also significant because it fills a void in the literature review when concerning longitudinal growth of students from kindergarten through fifth grade in relation to the mother's educational level. There is a plethora of research on how the parent's educational level affects children, but a longitudinal study of these various attributes have not been the focal point of past research. Pending the results of this study, perhaps there could be a shift in providing more resources for mothers either to obtain more schooling and/or to pinpoint the controlling factors that are greatly affected by the mother's educational levels.

Statement of Positionality

This study quantitatively explored the relationship between the mother's educational level and her child's academic attainment and growth throughout the early years of schooling. The longitudinal data that was used for this study came from a nine-year research project led by the National Center for Educational Statistics (NCES).

Coghlan and Brydon-Miller (2014) define positionality in action research as the "stance or positioning of the researcher in relation to the social and political context of the study" (p. 191). This statement relates to the possible manipulation of data in order to fit a political narrative, therefore all researchers must be diligent and aware of potential bias that may exist in the methods and conclusions (Creswell & Creswell, 2018). The purpose of the statement of position is to present the researcher's beliefs and past experiences in relation to a variety of factors that allows the reader to understand the unique perspective of the researcher.

I recognize that my strong beliefs about education and my internal biases can present itself, therefore I carefully chose a survey that would minimize my subjective judgments. I chose to analyze an already completed longitudinal survey concerning students from kindergarten through eighth grade. I feel that this already gathered data would greatly help limit any biases that may arise, because the collection of data has already been completed with proper valid and reliable instrumentation, the same students were tracked throughout schooling, and the data is universally available for anyone to inspect.

Summary of the Methodology

This quantitative study utilized longitudinal data to examine the relationship between the mother's educational level and her child's academic attainment from kindergarten through fifth grade. The ECLS:K-2011 longitudinal survey followed 18,174 children as they navigated from kindergarten through eighth grade. This multi-source, multi-method survey includes parent interviews, direct child assessments, self-administered questionnaires for students and teachers. More specifically, the direct child

assessments focused on analyzing reading levels, math proficiency, science proficiency, and overall academic competency levels.

The population from the ECLS-K:2011 data was obtained from children attending 283 private and 1,036 public schools in the United States (Najarian, Tourangeau, Nord, & Wallner-Allen, 2018). This survey started to gather information from the fall 2011 kindergarten classes of students and followed these children through the end of their eighth grade year. It should be noted that this researcher only focused on the kindergarten through fifth grade data because the sixth through eighth grade data has not been fully released to the public yet. The ECLS:K-2011 is not a simple random sample survey, but rather a multistage, stratified, clustering design survey (Buek, 2018). The survey sampling was performed in three stages of the clustered design: stage one involves similar areas of counties with a similar number of five-year-old children, stage two consisted of narrowing down to private and public schools, and stage three represents children chosen within the individual private and public schools.

The ECLS:K-2011 survey data was analyzed using the IBM SPSS statistical software because of the overall complexity and breadth of the data. A wide range of statistical analysis were performed on the data such as ANOVA, *t*-tests, and multiple regression analysis in order to help answer the research questions. By analyzing the data, this researcher was able to further inspect various controlling variables and how these are affected by the mother's education level. Finally, the researcher interpreted the data to draw conclusions and provide recommendations for future research.

Assumptions

An assumption is information that is accepted to be true without being checked or tested (Fraenkel & Wallen, 2008; Theofanidis & Fountouki 2018). All instrumentation used for the ECLS-K:2011 allowed for honest and accurate responses from children and adults. The direct assessments, surveys, and interviews were performed by impartial trained individuals, which allowed for accurate, unbiased results. The researcher also assumed that the children tried with fidelity on the direct cognitive assessments because of the low-pressure testing which did not have a bearing on their grades. Also, a great deal of time and attention was paid to the children being tracked correctly according to their grade progression throughout kindergarten through eighth grade. Lastly, all data in the ECLS-K:2011 data sets are available and accessible to the researcher as well as the general public.

Limitations

A limitation is "an aspect of a study that the researcher knows may negatively affect the results or general ability of the results but over which the researcher has no control" (Frenkel & Wallen, 2008). There are several limitations of this study that have the potential to weaken the results and limit the accuracy of the findings. The limitations are as follows:

- The ECLS-K:2011 is a secondary data set, consequently a variety of limitations are possible because of the techniques used to administer to over 18,000 children and adults. The researcher has trust that the original researchers used proper techniques available at the time in order to properly administer and follow the large number of children and adults.

- The self-reported data, which relies on accurate self-perceptions and knowledge, could be inaccurate (Gay, Mills, & Airasian, 2012). Because of the nature of self-reported data, the individuals could be mistaken or slightly fabricate the self-reported information.
- The direct cognitive assessments were based on educational frameworks from 2005 through 2012, which may be not as accurate as today's cognitive assessments. With the ever-increasing knowledge and advancements in academics and technology, the educational frameworks may not be as valid as today's frameworks.
- The ECLS-K:2011 survey is very extensive; therefore, there could be a limitation of correct corresponding data being included into the data sets. This study will only focus on a few variables while the ECLS-K:2011 survey includes a multitude of variables and information.

Delimitations

Delimitations are the opposite of limitations, because they are within the control of the researcher. The delimitations are controlled by the researcher to limit the scope of the research and to make the research much more manageable (Creswell & Creswell, 2018). The first delimitation is that the researcher chose the ECLS-K:2011 survey data instead of previous ECLS surveys, because the 2011 survey allows for cross cohort comparisons of nationally represented kindergarten classes experiencing different educational demographic environments and educational policies (Tourangeau et al., 2017). Also, the researcher chose to analyze just the academic data instead of the social emotional data gathered from the ECLS study. This allowed for the researcher to have a

narrower focus and scope. Next, the researcher chose the research questions to focus on the educational growth and attainment from kindergarten through fifth grade. The researcher chose a very extensive longitudinal study that allowed for more accurate calculations to be made because thousands of data points have already been gathered. Lastly, the study focused just on the mother's education level and not the father's or the parents as a whole. McLeod and Kaiser (2004) stated that most childhood and adolescence outcomes are associated with the mother's education and OECD (2001) showed that a mother's educational level is more strongly associated with student academic performance than the father's level of education.

Definition of Terms

In an effort to aid the reader in understanding the study, definition of key terms referred to in the study follow:

Academic Attainment. Academic attainment is the highest level of education that a person has successfully completed.

Academic Growth. Academic growth is the progress a person makes between two or more points in time to demonstrate their progression toward specific goals and/or benchmarks.

Achievement Gap. The disparity in the academic performance or educational attainment between a group of students, such as students from higher-income and lower-income households.

A Nation at Risk. The 1983 landmark education report of then President Ronald Reagan's National Commission on Excellence in Education. The report warned of the failings of public education, called for local, state, federal reform, and provided

recommendations. The report highlighted four main areas of concern including content, expectations, time, and teaching (Park, 2004).

Controlling Background Variables. Variables that are held constant or at a limited capacity. These variables are not the focus of a study, but rather are controlled to show any influence they may have on the outcomes.

Direct Testing. Direct testing refers to assessing a person by having them demonstrate ability in the skilling being sampled.

Indirect Testing. Indirect testing refers to assessing a person to measure their knowledge about a subject.

Early Childhood Longitudinal Studies (ECLS). The Early Childhood Longitudinal Surveys are conducted by the U.S. Department of Education, mandated by law, that collects statistical data on the condition and progress of education in the United States. Currently there have been three completed ECLS surveys: ECLS-B (Birth Cohort), ECLS-K:2008 (kindergarten class of 2008), and ECLS-K:2011 (kindergarten class of 2011). The ECLS-K:2024 survey will be completed at the end of the 2024 school year. (NCES, 2022).

Fast Response Survey System (FRSS). The FRSS, established in 1975 and designed by the U.S. Department of Education, collected survey data to report data on core education issues at the elementary and secondary levels.

Kindergarten Readiness. Levels of development, which include skills and competencies needed to enter and adapt to a kindergarten classroom.

Longitudinal Study. Study in which researchers conduct multiple observations of the same subjects over a period of time. Caruana, Roman, Hernández-Sánchez, & Solli, 2017).

Maternal Education Level – Measure of a mother's educational level. These levels may include: no high school diploma, high school diploma, associate's degree or trade school certification, bachelor's degree, and master's degree and above.

National Assessment of Education Progress (NAEP). Assessment developed in 1969 to measure student achievement in the United States.

Socioeconomic Status (SES). Socioeconomic status refers to a combined total measure (economic and sociological) measure of an individual, family, group of people's access to resources and social position in relation to others.

Organization of the Study

The focus of this study revolved around analyzing the longitudinal data found from the ECLS-K:2011 survey in order to analyze the correlation between the mother's educational level and her children's academic attainment and progress from kindergarten through fifth grade. The chapters involved are as followed:

Chapter I started with the introduction of the quantitative study, followed by the background and statement of the problem. Next, the research questions were introduced, which framed the study. Subsequently the significance of the study, positionality, and summary of methodology were discussed. The chapter finished with the assumptions, limitations, delimitations, and lastly, the definition of terms are explained.

Chapter II provides a detailed historical account and development of parenting roles in the United States. Research on parental educational beliefs and kindergarten

readiness as well as middle-childhood academic achievement are discussed. The chapter finishes with a review of parental education research and how this relates to race, ethnicity, and socioeconomic status as well as focusing on previous ECLS studies.

Chapter III explains the quantitative study's methodology. The chapter starts with introducing the research questions and a detailed analysis on the longitudinal study being studied. This analysis involves research methods, design, reliability, validity, and the data collection techniques. Chapter III then concludes with precise data analysis procedures utilized in this study.

Chapter IV concentrates on the analysis of the ECLS-K:2011 data and gives a comprehensive presentation of the study's results. Descriptive statistics with tables and figures were used to support the data analysis findings. Lastly, an interpretation and analysis for each research question is explained, followed by the summary of results.

Chapter V begins with a summary of the dissertation followed by statistical findings, interpretation of said findings, and overall conclusions. Included is an explanation of how this research enhances existing research, suggestions for future studies, as well as an explanation on how this data can be used to support providing extra assistance for mothers to enhance their education levels. Chapter V concludes with recommendations based on the findings in this current study.

CHAPTER II

REVIEW OF THE LITERATURE

This quantitative research study sought to evaluate the effect a mother's education has on her child's academic development in the elementary school grades. In investigating this relationship, the study also sought to understand what other background factors related to the parental-child dynamic influence the level of student academic growth and attainment in elementary school grades.

Chapter II provides a review of literature about the topic being studied, previous research studies related to the topic, and background information that assists in the framing of this study. More specifically, the chapter details previous research relating to the progress of elementary school students' academic growth in relation to variables associated with level of maternal education. Research involving the impact parental involvement has on their child's educational performance levels and growth has been quite substantial in the last few decades (Topor, Keane, Shelton, & Calkins, 2010; Wong et al., 2018). However, research specifically outlining the longitudinal educational effects that the mother has on her child is quite limited (Cohen, Schunke, Vobal, & Anders, 2020). Therefore, this study seeks to answer the following research questions:

1. What effect does maternal education have on educational performance in kindergarten?
2. What effect does a mother's education have on her children's academic development from kindergarten through fifth grade?

3. How do background characteristics impact the children's academic development when in relation to the mother's education?

By answering these questions, a greater understanding can be gained regarding the relationship between a child's school level performance and mother's educational level.

This literature review was conducted primarily through the Western Illinois University's online library databases. Specifically, the elementary education database used was the Education Resources Information Center (ERIC). ERIC is sponsored by the Institute of Educational Sciences (IES) of the U.S. Department of Education and consists of over 1.3 million citations to articles, documents, and reports (WIU.edu, 2022). Other educational databases utilized for this literature review were the following: Google Scholar, APA PsycNET, SAGE, ProQuest, Reference Online, and Primary Search. More than 265 references are cited from a variety of peer-reviewed journals, books, dissertations, and historical newspaper articles. A majority of the information was found by searching several key terms and phrases in the above-mentioned databases: maternal education, ECLS studies, paternal education, history of parenting in the United States, parenting philosophies, children's educational levels, parenting techniques, educational attainment, and elementary school education.

This literature review is structured in a manner that lays the foundation for historical parenting roles in the United States from the 19th century until the establishment and utilization of kindergarten level classes for children. Following the literature review are sections on philosophy of parental education beliefs and kindergarten readiness for their children, which leads to a discussion about parental beliefs and middle school academic achievement. This chapter further discusses the

trends in parental education involving White, Black, and Hispanic students and parents. A variety of research studies and meta-analysis are used to discuss these trends as it pertains to parental involvement and aspirations for their children. The chapter then concluded to previous studies involving the effects of parental education on their children's academic success, with an emphasis on previous longitudinal studies of data sets closely related to previous ECLS studies.

Historical Evolution of Parenting Roles in the United States

In order to lay a foundation concerning the relationship between the mother and her child's(s) educational level, it is important to first establish what is considered to be "parenting" and how this has evolved through the centuries. According to Bornstein (1991), parenting is a "particular and continuing task of parents and other caregivers to enculturate children . . . to prepare them for socially accepted physical, economic, and psychological situations that are characteristic of the culture in which they are to survive and thrive" (p. 6).

Paula Fass (2013), an American historian specializing in the history of childhood who also served as the President of the Society of the History of Children and Youth, explained that starting in the late 18th century, American parents sought to "parent" their child differently than their counterparts in the European countries. Fass wrote:

> American children, Europeans observed in the nineteenth century, are rude, unmannerly, and bold; and even very young children were described as unnervingly confident. Some commentators were pleased by this directness and saw it as a refreshing sign of American vigor; others were far less charmed. (p.8)

Fass articulated that after the end of the American Revolution with England, parents in the United States wanted to give their children the freedom that they just fought England to gain.

Various scholars that traveled to the Americas in the early 1800s also agreed with the sentiment that American children were rude, obnoxious, and acted as if they were small adults (Fass, 2013). Count Adam de Guronski (1857), a Polish-born author, wrote that American children were:

> emancipated … from parental authority and domestic discipline. Children accustomed to the utmost familiarity and absence of constraint with their parents, behave in the same manner with other older persons, and this sometimes deprives the social intercourse of Americans of the hint of politeness, which is more habitual in Europe. (pp. 380-381)

Guronski's viewpoint aligned with Fass's, who believed that children in the Americas were not being properly "parented" at the level to which children of England were accustomed. Guronski (1857) also questioned at what level were the parents properly educating their children when it comes to proper schooling of their language and mathematics.

Alexis de Tocqueville (1835), a French diplomat and historian, found that the most intriguing aspect of the American parenting relationship between parents and children was that the father-son relationship was very informal compared to other parts of the world. He also noted that there was a great need for individual advancement in the newly formed republic; therefore, children started work early. Because of this, the children were then treated more equally in the household. Tocqueville did not articulate

or express much interest in the bond of the mother and the children, but rather focused on the relationship with the father and son. This, by itself, sheds light on the mindset and focus of the historian of the time, that is not focusing on the parenting roles of the mother.

Much of the writing of the time focused on American children and parenting that was described by historians and travelers from other countries. It was not until the late 1800s when publications from those who experienced "American parenting" started focusing their writings on their own experiences (Fass, 2013). Ulysses S. Grant (1894), the 18th President of the United States, wrote in his personal memoirs how he was raised in "comfortable circumstances" and was expected to perform most of the work on the land that his father owned. Grant detested the work but was not forced to work on the land by his father. Because of this, he found great freedom in doing what he wanted to do and gradually took on the responsibilities of working the land. This, in return, caused him to take ownership of the work on his father's land because he knew that he was an important contributor to the Grant household (p. 20).

By the end of the 19th century, America started to change dramatically with increased industry, rapid immigration, and over-populated cities. The number of children committing crimes increased dramatically and the percentage of children not attending school saw a great increase (Fass, 2013). John Dewey (1902), an educational philosopher, sought to change how schools taught children, and in his vision, schools should allow students to have more independence. He felt that students should be more engaged in the classrooms and that parents should be more engaged and have an influence on what the children learn at home as well.

Dewey's vision for having more independent schooling for children was diametrically opposed to the top behavior psychologists and pediatricians of the time. Luther Emmett Holt (1894), an American pediatrician, author, and professor that served as the medical director of New York's Babies Hospital, outlined that mothers were to be extremely strict with the scheduling of feeding and toilet training, therefore giving their children little to no independence. Holt's 131 different publications about infant care were widely distributed and were considered to be *the handbook* on how to properly raise children (Dunn, 2000).

Starting in the 1920s, American parents started to place much emphasis on the educational and psychological research related to child development. As a result, parents started to alter how they raised their children (Child Study Association, 1926; Lomax, Kagan, & Rosenkrantz, 1978; Neem, 2017; Senn, 1975; Thattai, 2017). The scientific, research-based child-rearing principles became the main focal point of American parents as the proper way to raise their children. The older methods of just doing what feels natural in parenting was overshadowed by proven scientific techniques being established at this time (Stendler, 1950).

John Watson, the founder of behaviorism, articulated that children were not born, but were made by their parents. Therefore, raising happy children properly falls on the shoulders of the parents. One of his main concerns was teaching parents how to produce a child "who finally enters manhood so bulwarked with stable work and emotional habits that no adversity can quite overwhelm him" (Watson & Watson, 1928, p. 10). He further stated that a happy child is:

a child who never cries unless actually stuck by a pin, illustratively speaking …

> who soon builds up a wealth of habits that tides him on dark and rainy days—who puts on such habits of politeness and neatness and cleanliness that adults are willing to be around him at least part of the day … who eats what is set before him—who sleeps and rests when put to bed for sleep and rest—who puts away two-year-old habits when the third year has to be faced … [who finally enters manhood so bulwarked with stable work and emotional habits that no adversity can quite overwhelm him]. (pp. 9-10)

Watson used the results of his research to provide evidence to parents that preparing their children for the world was a very detailed task, which takes a tremendous amount of time and patience.

Watson's research on child-rearing was, in general, accepted by the general public, but his specific advice about love and affection was met with extreme criticism (Lomax, Kegan, & Rosenkrantz, 1978). One of his greatest sources of opposition came from the Housewives' League, especially from their president, Julian Heath. She stated on the radio and in papers that "Watson must be a very unhappy man to offer such ideas" (Cohen, 1978, p. 212). Various women who attended Watson's public lectures stated they were grateful that they raised their children before hearing his horrendous advice. They felt that if they used Watson's advice, then they would not have enjoyed raising their children (Cohen, 1978). Even pediatricians of the time placed the blame on Watson for the increase in infant sleeping problems. The lack of love and attention given to the infants, because of Watson's research, caused social-emotional issues with infants, and as a result, the emerging sleeping patterns (Senn, 1975). Author, and well-known critic of his time, Floyd Dell, published a variety of articles and books that used scientific studies

that disproved Watson's findings, as well as stated that a child would fail to grow and thrive when parents withhold affection from their child (Harvey, 1930). Dell stated that even if a mother follows a portion of Watson's techniques, the mother will still victimize her children. Dell felt that Watson failed to see the big picture and the possible ramifications of his theories that he exposed to the world.

Deavers and Kavanagh (2010) stated that the philosophies and ideas proposed by Holt and Watson, as well as many other child care experts, were used in the *Infant Care* pamphlets that were distributed by the U.S. government in 1914. These pamphlets warned against unwarranted affection to babies, in order to keep them from becoming fussy or spoiled. The experts stated that in order to minimize the spread of infections, children should only be kissed on the forehead and the total number of displays of affection should be greatly limited (as cited in Lomax et al., 1978). The pamphlets also outlined up-to-date health information in order to reduce the number of baby deaths, which corresponds to decreasing the baby mortality rate. The *Infant Care* pamphlets were the first government publication for families that detailed proper ways in raising a child (Deavers & Kavanagh, 2010).

Hagan, Shaw, and Duncan (2008) stated that the Children's Bureau moved their concentration to three programs of focus: services for crippled children, child welfare services, and maternal and child health. These new areas of focus were the cornerstone of the Title V of the Social Security Act of 1935, which remains the longest lasting public health legislation in U.S. history. This act developed plans on how to properly utilize funds to improve public child welfare services, with special attention given to rural areas.

President Franklin Delano Roosevelt was the driving force behind the Title V of

the Social Security Act of 1935 which provided massive funding to be given towards research on parenting and raising children (Hagan et al., 2008). One of the most prolific American pediatrician, author, and researcher of the time, Dr. Benjamin Spock, published perhaps the most influential book on child rearing of the time, *Common Sense Book of Baby and Child Care*. Spock (1946) felt that the parenting trends by established researchers that were against showing affection for their children, such as Holt and Watson, needed to be greatly altered to reflect the educational experiences of children. Spock's publications started a flood of new learning and psychological theories that emerged from university laboratories, in which these findings started appearing in publications and in everyday conversations with American families (Fass, 2013).

The Title V of the Social Security Act of 1935 was instrumental in funding a variety of programs on parenting and child welfare starting in the 1930s, but gained the most momentum following World War II because of the high birth rate during this time (Oettinger, 1940). Katherine Oettinger, the former Chief of the United States Children's Bureau, published many articles about the impact of the 1935 Social Security Act, but none were more important than her publication in the Social Security Bulletin in 1940. Her article entitled, "Title V of the Social Security Act: What it Has Meant for Children," shed light on the impact of Title V on funding for parenting, child services, and child health. Oettinger noted that because of Title V, there was a threefold increase in funding during the 1950s that helped to increase programs for postgraduate training of hospital personnel. Training that focused on the emotional growth of infants and children, especially the parent-child relationship.

Perhaps the greatest change in the role of parents in raising children came during and after World War II (Bianchi & Spain, 1996). America was hesitant to join the war that erupted in 1939, but it was the bombing of Pearl Harbor in 1941 that caused America to jump into the second World War (Brinkley, 1992). With over 16 million American men involved in World War II, the responsibility to help with the workforce fell upon the women. The importance of women in the workforce during the war was most evident in the major factories that were transitioned in helping with building items for the war. The ALCOA factories became critically important during WWII because they produced 34% of the world's aluminum, the main metal necessary in making airplanes. More than 310,000 women worked in the United States aircraft industry within the first year of World War II, which in return, caused working mothers to face great challenges in working full-time and raising their children (Weatherford, 2009). Data indicates that there were 13 million in the workforce in 1940 and this increased by more than six million by 1944 (Stolzfus, 2000). During the war, for the first time ever, the number of single women in the workforce was surpassed by the number of married women working. Dorris Weatherford in her book, *American Woman and World War II,* attributes this fact to the fact couples hurriedly married right before the men (and women) were sent to war (2009).

In order to relieve the pressure of working mothers in taking care of their children, President Franklin Delano Roosevelt, under the guidance of his wife Eleanor, approved the first U.S. government childcare facilities in 1942. The Communities Facilities Act of 1942 led to seven childcare centers being initially built that could service 105,000 children (Stolzfus, 2000). A variety of federal grants allowed communities to

open their own daycare centers, which reached 1000 centers by July of 1946. Women found a peace of mind knowing their children were taken care of during their long days of working in factories because of the federal initiatives creating these centers. Towards the end of the war, funding started to be diverted from child care centers to other sectors in the government that would allow industrial advancement of the U.S. economy (Weatherford, 2009).

Perhaps one of the strongest moves by the US government in order to maximize child care as well as allowing mothers to enter the workforce and to allow for more parental educational training was in establishing the child care tax deduction, which allowed low to moderate income families to deduct up to $600 for child care from their income taxes (Michel, 2011). This child care deduction, and several bills established by Congress, allowed more parents to enroll their children in daycares that provided education and care for their children.

With more money being redirected by the U.S. government to daycare and early childhood learning, the importance of these programs became more prevalent than ever. A total of one billion dollars was spent on creating daycare centers from 1943 to 1946, with 130,000 attending early learning centers at the start of 1943, this number rose to 600,000 within a few years (Cohen, 2015). With the flood of early learning centers and daycares being created, the U.S. government created a variety of programs to help examine how to educate the young children in these programs to be the best U.S. citizens in the future that could contribute to the workforce. Perhaps the most comprehensive and impactful action of the U.S. government was creating a child-development program known as the National Head Start Association in 1965 (Bratton, Ceballos, Sheely-Moore,

Meany-Walen, Pronchenko, & Jones, 2012). The Head Start Program was (and still is) the nation's largest early intervention and program for low-income and at-risk preschoolers in the United States. In order to study the success of the Head Start Program, the Head Start Longitudinal Study (HSLS) was conducted by The Educational Testing Service (ETS) in 1971. The study was performed to examine the comparative gains of 5,000 three and four-year old children in the Head Start Program against preschoolers who attended non-preschool programs and preschoolers who attended non-Head Start programs (Lee, Brooks-Gunn, & Schnur, 1988). The results of the HSLS further concreted the fact that Head Start preschool children scored significantly higher than the other student groups on the California Preschool Competency Test (Lee et al., 1988).

Parental Educational Beliefs and Kindergarten Readiness

The importance of kindergarten readiness gained momentum when the National Association for the Education of Young Children (NAEYC) adopted their standards on what constitutes proper standards for readiness (Bredekamp, 1987; NAEYC, 2020). The NAEYC stated that kindergarten programs should be more age appropriate and should accommodate children with a wide variety of individual background differences. By late 1980, nearly all children in the United States attended a variation of kindergarten before first grade (West, Hausken, Chandler, & Collins, 1991).

The viewpoints of the NAEYC became widely accepted among early childhood educators because of the diversity among the parents of said kindergartners (Becker, Rigaud, & Epstein, 2022; Hitz & Wright, 1988). Strong competition among parents started to develop in the 1990s in order for their kindergarten-aged children to be ready

for schooling. School readiness started to take shape in both cognitive and non-cognitive skills that include the child's ability to adapt to communication, problem-solving, respect, cooperation, and the basic skills of numbers, shapes, and counting (Blair & Raver, 2015). Parents began to realize their child had to be properly exposed to age-level stimulation, thus allowing them to create the building blocks needed to perform at the level expected. Children who enter school at lower academic achievement are more likely to stay academically behind other students throughout school (Cadima, Leal, & McWilliam, 2010).

Several major studies were sponsored by the U.S. Department of Education National Center for Educational Statistics in 1993 involving parental and teacher beliefs on what constitutes kindergarten readiness. The 1993 National Household Education Survey (NHES:93) asked preschool parents to rate how important certain skills are needed for kindergarten (Kim, Murdock, & Choi, D, 2005;. West, Hausken, & Collins, 1995). The Fast Response Survey System (FRSS) Kindergarten Teacher Survey also asked these same questions but was targeted just for the kindergarten teachers. The results of these surveys indicated that parents and teachers agreed that it is very important for the children to communicate their needs and wants verbally as well as being enthusiastic and curious when approaching new ideas (see Table 2.1). It was also determined that twice the percentage of parents felt that all behavior items were "essential" or "very essential" compared to teachers and also four times the number of parents felt that all school-related skills were "essential" or "very essential" when compared to teachers.

Table 2.1

Percentage of Preschool Parents and Kindergarten Teachers Who Rated "Essential" or "Very Essential" on the NHES:93 and FRESS Surveys for Kindergarten Readiness

Child Characteristic	Preschool Parents	Kindergarten Teachers
Estimated number (thousands)	8,441	119
Behavior		
Communicated needs and wants verbally	92%	84%
Enthusiastic and curious when approaching new ideas	84%	76%
Takes turns and shares	92%	56%
Sits still and pays attention	80%	42%
School-related skills		
Able to use pencils or paint brushes	65%	21%
Can count to 20 or more	59%	7%
Knows the letters of the alphabet	58%	10%
All 4 behavior characteristics	65%	29%
All 3 school-related skills	41%	4%

Note. The NHES:93 unit analysis is per child with the base for percentages being calculated from number of preschoolers, not the number of parents. Adapted from "Readiness for Kindergarten: Parent and Teacher beliefs," by J. West, E. G. Hausken, M. Collins, 1995, *Statistics in Brief,* Copyright 1995 by the National Center for Educational Statistics.

These previous NHES studies originally shed light on the different perspectives that parents and teachers had about children's readiness for school. The researchers followed up by going one step further to break down the parental educational levels according to how they answered the surveys. Substantial research found that the educational level of parents greatly influences the type of activities in which children are exposed by their parents (Clearinghouse, 2020; West, Hausken, Chandler, & Collins, 1992). In breaking down the educational levels of attainment of the parents from the

NHES:93 and FRSS surveys, it was found that parents with less than a high school education, high school diploma, and vocational/some college rated the behavior skills as more important than the school-related skills for their children being ready for kindergarten. In contrast, college graduates felt that school-related skills are much more important than behavior skills (see Table 2.2).

Table 2.2

Percentage of Preschool Parents and Kindergarten Teachers Who Rated "Essential" or "Very Essential" on the NHES:93 and FRESS Surveys for Kindergarten Readiness by Education Level

Child Characteristic	Less than High School	High School/ equivalent	Vocational/ technical/some college	College graduate/ professional
Estimated number (thousands)	1,026	3,191	2,644	1,579
Behavior				
Communicated needs and wants verbally	96%	94%	91%	88%
Enthusiastic and curious when approaching new ideas	86%	86%	82%	81%
Takes turns and shares	92%	94%	92%	85%
Sits still and pays attention	95%	84%	76%	69%
School-related skills				
Able to use pencils or paint brushes	78%	68%	64%	54%
Can count to 20 or more	70%	62%	57%	50%
Knows the letters of the alphabet	73%	63%	55%	41%

Note. The NHES:93 unit analysis is per child with the base for percentages being calculated from the number of preschoolers, not the number of parents. Because of rounding, the sum of items of Table 2.2 and 2.1 may not match. Adapted from "Readiness for Kindergarten: Parent and Teacher beliefs," by J. West, E. G. Hausken, M. Collins, 1995, *Statistics in Brief,* Copyright 1995 by the National Center for Educational Statistics.

The NHES:93 and FRSS Kindergarten Teacher surveys results showed consistent patterns with earlier research involving the emphasis parents and teachers place on the

various skills and attributes about kindergarten. Eisenhart and Graue (1990) highlighted that parents felt that a child's social and emotional maturity was much more important than academic skills when determining kindergarten readiness. Conversely, parents placed greater importance on academic skills and classroom practices when the child is at school (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020; Knudsen-Lindauer & Harris, 1989). The researchers felt that a reason for this is because parents held greater importance to certain activities from their own childhood and felt this would also work for their child.

Harris and Knudsen-Lindauer (1988) rationalized that the parent's own educational attainment influenced their own beliefs on what educational attributes were important for their kindergarten child. They theorized that parents with higher educational attainment held very positive opinions toward early education because of their own early exposure to positive schooling experiences. The parents with higher educational attainment felt that programs should accommodate the various individual differences of the students' experience and backgrounds. Parents of lower socioeconomic groups, also with lower educational attainment levels, placed a greater significance on concrete skills than upon more abstract development.

The differences between parent and teacher responses on the FRSS Kindergarten Survey on Student Readiness and NHES:93 were measurable, but these results could have been slightly tainted by the administration and other methodological characteristics. Knudsen-Lindauer and Harris (1989) emphasized that perhaps the difference of parental beliefs on the studies would be minimized if there were increased communication between parents and children, perhaps classes that would help both groups define similar

goals with their child(ren). The researchers surmised that clarity of goals is an extremely important attribute for both parents and teachers to reach in order for their child's performance to be maximized. While it is assumed that behaviors are a result of personal beliefs, what parents and teachers say may differ from what is actually practiced at home (Amos-Hatch & Freeman, 1988; Jeynes, 2018; Spidell-Rusher et al., 1992).

Parental Education and Middle Childhood Academic Achievement

A plethora of studies have shown that there is a positive link between socioeconomic status and the child's academic achievement (Davis & Warner, 2018; Sirin, 2005; White, 1982). McLoyd (1998, 1999) and Reiss, Meyrose, Otto, Lampert, Klasen, and Ravens-Sieberer, (2019) referenced there is a very strong relationship between a parent's low socioeconomic status and the negative outcomes of their children, including low educational attainment, low IQ, and increased social-emotional problems. These studies also highlighted that parental education attainment is a strong predictor of the child's socioeconomic status, which predicts children's behavior and educational outcomes. Duncan and Brooks-Gunn (1997) concluded that parental educational levels were strongly linked to the outcomes of the children's intellect, even after controlling for a variety of SES variables. In their book, *Consequences of Growing Up Poor*, the authors dedicated individual chapters to the various aspects of growing up with economic hardship, in which they used various studies to further their claims. Chapter 3 of their book made several references to the fact that the maternal education level greatly affected student schooling outcomes, especially at the middle childhood stage of life. According to Eccles (1999), middle childhood is defined as ages from 6 to 12 years old.

Davis-Keen (2005) discovered that there are direct correlations between parental

education and standardized test scores among European American students, especially for middle childhood. Data for their study was gathered from a national cross-sectional study of children that included 869 eight to 12 year olds, divided equally among gender (433 males and 436 females). More specifically, the researchers used data from the 1997 Child Development Supplement of the Panel Study of Income Dynamics (PSID-CDS), that included 800 families (49% non-Hispanic European Americans and 47% African Americans) for almost 30 years (Hofferth, Davis-Kean, Davis, & Finkelstein, 1998). The PSID-CDS data was gathered from interviews, data analysis of various factors, with adult literacy being measured on the Woodcock-Johnson Passage Comprehension test (Woodcock & Johnson, 1989, 1990). The results of the study showed a moderate to strong relationship between parental education and income when it comes to predicting the child's achievement on standardized tests. The researchers also concluded that parental educational level and care-giving beliefs, home behaviors, and SES are strongly related to the children's achievement. It is noted that this study did extensively examine a variety of factors, but did not differentiate the parents' educational levels; rather, it averaged the father and mother's education levels. Furthermore, they noted that the educational level of the parents had more of a statistical significance with European Americans than with African Americans in the study when it comes to overall standardized testing performance. It was determined that parental attitudes toward education were a very strong factor when it comes to African American student success.

Johnson et al. (1983) used a battery of 15 cognitive tests to determine the impact the parental educational level has on their child's thoughts and performance when it pertains to educational success and feelings over future occupations. The study consisted

of having 105 families take the Comrey Personality Scales assessments to determine the direct and indirect links between educational and occupational levels. The study first revealed that the cognitive ability, personality, and family background for Japanese males, Japanese females, European males, and European females all have a similar impact on educational attainment. Overall, the study found that the educational levels of both the mothers and fathers were positively associated with positive thoughts for "advanced" professions during the middle childhood years and beyond.

Dubow, Boxer, and Huesmann (2009) studied the long-term effects of parental education on children's success. They showed that there was a moderate, positive correlation between parents' educational level and occupational prestige 40 years later. Data from this study came from the Columbia County Longitudinal Study, which began in the 1960s and completed in the year 2000. This 40-year study used data from 856 third graders in semi-rural county in New York State. Information was gained from interviews of the children and the parents at ages nine, 20, and 48 (Huesmann et al., 2002). The educational level of the parents when the child is eight years old had a significant predicted educational and occupational success of the children some 40 years later. More precisely (Figure 2.1), there was a significant correlation between parents' educational level when the child is eight years old and children's educational level 40 years later ($r(834) = .42$, $p < .01$). The study also declared that the level of education of the parents when the child is eight years old, has a significant positive correlation to the child's own level of occupational prestige when they are an adult ($r(834) = .47$, $p < .01$).

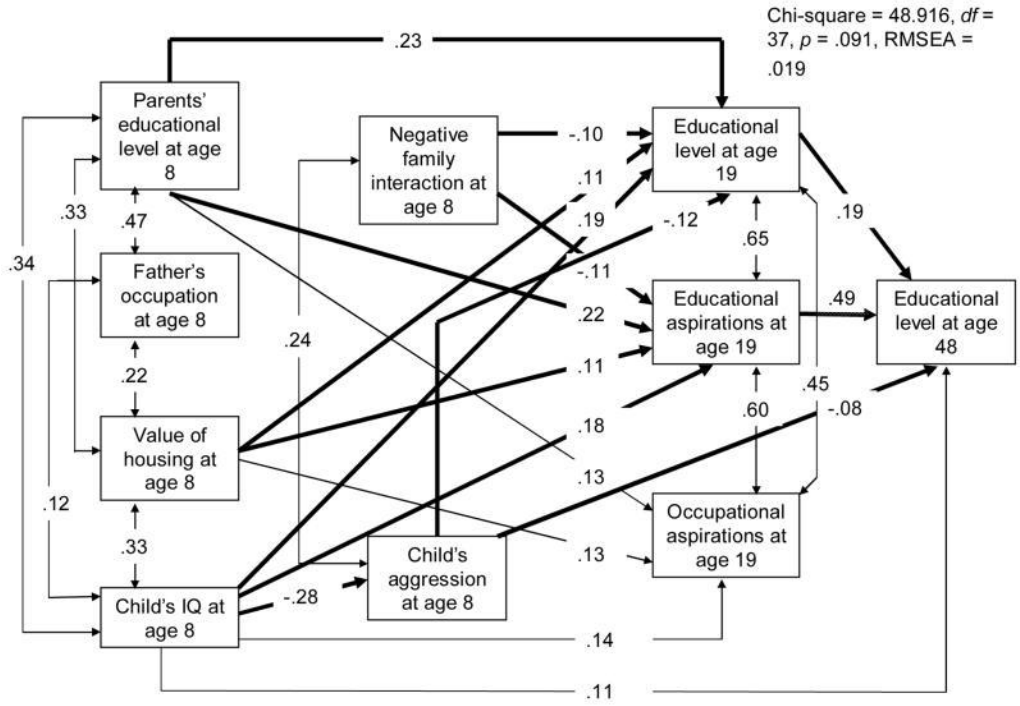


Figure 2.1. Predicting a Child's Education Level at 48 Years of Age from Parents' Education. All pathways (Age 8 to Age 19 and Age 19 to Age 48) were included in the model, but the non-significant paths are not displayed. Significant indirect paths from age 8 to 48 are shown in bold. Model fit statistics: χ^2=48.916, *df*=37, *p*=.091; Squared Multiple Correlation = .61 for females and .50 for males. Adapted from "Long-term Effects of Parents' Education on Children's Educational and Occupational Success: Mediation by Family Interactions, Child Aggression, and Teenage Aspirations," by M. Palmer, 2009, *Wayne State University Press*, July; *55*: 224-249.

Parental education and family interaction patterns during middle childhood has been linked to the children's attitude towards education as well as overall academic success. Bandura (1986) and (Brumariu & Kerns, 2022) found that this was the case based on the social-cognitive framework where behavior is shaped by the experiences and social learning of the children from the parents. The experiences of childhood where values, beliefs, and behavior are modeled over time based on interactions with the parental figures. Eccles (1993) found that this cognitive process emerges over time and is ultimately connected to successful achievement. Eccles's framework coined the phrase

"expectations for success", refers to the particular viewpoint of the children when parents have expectations and take on the role of "expectancy socializers" (Frome & Eccles, 1998). For example, when a child is exposed to "positive-oriented" behavior such as reading frequently, obtaining degrees, work ethic, and providing positive educational opportunities [museums, trips, educational books and videos, and school enrichment programs], the child develops similar thought patterns toward educational achievement. As stated previously, this was found in the research by Davis-Kean (2005), who articulated that highly educated parents actively encourage their children to develop identity and high expectations of their own. Conversely, McLoyd (1989) stated that there were extreme pessimistic traits among children toward educational and vocational futures when their parents experienced difficult economic times.

Trends in Parental Education

A major study from the U.S. Department of Education entitled, "Status and Trends in Education of Racial and Ethnic Minorities", shed light on hundreds of correlational attributes associated with race, ethnicity, and gender (KewalRamani, 2007). This in-depth study used data from previous research and incorporated the results from CPS (Current Population Survey) to help differentiate how the various levels of parental education impacted their children.

This study found staggering differences among mother's and father's educational levels of the children aged six to 18 years old based on race/ethnicity (Table 2.3). Overall, the data analysis indicated a link between the parental education levels and various outcomes of their children, including academic achievement and attainment. An example of this would be a strong positive correlation between extremely high rates of

home literacy programs and participation in early childhood educational programs among the children and mothers of higher education status. Also, children who obtained higher average mathematics and reading scores on the National Assessment of Educational Progress (NAEP) were from parents of highly educated parents. For the purpose of their research, "highly educated parents" had at least a bachelor's degree. It is noted that fathers with bachelor's degrees increased by 8% from 2005 to 2017 and mothers with at least a bachelor's degree increased 10% during the same time period.

Table 2.3

Percentage of Children (ages 6-18) by Parents Highest Educational Attainment

					Bachelor's or higher degree		
Parent and race/ethnicity	Less than high school completion	High school completion[1]	Some college	Associate's degree	Bachelor's degree	Master's degree	Doctorate or first-professional degree
Mother							
Total[2]	**13.2**	**27.8**	**19.1**	**11.5**	**20.2**	**6.5**	**1.7**
White	4.6	26.4	20.2	13.1	25.0	8.5	2.3
Black	12.9	35.5	23.6	11.2	12.5	3.5	0.7
Hispanic	39.3	29.0	13.6	7.3	8.4	1.8	0.5
Asian	14.6	20.5	6.7	7.7	35.1	12.4	3.1
Native Hawaiian/Pacific Islander	8.8	32.1	22.0	12.6	17.4	1.4	5.8
American Indian/Alaska Native	19.4	27.2	23.1	14.2	12.2	‡	‡
Two or more races	5.6	21.5	30.5	11.8	21.4	6.9	2.3
Father							
Total[2]	**13.1**	**28.6**	**16.5**	**9.1**	**20.3**	**7.9**	**4.6**
White	5.8	28.6	17.4	9.8	23.6	9.2	5.6
Black	11.2	35.0	21.1	11.6	14.2	5.0	1.8
Hispanic	41.1	28.6	11.9	5.6	8.9	2.9	1.1
Asian	10.5	17.6	7.5	7.8	30.7	15.3	10.7
Native Hawaiian/Pacific Islander	2.4	30.9	18.0	24.1	15.5	4.6	4.4
American Indian/Alaska Native	14.0	29.9	26.5	10.8	12.7	0.7	5.3
Two or more races	5.2	26.8	25.3	11.3	20.1	7.7	3.5

[1] Includes high school diploma or equivalent.
[2] Total includes other race/ethnicity categories not separately shown.
Note: Parents include adoptive and stepparents but exclude parents not residing in the same household as their children. Race categories exclude persons of Hispanic ethnicity. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS), Annual Social and Economic Supplement, 2008.

Parental Education and Race

An area of study involving how race affects the level of parental education and the impact this has on the educational development and attainment of children has been studied and analyzed for many decades (Assari, 2018; Cole, 2009). Social identities such as race, social class, beliefs, and individual norms all are interlinked and therefore are intertwined in the overall structure of families' economic, social, and cultural contexts (Cole, 2009; Collins, 1998). Therefore, race and SES represent structural processes and constructs, which influences family processes and micro level individual processes. The developmental outcomes for children can therefore be influenced by multiple social categories. This intersectionality theory simply means that there are a variety of advantages and disadvantages that can arise at the intersection of social categories, especially status-based categories, such as race and SES (Cole, 2009; McCall, 2005). Henry, Votruba-Drzal, and Miller (2019b) found that the intersection of multiple social categories has a dramatic effect on minorities, especially African-Americans, no matter the socioeconomic strata in which they belong.

African-American achievement gap. In the United States, the racial and social stratification have always been historically interconnected, thus minority families, especially African-American families, have a greater intergenerational and relational disadvantage to White families (Johnston, Cavanagh, & Crosnoe, 2020; Ladson-Billings, 2006). Sharkey (2013) found that Black Americans are more likely to grow up in poor communities, poor households, and live in distressed neighborhoods. The fact that when Black Americans grow up in disadvantaged areas, this limitation is embedded in their peer networks and experiences, meaning that household income and parental education

may not hold the same meaning and experiences to Blacks and White families. Summarizing, higher SES may not cause there to be similar advancement and achievement for White and Black children because there is a disadvantage between the access to resources, exposure to stressors, and cultural logic of child rearing (Lareau, 2011; Thomas, Erving, & Barve, 2021).

Dobbie and Fryer (2011) and Henry, Betancur-Cortés, and Votruba-Drzal (2020) found that the achievement gap between Black and White students undermines the future as a whole of Black children in the United States. A plethora of research has shown that certain markers of adult success, such as educational attainment and wages, are formed from early childhood and middle childhood academic achievement. This research supports the fact that the Black-White achievement gap has widened greatly because of the ongoing pattern of Black-White educational inequalities in America (Dobbie & Fryer, 2011). Cameron and Heckman (2001) articulated that raising the academic skills of Black students would help to narrow the disparities in high school graduation, therefore reducing the inequalities in annual earnings, employment rate, and economic mobility. Black children grow up in more socioeconomically disadvantaged families than White children, but disparities in SES, such as parental education and household income, rarely explain the totality of the achievement gap (Reardon, Kalogrides, & Shores, 2016). Additionally, research from Ferguson (2011) and Davis-Kean (2005) suggests the Black-White skills gap differs by education and income.

Reardon and Portilla (2016) concluded that minorities, specifically Black children, enter the schooling system with much lower developed literacy and math skills than compared to White children. Research by Burchinal, McCartney, Steinberg,

Crosnoe, Friedman, and McLoyd (2011) articulated that the Black-White achievement gap in literacy at kindergarten entry is around .40 of a standard deviation (*SD*) and as much as .75 *SD* in mathematics. With a recent data analysis of the original Early Childhood Longitudinal Study (ECLS-K:1998) of over 21,000 kindergarten students, Quinn (2015) found that the Black-White achievement gap was closer to .32 *SD* for reading and .54 *SD* for mathematics. It should be noted that the research on the achievement gap when concerning early childhood science is not as vast as math and literacy subject areas, but nonetheless, Morgan, Farkas, Hillemeier, and Maczuga (2016) vocalized that the Black-White achievement gap for science was .62 *SD* for kindergarten entry and grew to .82 *SD* by spring of the same year. Fryer and Levitt (2004) found that the average overall increase for Black-White achievement disparities increased by .10 *SD* per year. The standard deviation of the achievement gap grows dramatically by fifth grade, with 1.00 *SD* in mathematics and .75 *SD* for reading (Reardon & Robinson, 2007), but from fifth to eight grade, the *SD* values stabilize (Reardon, Robinson, & Weathers, 2015). This same pattern can be seen with the science achievement gap, in which the gap exceeds 1.00 *SD* by third grade and seems to minutely increase through eighth grade (Quinn & Cooc, 2015).

A recent analysis of the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) by Henry, Betancur, and Votruba-Drzal (2020), shed more light on the achievement gap between Black and White students. The researchers' analytic sample consisted of 9,100 students (Black or White children) whose parents were born in the United States. The researchers believed that isolating the study of parents (and children) born in the United States would minimize the multigenerational systems of

stratification of their native-born peers. Henry, Betancur, and Votruba-Drzal (2020) found a variety of differences among the fall Kindergarten entry test scores when comparing Black students and White students (Table 2.4). The mean value of the math, reading, and science scores for Black children were lower than the White children. Perhaps the most interesting aspect to the table is the growth of the mean differences as the students progressed further through the school grade levels. Reading scores only showed a difference of 3.75 during the fall of their kindergarten year, but this rose to 24.63 by the end of their eighth-grade year. Another interesting finding was that the math and reading differences of means only slightly increased from fifth to eight grades.

The researchers also found a variety of other interesting details that emerged from the data-analysis of the ELCS-K study (Henry, Betancur, & Votruba-Drzal, 2020). The parental education and household income saw a moderate increase over time and the percentage of non-working mothers decreased. The researchers did state that other demographics in the study remained very stable throughout the nine years of the data gathering. There were profound Black-White differences on all indicators for SES, child, parental, and house characteristics, with the only exception being gender. Perhaps a very telling finding was that the average household income for White families was more than twice that of Black families. Approximately 14% of the Black parents completed a college degree or equivalent, while White parents were nearly 43%. Black mothers were more likely to be employed than White mothers, but White mothers tended to give birth to normal birth weight children and were more likely married at this time.

Perhaps the most insightful result of the researchers' analysis of the ECLS-K study was when they performed advanced mathematics calculations in order to adjust for

SES factors. They uncovered that the race gaps were still large at kindergarten entry and still increased as the students progressed through the eighth grade. At kindergarten entry, Black students fell behind their White peers by .93 points (.12 *SD*) and the achievement gap grew .15 points (.02 *SD*) per month. The same pattern can be seen with the reading scores as well: Black students were behind White students by 1.81 points (.21 *SD*) in reading and these gaps increased by .17 points (.02 *SD*) a month. The science scores were very telling when the students entered kindergarten: the Black students were behind the White students by 4.73 points (.64 *SD*) in science achievement, but the gap barely increased when the students progressed through the elementary and middle school (Henry, Betancur, & Votruba-Drzal, 2020).

Table 2.4

Standard Deviation, Mean Values, and Overall Difference of Test Scores Between Black and White Students

	Black Students	White Students	
Variable	*M* (SD)	*M* (SD)	Mean Difference
Math			
Kindergarten fall	16.81 (5.73)	21.75 (7.54)	4.94
Kindergarten spring	23.76 (7.48)	30.28 (8.61)	6.52
First grade fall	28.81 (8.56)	35.47 (9.05)	6.66
First grade spring	39.05 (8.87)	45.92 (8.54)	6.87
Third grade	73.22 (17.30)	89.27 (16.36)	16.05
Fifth grade	98.11 (21.42)	118.61 (19.40)	20.5
Eighth grade	124.86 (21.75)	145.63 (19.91)	20.77
Reading			
Kindergarten fall	20.18 (7.15)	23.93 (8.81)	3.75
Kindergarten spring	29.15 (9.58)	34.07 (10.20)	4.92
First grade fall	34.91 (17.71)	40.58 (12.38)	5.67
First grade spring	50.95 (13.64)	58.60 (13.10)	7.65
Third grade	96.52 (19.93)	113.07 (18.61)	16.55
Fifth grade	125.27 (23.40)	145.33 (21.19)	20.06
Eighth grade	149.59 (27.78)	176.00 (24.63)	26.41
Science			
Kindergarten fall	17.53 (6.06)	25.18 (6.96)	7.65
Kindergarten spring	22.22 (6.87)	30.37 (7.00)	8.15
First grade fall	25.41 (7.09)	33.24 (6.95)	7.83
First grade spring	30.05 (7.33)	37.51 (6.16)	7.46
Third grade	27.03 (8.70)	37.78 (8.80)	10.75
Fifth grade	46.41 (13.69)	62.58 (12.19)	16.17
Eighth grade	70.11 (15.58)	88.41 (13.63)	18.3

Note. Mean (*M*) refers to the Arithmetic Mean. *SD* = Standard Deviation

When focusing on the SES variable, the researchers indicated that upper-income students performed statistically better in reading, math, and science achievement when entering kindergarten, in which their achievement scores grew slightly faster each month when compared to other students in the study. It was found that a $10,000 increase in household income was associated with higher math, reading, and science scores when

students entered kindergarten. This income-achievement gap grew slightly from kindergarten to eighth grade for students in the upper-income bracket. Perhaps the most intriguing finding for this researcher, is the relationship of the effect parental education has on the achievement trajectories of the children (Figure 2.2). At kindergarten entry, students with parents earning a high school diploma or some college were .30 *SD* ahead of non-high school diploma earning parents in math, .38 *SD* in reading, and .29 *SD* in science. This gap widened when comparing to children of parents with at least a bachelor's degree: .66 *SD* in mathematics, .74 *SD* in reading, and .64 *SD* in science. It was also concluded that the achievement gaps were exacerbated as the students progressed through the years, especially when compared to students with parents of the least amount of education to the students with parents with at least a bachelor's degree.

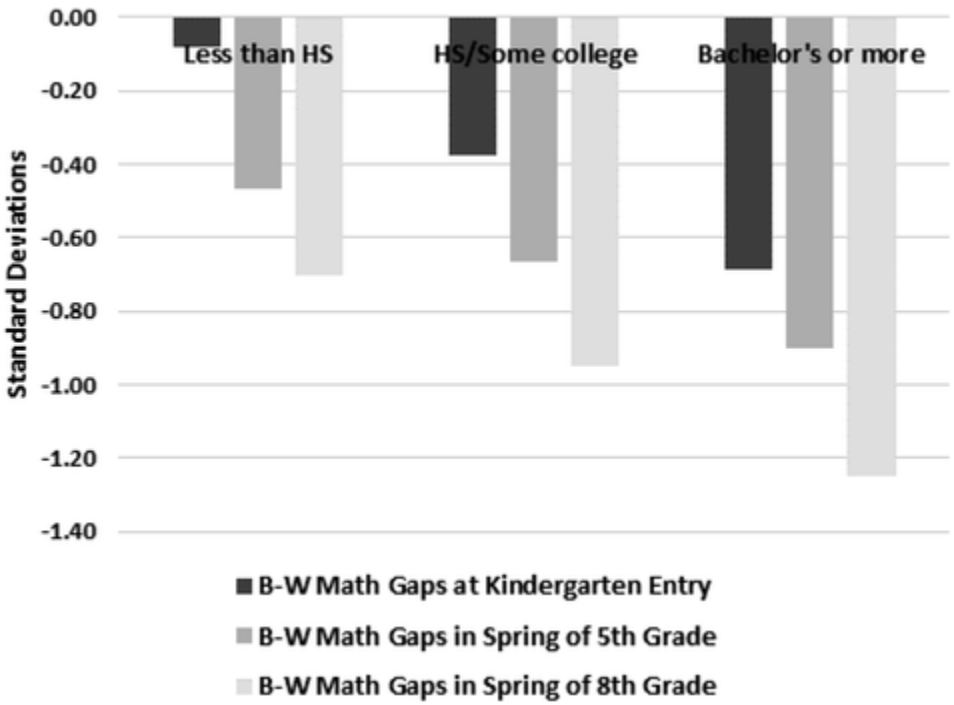


Figure 2.2. Black-White gaps in math skills by parental education at kindergarten, fifth, and in eighth grade. Adapted from "Black-White Achievement Gaps Differ by Family Socioeconomic Status from Early Childhood through Early adolescence," by D. Henry, L. Betancur, and E. Votruba-Drzal, 2020, *Journal of Educational Psychology*, 112, p.

1485. Copyright 2020 by the American Psychological Association.

In 2006, a research article was published in the *Journal of Negro Education* that investigated the longitudinal and concurrent effects of parenting practices among children using data collected from the National Center of Educational Statistics (NCES) for 2,247 African American families (Wu & Qi, 2006). This research study used the data from the Early Childhood Longitudinal Study of the Kindergarten class of 1998-1999 (ECLS-K). The results of this study were somewhat inconclusive since the effects of parental involvement in schooling at home were extremely mixed. The most unexpected finding was that single-parent households had no mathematical evidence that the children performed better or worse than dual-family parenting when it comes to academic testing. The researchers used advanced mathematical analysis to review various home and environmental factors as well as the survey and testing data in order to come to their conclusions. They stated parental family discipline styles, expectations and beliefs for high educational attainment and competency, and parental home-based involvement were found to have the most significant effects on their children's math, reading, or test scores in kindergarten, first grade, and third grade. Lastly, they found that socioeconomic status (SES) is mathematically the most powerful predictor of their child's academic achievement in elementary school (Wu & Qi, 2006).

The research by Wu and Qi (2006) shed light on a variety of interesting results that were not congruent with existing literature on parenting at the time. As stated previously, family SES is perhaps the strongest predictor for elementary children academic success, followed by parental beliefs about their children's general abilities and highest level of educational attainments. Similar findings were reported by Halle, Kurtz-

Costes, and Mahoney (1997) when they concluded "parental beliefs were more strongly linked with child outcomes than were parents' achievement-oriented behaviors" (p. 527). Yan and Lin (2005) used a nationally representative sample of high school students, which also made very similar claims. The authors' findings indicated that when combining several parental practices, prenatal beliefs surpassed parental involvement and discipline styles to become the most influential factor on child school achievement. However, Sonuga-Barke and Stevenson (1995) stated there should be caution when interpreting these results because parental beliefs in their children's abilities are strongly influenced by the actual performances of the students.

Hispanic achievement gap. For the past 15 years of increasing test scores on national assessments, the Black-White and Hispanic-White student achievement gaps continue to close (Carnoy & Garcia, 2017). This is not the case with Hispanic students who are English Language Learners (ELL), which are falling behind White students in mathematics and reading achievement. It is also noted that the proportion of low-income students in the United States has increased quickly. The odds of students being in high poverty or high-minority schools are greatly determined by social class and by the student's race. Hispanic and also Black students are more likely than White students to be in high-poverty schools, even if they are not considered poor. Carnoy and Garcia (2017) further established that students who attend high-poverty schools will cause a lowering effect on math and reading achievement scores; this fact has not diminished over time. Attending a school with Blacks and Hispanics comprising 75% of the student body, does in fact lower achievement for Hispanic and Black students, but has no effect on White students' academic achievement.

In order to get the full picture of the Hispanic academic achievement gap between children, baseline school entry-level academic data needs to be inspected. Aubrey Wang (2008) used a previous version of the ECLS studies, specifically the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), to perform an in-depth analysis to determine if there was in fact a pre-kindergarten achievement gap. For reference, the ECLS-B is the only national representative study that primarily focuses on the home and educational experiences of children from infancy to kindergarten entry (NCES, 2008). The ECLS-B study involved following a cohort of almost 10,000 United States born children through four waves of data collection from 2001-2007. The ages of the four waves are as follows: 9-month-old, 2-year-old, 4-year-old, and 6-year-old. The demographic data for the study stated that 54% were White, non-Hispanic, 14% were Black, non-Hispanic, 25% were Hispanic, 3% were Asian, non-Hispanic, and 5% were Other (NCES, 2008).

Wang (2008) found statistically significant differences in mathematics knowledge, literacy knowledge and skills, and also language skills when comparing Hispanic and White children as early as four years old. In fact, the largest achievement gap was found between White and Hispanic children (see Table 2.5). On average, Hispanic children scored 4.1 points lower, which is approximately half a standard deviation, than White children. Hispanic children 3.5 points lower in literacy than White students, which is also half a standard deviation below the White children. These findings by Wang (2008) contribute to current literature on the achievement gap in two ways: (1) using a national representative sample to document the gap between Hispanic vs. White pre-kindergarten children in mathematics and overall literacy knowledge and skills. (2) These findings add to current research by highlighting the educational

inequality experienced by Hispanic children in the United States. This reminded researchers, educators, and policy makers to consider the overall educational experiences of this minority subgroup in the achievement gap debate.

Table 2.5

Mean Differences in Overall Language, Literacy, Mathematics, and Fine Motor Skills Among Four Year Olds[a]

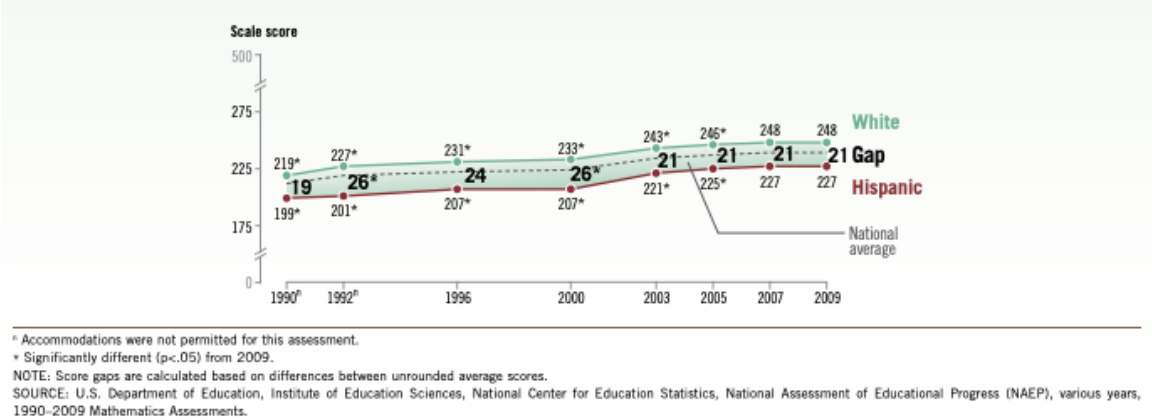
	Overall Mathematics	Overall Literacy
Black[b]	-3.6	-2.2
Hispanic[c]	-4.1	-3.5
Asain[d]	2.1	3.3

Notes: All reported results were statistically significant at the .05 level.
[a] Four-Year-Old Children include children between 48 through 57 months or 4 years old to 4 years, 9 months old.
[b] Black children were compared to white, non-Hispanic children.
[c] Hispanic children were compared to white, non-Hispanic children.
[d] Asian children were compared to white, non-Hispanic children.
Source: U.S. Department of Education, National Center for Education Statistics. (2008). Preschool: First findings from the preschool follow-up of the early childhood longitudinal study, birth cohort (ECLS-B). (NCES 2008-025).

The achievement gap, especially the mathematics gap, at school entry has been well studied for decades, with a consensus that these achievement gaps increase over time (Wang, 2008; Wu, Shen, Spybrook, & Gao, 2021). According to Magnuson and Duncan (2005), Hispanic kindergarten aged children scored two-thirds a standard deviation below White kindergarten students in mathematics and half a standard deviation below White students in reading achievement when they analyzed previous ECLS studies. The U.S. Dept. of Education (2004), using similar longitudinal studies, found that the mathematics gap widened from 5 to 16 points from kindergarten to grade 3, with the reading gap widening from 3 to 14 points.

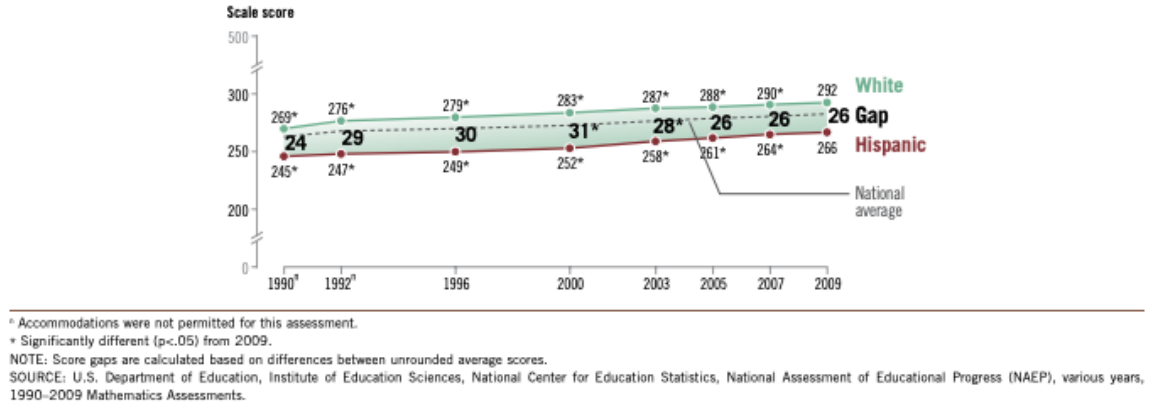
Rock and Stenner (2005) stated that because of criticism around the fact that the achievement gap between students was highly determined by the actual assessment used, they reviewed six major assessments to further analyze this issue; including the Peabody Picture Vocabulary Test-Revised (PPVT-R) and the Early Childhood Longitudinal Study Kindergarten Battery (ECLS-K). The researchers determined the Hispanic to White children's achievement gap in English and mathematics ranged from half a standard deviation to a full one standard deviation, which correlates to the previously mentioned study by Wang (2008).

Hemphil and Vanneman (2011) analyzed the 2009 National Assessment of Educational Progress (NAEP) main assessments in mathematics and reading in order to determine if there are in fact achievement gaps and if these gaps are growing between Hispanic and White students in public schools. The researchers focused on fourth grade and eighth grade students from the public schools in the United States. They first found that the overall mathematics scores for both Hispanic and White students were much higher on the 2009 assessment than the 1990 assessment for both subgroups. But the overall achievement gap was statistically close to the same for 2009 and 1990 for both fourth grade and eighth grade students. The fourth grade achievement gap of 21 points in 2009 and 19 points in 1990, with White students scoring higher than the Hispanic students. The eighth grade achievement gap was 26 points in 2009 and 24 points in 1990 (see Figures 2.3 and 2.4).



n Accommodations were not permitted for this assessment.
* Significantly different (p<.05) from 2009.
NOTE: Score gaps are calculated based on differences between unrounded average scores.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1990–2009 Mathematics Assessments.

Figure 2.3. Mathematics Achievement Score Gaps Between Hispanic and White Public School Students at Grade 4, 1990-2009. Source: Hemphill and Vanneman (2011) Achievement gaps: how Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education.

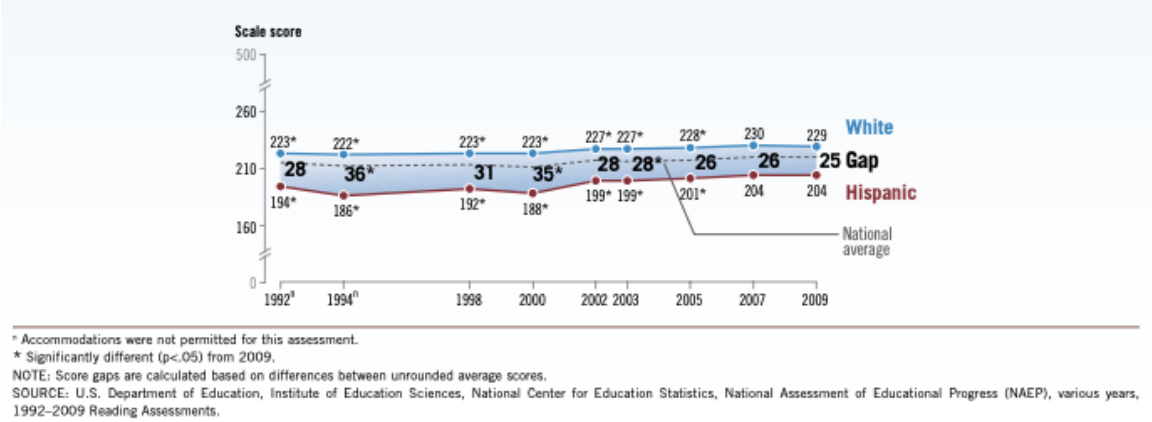


n Accommodations were not permitted for this assessment.
* Significantly different (p<.05) from 2009.
NOTE: Score gaps are calculated based on differences between unrounded average scores.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1990–2009 Mathematics Assessments.

Figure 2.4. Mathematics Achievement Score Gaps Between Hispanic and White Public School Students at Grade 8, 1990-2009. Source: Hemphill and Vanneman (2011) Achievement gaps: how Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education.

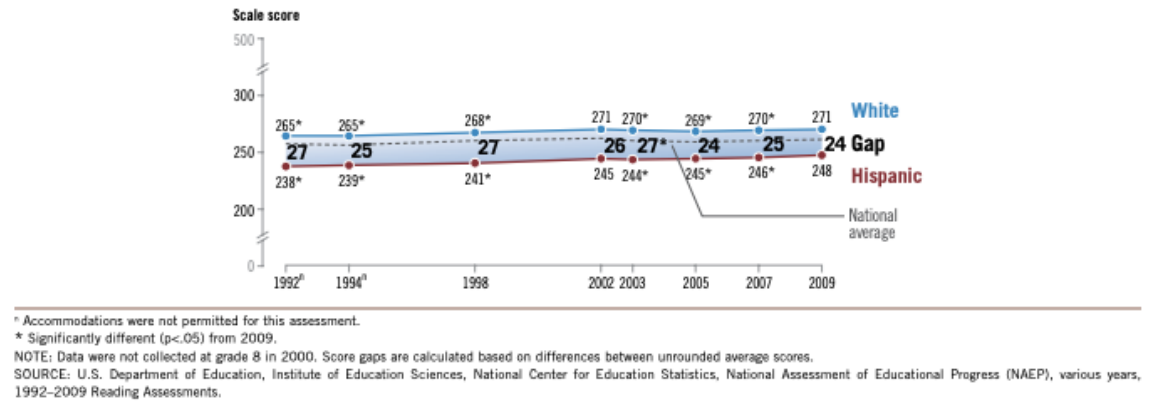
Hemphil and Vanneman (2011) further stated that the reading results were very similar to the mathematics results. The average fourth grade and eighth grade reading and mathematics test scores were higher in 2009 than in 1992. There was a 25-point gap

in 2009 and a 28-point gap in 1992 for fourth graders and also a 27-point gap in 2009 and a 25-point gap in 1992 for eighth graders (see figures 2.5 and 2.6).



‡ Accommodations were not permitted for this assessment.
* Significantly different (p<.05) from 2009.
NOTE: Score gaps are calculated based on differences between unrounded average scores.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1992–2009 Reading Assessments.

Figure 2.5. Reading Achievement Score Gaps Between Hispanic and White Public School Students at Grade 4, 1990-2009. Source: Hemphill and Vanneman (2011) Achievement gaps: how Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education.



‡ Accommodations were not permitted for this assessment.
* Significantly different (p<.05) from 2009.
NOTE: Data were not collected at grade 8 in 2000. Score gaps are calculated based on differences between unrounded average scores.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1992–2009 Reading Assessments.

Figure 2.6. Reading Achievement Score Gaps Between Hispanic and White Public School Students at Grade 8, 1990-2009. Source: Hemphill and Vanneman (2011) Achievement gaps: how Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education.

Parental Aspirations for Their Child's Educational Attainment in Relation to Ethnicity

Research on the relationship between family and school has shed light on a variety of complex developmental issues involving parenting styles (Estlein, 2021; Wentzel, 1994) and parental involvement to their children's' academic outcomes (Davis-Kean, Tighe, & Waters, 2021; Epstein, 1996). The parental belief system concerning the parental aspirations for their children's educational attainment has been shown to be an important predictor of children's actual academic achievement (Hayek, Schneider, Lahoud, Tueni, & De Vries, 2022; Scott-Jones, 1995). These aspirations are considered to be the guiding standards for parental behavior toward their children in order to maximize their children's educational attainment. These aspirations are strongly correlated to the parental ethnicity as well as the level of their own parental educational attainment (Wentzel, 1998).

Driessen, Smit, and Sleegers (2005) found that Hispanic parents and African American parents place a high value on education, especially aspirations for their children's education attainment. The researchers also concluded that these ethnicity groups value education the same level as non-minority parents. Delgado-Gaitan and Trueba (1991) stated these minority groups view education as the vessel that will allow their children to be more successful in society. Wetzel (1998) and Assari, Mardani, Maleki, Boyce, and Bazargan, M. (2021) concluded that African American parents reported higher values of educational aspirations and academic achievement for their children than Caucasian parents, even when controlling the level of parental education (Soloranzo, 1992). The relationship between parental aspirations for their child's

educational attainment and the children's actual educational attainment have been shown to be not a direct cause and effect. According to the US Bureau of Census (2004) there is a much smaller percentage of Hispanics and African-Americans obtaining college degrees when compared to Caucasians. These ethnicity groups also have lower levels of educational attainment and higher high school dropout rates (Goldenberg, 1996; McFarland, Cui, Rathbun, & Holmes 2018; Soloranzo, 1992).

Hoff, Laursen, and Tardif (2002) and Kalil and Ryan (2020) asserted that minority socioeconomic status is the main driving force causing the discrepancy between parental beliefs and aspirations for the children and the actual educational attainment of their children. They concluded that fewer resources, such as income for education materials and providing educational experiences outside the classroom, limits their children's ability to reach the aspirations established by the parents. In return, parents gradually lower their expectations for their children in relation to educational attainment. Rank (2005) asserted that minority parents usually work in jobs with more rigid hours, less autonomy, less flexibility, therefore leaving little room in assisting their children with their educational studies. Several studies (Davis-Kean, Tighe, & Waters, 2021; Mayer 1997; Scott-Jones, 1995) stated there is a very high correlation between the level of parental education attainment and the aspirations set for their children's educational attainment. This is due to the fact that parents with higher education levels can use their previous experiences to help their children achieve higher educational attainment, when compared to parents with lower education levels.

Spera, Wentzel, and Matto (2009) conducted a research study to determine parental aspirations for their children's educational attainment in relation to a variety of

areas, specifically parental education attainment. Their research study involved 13,577 parents from a county in a Mid-Atlantic state with a population of over 800,000 persons. The study only focused on middle and high school students from a large public school system in which involved a parent satisfaction survey. The survey was sent home with children and involved a questionnaire that all parents were to fill out. The survey response rate was 71%. Of the 13,577 parents surveyed, 67.2% were Caucasian parents, 9.4% were African-American, 11.3% were Asian American, 6.7% were Hispanic, and 5.5% were of parents of other ethnicities. The level of education of the surveyed parents is broken down by ethnicity presented in Table 2.6.

Table 2.6

Levels of Parental Education Per Minority Group

	No High School	High School	Community College/Trade	College Degree	Master's/Doctorate
Caucasian	.4%	9.9%	9.9%	36.4%	43.3%
African American	2.3%	19.7%	22.4%	32.1%	23.6%
Asian American	3.0%	12.6%	6.7%	35.0%	42.7%
Hispanic	14.0%	24.4%	17.0%	24.5%	20.2%

Note. Chi-square is 1,440.48 with $df = 16$, $p < .001$.

The research study focused on six scales that comprised the parent satisfaction survey: (1) quality of academic instruction; (2) extent to which the school informs parents; (3) extent to which the school empowers parents; (4) level of school safety and discipline; (5) quality of health education; and (6) quality of guidance. Parents rated thirty-two items on a four-point Likert scale, in which the values were summed to determine a final measure (Griffith, 1998).

The researchers found that 80% of the parents in the study indicated they would like their child to obtain a college or graduate level degree, with the lowest percentage being African-American at 86.9% and the highest being 96% for Asian parents. In relation to the parental aspirations for children to achieve higher educational attainment than themselves, the researchers found that 30% of Caucasian and Asian parents wanted their child to have higher educational attainment than themselves, 50% for African American parents, and 66% for Hispanic parents. The researchers determined using a one-way ANOVA test to show Asian-American parents, followed by Caucasian parents, had significantly higher aspirations for their children's educational attainment when compared to other ethnicities groups. Using statistical analysis, parental educational aspirations for their children had a positive increase as a function of their own parental education, especially in those parents with higher education levels. Perhaps the most intriguing finding of this research study is that Caucasian parents without a high school degree had a much significantly lower educational aspirations for their children when compared to other ethnic groups (Cross, 2020; Spera, Wentzel, & Matto, 2009).

An assortment of research studies have outlined the differences in academic performance and also parental and student aspirations when it relates to SES and race. Previously analyzed ECLS and national testing data sets have articulated there is an achievement gap that widens as students progress through the elementary school ages (Hemphil & Vanneman, 2011). These achievement gaps are not fully explained when it relates to parental aspirations for their children as well as the children’s own aspirations for the workforce and/or college aspirations (Assari, Mardani, Maleki, Boyce, & Bazargan, 2021; Spera, Wentzel, & Matto, 2009). An assortment of other variables

impact the achievement gap and educational aspirations between the various races, but the overall trend showcases that the higher the aspirations for parents have for their children, does indeed, effect the overall outcome of the students as they progress through schooling and in life after school (Mayer, 1997).

Studies That Used ECLS Data Sets

The Early Childhood Longitudinal Studies (ECLS) programs, conducted by the U.S. Department of Education, The National Center for Education Statistics (NCES), within the Department's Institute of Educational Sciences, has collected data involving the progress and condition of early school education in the United States (NCES, 2022). Congress passed a mandate to lawfully allow these departments to conduct multiple longitudinal studies that follow children through several years of school. The ECLS program includes four longitudinal studies, with future studies being considered: ECLS-B, ECLS-K:1998, ECLS-K:2011, and the ECLS-K:2024. These various studies have been the foundation for research on a variety of levels because of the vastness and overall magnitude of the studies. These ECLS studies include over 18,000 students, staff, and parents reporting on educational topics with interviews and questionnaires, comprehensive testing on math, science, English, social emotional skills, as well as assessments on well-being and health. The ECLS studies have been extremely valuable in understanding and diagnosing issues with education in the United States concerning child development, early learning, and performance in school.

A large portion of research that used the ECLS studies as the guiding data set has been purely diagnostic in relation to the subject areas of mathematics, English, and science. Researchers have used these data sets to determine entry level performance and

growth of kindergarten students all the way up to middle school. This analysis was then paralleled with dozens of variables including ethnicity of students, social-economic status of the families, parental education, geographic location of families, and many more characteristics in order for the researchers to make conclusions and recommendations for further research.

Kindergarten Advancing Over the Decades

Bassok, Latham, and Rorem (2016) analyzed two different ECLS studies in reaction to the report published in 2009 entitled, "Crisis in Kindergarten". This report highlighted how vastly different Kindergarten has become over the last two decades. The main reason is the shift from developmentally appropriate learning practices such as play and social interaction to test preparation, curricula, and explicit focus on academic skill building. The researchers analyzed both the ECLS-K:1998 and the ECLS-K:2011 studies to compare public school classrooms between 1998 and 2010 in five key dimensions: (a) teachers' beliefs about school readiness, (b) time allocated to academic and nonacademic subjects, (c) classroom organization, (d) pedagogical approach, and (e) assessment practices (Bassok, Latham, & Rorem, 2016). The researchers found substantial differences in these five areas when comparing the last two decades of ECLS data. Kindergarten teachers in the ECLS-K:2011 study had much higher expectations for children prior to kindergarten entry and during actual kindergarten. Also, the newer study displayed that more time was devoted to advanced math content, advanced literacy content, assessing students, more teacher-directed instruction, and substantially less time to science, art, music, and child-selected activities.

Early Childhood Mathematics Gap

Several studies (Fryer & Levitt, 2010; Ganley & Lubienski, 2016; Husain & Millimet, 2009; Penner & Paret, 2008; Robinson & Lubienski, 2011) sought to determine if there was a gap in mathematics academic performance between kindergarten through fifth grade male and female students. All of these studies analyzed the ECLS-K:1998 and each study concluded the same result: kindergarten boys and girls performed at the same level in mathematics, but a performance gap (favoring boys) and student confidence gaps started to form as early as third grade. Conversely, the reading gap (favoring girls) was present in kindergarten but narrowed during elementary grades.

Cimpian, Lubienski, Timmer, Makowski, and Miller (2016) sought to reexamine previous findings from ECLS studies to determine if the gender gaps in mathematics were still prevalent by analyzing the ECLS-K:2011 study. These researchers revealed their results to be very similar to previous ECLS studies. They stated the gender gaps developed early among higher achieving students, and teachers rated boys' mathematical proficiency higher than girls with similar achievement and learning behaviors. It was also determined that learning approaches among the boys and girls were consistent, but the girls had a more studious approach that allowed those at the bottom performance levels to have more growth throughout the year. The researchers felt that consistent patterns in both the ECLS-K:1998 and ECLS-K:2011 showing girls poor early mathematics learning experiences merited further inspection.

Gifted Programming

Andelson, McCoach, and Gavin (2012) inspected the ECLS-K:1998 data set to determine if different types of programming affected gifted students compared to non-

gifted students throughout the school years. The researchers isolated their analysis to third through fifth grade students and separated these students into a variety of sub-groups. Their findings represented a national look at school personnel-reported programming of the gifted programs, but without defining length, type, degree of programming. They discovered, even though with a wide-variety of reported gifted programming, there was no major effect on gifted student's academic attitudes or achievement on any of the gifted programming for both boys and girls.

Redding and Grissom (2021) analyzed the ECLS-K:2011 to determine if a typical gifted program benefits elementary students' achievement and nonachievement outcomes. The researchers did find, although small, there wasa an association with higher math and reading achievement for a student who was involved in gifted programming. They did discover that there was no evidence of a relationship between gifted participation and student absences, reported engagement with school, or student mobility. Their last finding was that Black and low-income students saw no academic gains to that of their peers when receiving gifted services.

Summer Learning Gap

Scholars have argued that summer vacation causes specific student sub-groups (race/ethnicity and socioeconomic status (SES)) to fall behind at a higher rate than the other sub-groups (Kim, 2021; Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Downey, Von Hippel, and Broh (2004) analyzed the ECLS-K:1999 to further investigate the summer learning gap and found, when they controlled the race and other variables, the inequality in literacy for SES widened during the summer after kindergarten more than it did over the kindergarten and first grade school years. The SES math inequality

did widen over kindergarten, but not over that next summer. Furthermore, they found that summer learning loss did widen for Black-White inequality, but narrowed for Asian-White students. These results were verified by Rambo-Herandez and McCoach (2015) when they analyzed the NWEA Measures of Academic Progress test results. They also discovered that the summer learning loss flatlined when it came to average-achieving students. McEachin and Atteberry (2016) found vastly different results when they examined the NWEA data for over 500,000 students in grades second through ninth graders in a southeastern state. They determined that the summer learning loss of the average student was 25% to 30% below the learning loss compared to progress during the school year.

Quinn and Tien (2018) contributed to previous literature on summer learning loss by examining both the ECLS-K:1999 and ECLS-K:2011 data sets to examine how summer learning loss has possibly changed over time. They found that the Black-White summer learning gap widened as the student aged, but the math inequality widened from kindergarten to first grade among students in the most recent ECLS study. However, the opposite occurred for Hispanic-White students, in which the inequalities narrowed from kindergarten to first grade. The Black-White summer math and reading learning loss inequality seemed to get worse over time, especially during the first two years of school.

Maternal Stress and Depression When Raising Children with Autism

Jeans, Santos, Laxman, McBride, and Dyer (2013) sought to determine to what extent mothers of autistic preschool children experienced stress and depressive symptoms by analyzing the ECLS-B data set. The ECLS-B data set included 100 four-year-old students who were reported to have an Autism Spectrum Disorder (ASD). By inspecting

questionnaires and interviews, the researcher concluded that mothers of children with ASD at 9 months and at 4 years had significantly higher amounts of reported stress and depressive symptoms than mothers of typically developing children. It was also determined that by using a linear regression analysis, there was no difference of reported depressive symptoms among the subgroups of child gender, number of children in the family, partnership status, and ethnicity.

The ECLS studies have been examined by a variety of researchers in previous years concerning areas ranging from the summer learning gap, parental stress, gifted programming, as well as the progressing of kindergarten aged students as they progress through the grades. The usefulness of these ECLS studies in analyzing a wide range of variables has been well documented though the years and have been the basis of a variety or programming changes in schooling, socioemotional supports, and having an overall understanding of the parental influence in effecting the outcomes of their children (Deunk, Smale-Jacobse, De Boer, Doolaard, & Bosker, 2018).

Maternal Education Studies

The influence a mother's education has upon her children's academic success has been analyzed in previous years using ECLS data sets, meta-analyses of numerous studies, national and global testing, as well as smaller research studies. Suizzo and Stapleton (2007) and Boonk, Gijselaers, Ritzen, and Brand-Gruwel (2018) outlined the fact that overall parental involvement in their children's school has a very positive effects on their children's outcomes when it comes to all races across the United States. The significance of maternal education on their children's academic outcomes has been

broadly recognized, but the mechanisms that explain this relationship have been underexplored (Harding, Morris, & Hughes, 2015).

The Effect Increased Maternal Education Attainment Has on Their Child's Academic Performance

Magnuson (2007) stated there is a link between a mothers' educational attainment and their child's outcomes, but wanted to further examine data to determine if a *change* in maternal education during the child's life causes an improvement of the child's academic achievement. The researcher analyzed the ECLS-K:1998 study to gain further insight on this topic and as well as determining if the quality of home environments improve as the mother earns higher educational attainment. The results found that children with mothers of lower levels of educational attainment actually performed better on academic skill tests and improved home environment learning options when the mothers completed more schooling. They found this not to be the case when the mothers already have a higher level of education when the children started schooling. The data suggests that increasing educational attainment for mothers with already medium to high levels of education did not translate into increased achievement or home environments when the mothers earned more education attainment. Lastly, the researchers concluded that children improved much more in reading than in mathematics when their mothers obtained more education during the child's early childhood.

Maternal Education and Child Birth Weight

Godah et al. (2021) performed a meta-analysis of cohort and cross-sectional studies to learn more about the association between maternal education level and their child's birth weight. Although the study focused on low- and middle-income countries,

the results of the study helped to create movements toward women earning more education. This meta-analysis started with 729 articles, but after looking at bias and quality scores according to the Newcastle-Ottawa Scale, nine total articles were used for the data analysis. The results of the analysis showed that mothers with high levels of educational attainment had children that were 33% more likely to not have low-birth when compared to lower education mothers. But these findings did not reflect the same outcome when low to medium level education attainment mothers were inspected. The final outcome showed that there was no significant variation of birth weight or risk of low birth weight when mothers of low and medium levels of education attainment were compared.

Maternal Education Attainment in Relation to Their Child's Early Speech and Language Skills

Dollaghan et al. (1999) examined whether four measures of speech and language varied for preschool aged children when the mother's educational level was used as the controlling variable. The researchers analyzed a total of 240 preschool-aged children's language samples using a variety of language specific measures and also the Peabody Picture Vocabulary Test-Revised (PPVT-R) to determine the measure of spontaneous language comprehension. These results were then compared with the mother's educational level in three different categories: less than high school graduate, high school graduate, and college graduate. A trend analysis showed statistically significant relevance of higher maternal education level caused higher ratings on the four language specific measures, but showed no statistically evidence that maternal education effects when analyzing the PPVT-R.

Maternal Education's Effect on Their Child's Physical Activity, Behavior and Emotional Problems, and Educational Performance

Kantomaa, Tammelin, Demakakos, Ebeling, and Taanila (2010) sought to examine how a mother's educational attainment level impacts her adolescent child's level of physical activity, emotional and behavior problems, and self-reported educational performance by analyzing 7,002 students in the 1986 Northern Finland Birth Cohort. The researchers chose the mother's educational attainment level to determine the parental socio-economic position because they felt that most childhood and adolescence risks are strongly correlated with the mother's level of education (McLeod & Kaiser, 2004). They also stated that the mother's educational level is more strongly associated with student academic performance than the father's level of education (OECD, 2001). When adjusting for multivariable analysis, the researchers came to the conclusion that the children of mothers with higher educational attainment had three to four times higher levels of physical activity with higher overall academic performance, advanced plans for post high-school education, and these students had fewer reported behavior problems when compared to children whose mothers had basic level of educational attainment.

Schlechter and Milevsky (2010) also explored the relationship between parental education levels and their child's academic achievement, psychological well-being, and reasons for wanting to pursue higher education. The researchers conducted a survey with 439 college freshmen from a university in northeastern United States. The results from the data analysis of student responses showed a positive correlation between parental education levels and the child's reasons for pursuing higher education, self-reported well-being, and child academic achievement. Perhaps the most interesting result of their

analysis is that the researchers discovered that parental education independently predicted society expectations as the main reason for college attendance.

Augustine (2014) examined the relationship between maternal education, family structure, and children's overall early achievement by analyzing data from the NICHD Study of Early Child Care and Youth Development survey. This national longitudinal survey of 1,304 children and their families contained information pertaining to child care arrangements related to measurements of school performance, behavior, health, and other indicators of development from infancy to middle adolescence. Augustine first established that less-educated mothers are more likely to be in unmarried families and more educated are more likely to be in stable married families (Härkönen, 2018; Raley & Bumpass, 2003; Sweeney & Cancian, 2004). They also established that homes with less educated mothers had few resources to promote well-being for their children, which is the direct opposite for more educated mothers. The results from the data analysis reaffirmed their assumptions that unmarried or disrupted family structures resulted in lower-quality parenting with mothers of lower education, which created negative achievement trajectories for their children. The strongest result from their data analysis was that family structure (either positive or negative) with higher educated mothers had no negative connection to their children's actual achievement.

Relationship Between Maternal Education Level and Children's TV Viewing

Hesketh, Ball, Crawford, Campbell, and Salmon (2007) sought to determine the relationship between a mother's educational level and her child's television watching time by analyzing a survey of 1,484 parents. The researchers established that maternal education is inversely related to children's television viewing, but wanted to further

inspect how a variety of variables impacted this inverse relationship. In order to understand the associated relationships; they performed a variety of regression analysis against three factors: 21 aspects of family education (potential mediators), maternal education, and time their children watched television. When isolating the mediating factors, they found the top factor was the actual placement of televisions in the house, followed by frequency of the family eating meals in front of the television. Lastly, the 12 top mediators actually accounted for 33% of the association between mother's education and children's television viewing time. The final results of the study suggest there is a strong relationship between children's television watching and maternal education and is fragmentarily mediated by a variety of aspects to the family television environment.

Summary

The overall impact of a mother's role in developing her child's social abilities, educational aspirations, educational attainment, and overall educational outlook is a topic that has been explored, but much more analysis needs to take place in order to fully understand the underlying relationships (Morales-Murillo, García-Grau, Grau-Sevilla, & Soucase-Lozano, 2020). Kindergarten readiness became a focus of the U.S. government as a variety of laws were created to aid in the development of intervention programs at daycares in order to help transition these children to kindergarten (Blair & Raver, 2015; Cadima, Leal, & McWilliam, 2010; West, Hausken, Chandler, & Collins, 1991). The 1993 National Household Education Survey (NHES:93) and the FRSS Kindergarten teacher survey were two of the first major surveys that focused on gaining information from parents and teachers on what they believe constitutes kindergarten readiness (McArthur, Colopy, & Schlaline, 1995). The findings of these surveys, combined with

further analysis and research, helped to develop kindergarten programs that would maximize the growth and attainment of the skills needed for children to advance into further grades (Gill, Winters, & Friedman, 2006; Hatcher, Nuner, & Paulsel, 2012; Little, Lonigan, & Phillips, 2021).

As children progressed through kindergarten, noticeable performance differences started to be observed, especially among children with varying racial and socioeconomical status (Kuhfeld, Condron, & Downey, 2021; McLoyd 1998, 1999; Sirin, 2005; White, 1982). Duncan and Brooks-Gunn (1997) also investigated this observation and determined that when controlling SES variables, the children's intellect was strongly associated with the parent's education levels. Davis-Keen (2005) and Hofferth, Davis-Kean, Davis, & Finkelstein (1998) also reaffirmed this finding by analyzing standardized tests and/or national survey results for children in middle childhood, which includes ages six- to 12-year-old children. Dubow, Boxer, and Huesmann (2009) went on to analyze the Columbia County Longitudinal Study to determine the overall long-term effect parental education has on their children's success. This 40-year study shed light on the fact that there is a strong correlation between the parents' educational levels and the educational levels of their eight-year-old child some 40 years later.

In 1984 the U.S. Department of Education focused their research in determining the parental educational attainment differences among race, ethnicity history, and gender as it relates to educational outcomes of their children (KewalRamani, 2007). This research was then analyzed against the National Assessment of Educational Progress (NAEP) results to further state that those children who performed well above average were from highly educated parents, which includes having at least a bachelor's degree

(U.S. Dept. of Commerce, 2008). Further analysis of the internal structure of American families showed that there is a widening student achievement gaps during the school year and over the summer (Cameron & Heckman, 2001; Carnoy & Garcia, 2017; Dobbie & Fryer, 2011; Kuhfeld, & Soland, 2021; Reardon, Kalogrides, & Shores, 2016), unequal kindergarten readiness (West, Hausken, & Collins, 1995), and varying parental and student educational aspirations between the races (Driessen, Smit, & Sleegers, 2005; Li, Wang, & Kim, 2022; Spera, Wentzel, & Matto, 2009; Soloranzo, 1992; Wetzel, 1998).

Previous ECLS survey data sets have been analyzed by numerous researchers in areas ranging from summer learning loss, educational performance throughout the school year, to predicting educational success of the children as they progressed through school (Bassok, Latham, & Rorem, 2016). By analyzing the ECLS-K:1998, Magnuson (2007) was one of the first researchers to focus just on the relationship between maternal education attainment and their child's academic performance in school. The results showed that children performed better in school when mothers with lower educational attainment completed more schooling. This finding was not the same for mothers who already had a high level of educational attainment and sought to earn more education. Furthermore, Kantomaa, Tammelin, Demakakos, Ebeling, and Taanila (2010) articulated that the mother's educational attainment level has a positive influence on her child's physical activity, emotional and behavior problems, and self-reported educational performance in school.

This literature review framed the relevant research associated to this study, providing a footing for the exploration and framework from which the associated research questions could be studied. This literature review was based on historical

research and development of the parental roles as they are related to education and overall development of children. The review then proceeded to outline parental education beliefs, kindergarten readiness, middle childhood academic achievement, trends in parental education as it relates to race, parental aspirations, and analysis of previous ECLS data sets and also overall research on previous maternal education studies. This literature review also helped to build a foundation to determine what is lacking when it comes to the effect the mother's educational attainment has on her children's educational attainment and growth throughout the first six years of schooling.

Chapter III builds upon the presented research in this review to explain the methodology of this quantitative study in order to examine the impact a mother's educational attainment has on her child's academic growth and attainment in the kindergarten through fifth grade. In addition, Chapter III outlines the design, instrumentation, reliability and validity, procedures, as well as the procedures for data collection and analysis.

CHAPTER III

METHODOLOGY

The purpose of this quantitative study was to examine the correlation between the level of a mother's education to that of her children's academic performance entering and progressing through kindergarten, progressing from kindergarten through fifth grade, and the background characteristics that effect student academic performance. Using the 2010-2011 Kindergarten Class Early Childhood Longitudinal Study (ECLS-K:2011) from the National Center for Education Statistics (NCES) within the institute of Education Sciences (IES) of the U.S. Department of Education, statistical analysis were performed on over 18,000 student information sets. The ECLS:2011 is third in a series of longitudinal studies (Kindergarten Class of 1998–99 (ECLS-K), the Early Childhood Longitudinal Study Birth Cohort (ECLS-B), and the ECLS-K:2011) performed from the NCES, with a fourth study projected to start in 2022 (NCES, 2020). Taking place more than a decade after the ECLS-K, the ECLS-K:2011 allows for cross cohort comparisons of nationally represented kindergarten classes experiencing different educational demographic environments and educational policies (Tourangeau et al., 2017). The ECLS-K:2011 study includes assessment scores, teacher questionnaires and parent questionnaires, and child perception surveys. The ECLS-K:2011 directly examines child development, early school experiences, and school readiness using direct testing data and questionnaires.

The chapter begins with the research questions that guide the study, followed by an explanation of the research methodology and research design. The study's population,

sample, and instrumentation are described in detail. Ending the chapter is an explanation of the data collection procedures, as well as the procedures for data analysis with an in-depth description of the statistical analysis and validity of the instruments. Chapter III concludes with a summary of the methodology.

Research Questions

Three research questions guided this study based on the identified purpose in Chapter I. All three questions relate to the effects a mother's educational attainment has on her child's academic outcomes:

1. What effect does the mother's education have on educational performance in kindergarten?
2. What effect does a mother's education have on her children's academic development from kindergarten through fifth grade?
3. How do background characteristics impact the children's academic development when in relation to the mother's education?

Research Methodology

The methodological approach chosen for this correlational study is quantitative. According to Gay, Mills, and Airasian (2012), quantitative research involves collection and data analysis in an attempt to describe, explain, and predict the phenomena of interest. A quantitative study can be one of four designs: descriptive, correlational, casual-comparative, and experimental (Habib, 2021; Murad et al., 2014). A descriptive design is simply measuring the subjects once, correlational design focuses on to what extent variables affect each other using statistical data, causal-comparative attempts to establish cause and effect among variables, and experimental design measures subjects

before and after a treatment. The major difference between these designs is the extent to which the independent variable is manipulated by the researcher. Experimental and causal-comparative studies establish causality, with correlational and descriptive studies establishing only the association among variables. Gays, Mills, and Airasain (2012) reference the fact that most quantitative educational research is nonexperimental. This is because the researcher either has no interest, or perhaps it is not possible to manipulate the independent variable. The quantitative research approach involves much more than numerical data gathering and analysis; it involves determining research questions and then utilizing a methodical approach and research process to validate or invalidate the hypothesis (Gay et al., 2012). According to Creswell (2014), the quantitative research approach is based on determining if a relationship exists between measurable variables.

This study analyzed the ECLS-K:2011 longitudinal study data, which used multiple methods to gather information about children's early school experiences: direct testing and also indirect (survey) testing. These multimethod surveys included parent interviews, one on one assessment of children, self-administered questionnaires completed by teachers and school administrators, and beginning in third grade, computer assisted, self-administered questionnaire for children. During the kindergarten year, which was the first year of the survey, the ECLS-K:2011 included self-administered questionnaires for before and after school care providers. Fraenkel and Wallen (2008) reported that the survey method is the most appropriate method for gaining perceptual information from and about the population on a variety of topics. This research study utilized a previously administered longitudinal survey to gather the data that was collected at different points in time in order to observe possible changes over time

(Fraenkel & Wallen, 2008). Since a portion of the population being studied did not change over time, this research utilized a cohort study approach (Gall et al. 2002; Grimes & Schulz, 2002; Fraenkel & Wallen, 2008). The cohort study approach was used for the children and mothers in the population because the same children are surveyed as they progress through the grades. The school staff were surveyed multiple times a year, but this population frequently changed as the students progressed through the grades from kindergarten through fifth grade.

Research Design

This study used a correlational approach to understand the relationship between children's educational performance compared to their mother's educational levels by first comparing assessment scores from a longitudinal survey. According to Gall, Gall, and Borg (2002), "The basic design to correlational research is very simple, involving nothing more than collecting data on two or more variables for each individual in a sample and computing a correlation coefficient (strength)" (p. 321). This research study used numerous variables to determine the strength and causality of the variable relationships. The two main advantages of a correlational research design compared to other research designs is that correlational research enables researchers to analyze a vast number of variables in a single study and provides information on the strength or degree of the variables being studied (Gall et al., 2002).

Secondary Data Design Component

This quantitative research study utilized a correlational design with secondary data sets. Instead of administering a survey, the use of secondary data sets allows the researcher to have immediate access to data that was already gathered from a previous

survey. According to Gall et al. (2002), secondary data sets have many advantages when compared to the use of primary data. Secondary data can provide higher-quality and larger databases that would not be possible for an individual researcher to gather. The use of secondary data is much more cost effective because all the prior work has been performed for organizing and gathering data. Secondary data sets are also cleaned and stored in electronic format, which saves hours of time for the researcher. Therefore, the researcher may be able to generate new insights from previous analysis of the data. This could lead to re-analyzing data that could result in unexpected discoveries (Ghauri, 2005). Shutt (2006) and Weston, Ritchie, Rohrer, and Przybylski (2019) referenced that secondary data sets are extremely useful when longitudinal data is needed because years of research has already been performed on the same students from year to year. This is precisely why using the ECLS-K:2011 data set is optimal for this study, as data was gathered from over 18,000 students from kindergarten through fifth grade.

Crossman (2020) indicated that there are several disadvantages when using secondary data instead of primary data sets. Firstly, using secondary data may not fully answer the researcher's specific research questions. Consequently, manipulation of the data is needed in order to have a basis for answering the research questions. Also, the data could have been collected in locations or specific populations not desirable to the researcher because this may cause other issues in answering the research questions. Secondly, the researcher did not collect the data; therefore, there was no direct control over the data set. The data needed to answer the research questions may be needed from other secondary datasets. The dataset could be incomplete, or perhaps not as itemized as the researcher would like. An example of this would be only defining two races instead

of multiple races needed for the study. Lastly, a significant disadvantage of using secondary data is that the researcher may not know exactly how the data collection process was carried out. Often this information is readily available, however, this may not be the case in all situations. Fortunately, the data used in this research study have all data as well as reliability and validity checks on all their data gathering instruments.

Correlational Design Component

This study used a correlational design component in order to assess the relationship between the mother's educational level compared to student attainment levels and growth from kindergarten through fifth grade. Fraenkel and Wallen (2008) stated that correlational research is sometimes called "associative research," which refers to the study of two or more variables. More precisely, "correlational studies investigate the possibility of relationships between only two variables, although investigations of more than two variables are common. In contrast to experimental research, however, there is no manipulation of variables in correlational research" (p. 328). The authors articulated that the major purpose of correlational research is to refine our understanding of important phenomena by recognizing relationships among variables. Curtis, Comiskey, and Dempsey (2016) alluded that a correlational study not only refers to determining relationships among variables, but also taking this one step further and using these relations to form predictions. A correlational study hinges around investigating a number of variables believed to be related to a complex variable. The independent variable for this study will be the level of educational attainment of the mother, with control variables being gender, ethnicity, income, and cognitive performance levels.

The goal of the research was to study the relationship between children's academic performance and their mother's level of education using the 2011 Kindergarten Class Early Childhood Longitudinal survey (ECLS-K:2011; U.S. Department of Education, 2011, 2015a). This longitudinal survey utilized student test scores and surveys given to students, mothers, daycare workers, and school staff in order to provide information on dozens of factors. The purpose of this study was determine to what extent the mother's educational level is related to her child's level of attainment and growth in kindergarten through fifth grade given a variety of educational variables.

Population and Sample

The ECLS-K:2011 data was obtained from 18,174 children attending public and private schools in the United States (U.S. Department of Education, 2018). All kindergarteners in this survey were enrolled in full or part-time schooling programs and represented diverse socioeconomic and racial backgrounds. The other participants in the studies were the birth parents of the children, teachers of the children, and the schools the children attended. The ECLS-K:2011 also added before-and-after school care providers as participants in the survey. Table 3.1, summarizes the population and exact samples used for the ECLS-K:2011 survey.

Table 3.1

Demographic Characteristics for Full Kindergarten Sample

Variables	*N*	*Percent*
Child sex[a]		
Male	9288	51.1
Female	8847	48.7
Child race[b]		
White, non-Hispanic	8495	46.7
African American	2396	13.2
Hispanic	4585	25.2
Other	2652	14.6
Parent education[c]		
eighth grade or below	781	4.9
9-12th grade	1398	8.7
High school diploma/equivalent	3543	22.0
Vocational program	893	5.6
Some college	4242	26.4
Bachelor's degree	3129	19.5
Graduate school (no degree)	267	1.7
Master's degree or higher	1752	10.9

Note: Adapted from U.S. Department of Education. (2015b). Early childhood longitudinal study, Kindergarten Class of 2010–11 (ECLS-K:2011): User's manual for the ECLS-K:2011 kindergarten–first grade data file and electronic codebook, public version (NCES 2015-078). Washington, DC: National Center for Education Statistics.
[a] Missing data for 39 children in full sample.
[b] Missing data for 46 children in full sample.
[c] Missing data for 83 parents in full sample.

The ECLS-K:2011 is not a simple random sample (SRS) of a target population, but rather a multi-stage, stratified, clustering design. Kindergarten students were studied at the start of the survey and were followed up by subsequent observations, with no student or schools being added after the sample was taken in the fall of the kindergarten year. For future grade years, a subsample of the fall kindergarten schools were selected to produce a subsample representative of the full study sample (Buek, 2018). Gall et al.

(2002) believed that simple random clustering was far less efficient than multi-stage clustering. In order to reduce field costs, the original researchers decided to create primary sampling units (PSUs) within the states. The PSUs were created using three stages to the clustered design:

- Stage 1: The USA was separated into PSUs, which consisted of multiple counties. The PSUs were chosen in a way that all have similar numbers of five year olds.
- Stage 2: Within the sample PSUs, private and public schools were chosen.
- Stage 3: Within these private and public schools, the children were chosen.

Fraenkel and Wallen (2008) stated that cluster random sampling "can be used when it is difficult or impossible to select a random sample of individuals, it is often far easier to implement in schools, and it is frequently less time consuming" (p. 95). By using a clustering design, the likelihood of the children in the study living near each other and possibly attending the same school is greatly increased over a simple random sample. Children who live near each other, who possibly attend the same school, are likely to have many more similar characteristics than when compared to children that live further away from each other (Gall et al., 2002). Therefore, there is less variation in a clustered sample than in a simple random sample.

The ECLS-K:2011 studied 18,174 children from 283 private and 1,036 public schools attending both full-day and part-day kindergarten starting in 2011 (U.S. Dept. of Education, 2018). The ECLS-L:2011 collected data from kindergarten through eighth grade, but only the kindergarten through fifth grade data is available for this study (Tourangeau et al., 2014). For the ECLS-K:2011, an average of 23 kindergartners were sampled from each sample school. The studied children came from diverse racial/ethnic

and socioeconomic backgrounds and included first time and repeat kindergarten students. If the sample of the participating school contained very few kindergarten students, then the entire population of the school was included in the survey. Because many of the children changed schools, the average number of children per school decreased over the time period of the survey. Tourangeau et al. (2014) further states that it should be noted that strong consideration was given to using all kindergarten students in the schools, but this was determined to be a large burden on the teachers participating in the survey and created a loss of efficiency associated with an additional level of clustering.

The ECLS-K:2011 also included any student who was retained and repeated kindergarten. It is common for at least five percent of a kindergarten class to be "held back" from moving on to first grade (Hong & Raudenbush, 2005; Robertson, 2021). The sample also included students with disabilities (IEP students) who were not sampled at different rates when compared to students without disabilities. Since students are tested and found to be in need of IEP services throughout the six years of the survey, the sample size of students receiving special education services increased in size. In general, 25% percent of students usually change schools between kindergarten and first grades and 50% of children change school from kindergarten to third grade (Hong & Raudenbush, 2005).

As referenced above, adults were also used in the ECLS-K:2011 giving insight and ratings for all children in the survey. These groups include the children's parents/families, before/after school care providers, teachers, and schools. The ECLS-K:2011 is purely a voluntary survey with no one required to give assessment data or answer questionnaires. Strict confidentiality was given to all information provided by the

participants. Any response that related to identifiable characteristics of individuals was only used for statistical analysis and not for any other identifiable purpose (Tourangeau et al., 2017).

Instrumentation

The ECLS-K:2011 is one of three survey studies (ECLS-K:1999, ECLS-B, ECLS-K:2011, and soon the ECLS-K:2023) launched by the U.S. Department of Education in order to study national representative children attending kindergarten, with both ECLS-K and ECLS-K:2011 following kindergarten students through eighth grade. All studies followed a national sample of United States children as they progressed through schooling. These studies provide descriptive information about children on a variety of topics by focusing on descriptive information about the children's entry into school and their progress through eighth grade. These longitudinal studies utilize very similar research designs and data collection methods; therefore, only one of the studies will be used to help the researcher identify relationships between the mothers' academic level and their children's level of academics and social levels as they progress through the lower grades.

Although the ECLS studies are extremely similar and use similar procedures and protocols, there were several updates to the 2011 survey reflecting various new educational movements (West, 2017). The ECLS-K and ECLS-K:2011 both used a nation-wide sample of children attending kindergarten up through eighth grade. The ECLS-K survey focused on the kindergarten class of 1998-99 and the ECLS-K:2011 focused on the kindergarten class of 2010-11. Both studies provided information on the children's early learning and development, transitions into the higher grades, and

progress throughout school. The ECLS-K:2011 study was developed not because the previous study, the ECLS-K, was incomplete, but rather was created to study the two different cohorts over a decade apart. The researchers believed that significant changes in a new educational policy, No Child Left Behind, the rise of school choice, and the increase of English language learners would possibly show different correlations and results than those from the original ECLS-K (West, 2017).

The instrumentation used in this research study needed to be effective and efficient in gathering the needed data from the population. Gay et al. (2014) defined an instrument as "a test or tool used to collect data" (p. 573). This study utilized archived public-use data from the ECLS-K:2011 longitudinal survey of kindergarten classes. The ECLS-K:2011 utilized a variety of yearly summative academic tests and questionnaires given to parents, daycare workers, and staff. Because of the in-depth nature of the instrumentation, Table 3.2 summarizes and clarifies all instrumentations used and at the appropriate grade levels.

Table 3.2

Survey and Assessment Measures for ECLS-K:2011

Study Measure Attribute	ECLS-K:2011
Direct child assessments	
Reading	K-8th
Math	K-8th
Science	1st-8th
Executive function	K-8th
Height and weight	K-8th
Social and academic competence	3rd-8th
Survey instruments	
School administrator questionnaire	K-8th
Classroom teacher questionnaire	K-8th
Special education teacher questionnaire	K-8th
Parent interview	K-8th
Before and after school childcare questionnaires	Spring K-8th

Note. The ECLS-K:2011 studied children from kindergarten through 8th grade, but only K-fifth grade data has been released at the time of this study.

The ECLS-K:2011 longitudinal study used direct and indirect methods to assess each child's socioemotional, physical, and cognitive development. The direct child assessments were administered to children and consisted of cognitive assessment batteries and socioemotional indicators. The indirect child assessments consisted of the parent, teacher, and daycare worker ratings for the children's socioemotional and cognitive development. Because of the complexity of the data, this study will only involve the use of the direct cognitive assessments. Refer to Table 3.3 to for the exact number of students that took specific direct cognitive assessments.

Table 3.3

Numbers of Students That Took Each Direct Cognitive Assessment

Direct Cognitive Assessment	Number of students assessed per assessment schedule								
	Fall K	Spring K	Fall 1st	Spring 1st	Fall 2nd	Spring 2nd	Spring 3rd	Spring 4th	Spring 5th
Reading	15,669	17,186	5,194	15,115	4,725	13,837	12,866	12,074	11,427
Math	15,595	17,143	5,222	15,103	4,729	13,830	12,866	12,080	11,426
Science	--------	16,936	5,180	15,072	4,724	13,819	12,856	12,069	11,419

Note. The ECLS-K:2011 studied children from kindergarten through 8th grade, but only K-fifth grade data has been released at the time of this study.

Direct Cognitive Assessments - Overview

The direct cognitive assessments were administered to children in order to gain information at specific points in the year as well as their progress through the subjects across time. These direct cognitive assessments were conducted by trained assessors in the schools, while teacher ratings were collected by self-administered questionnaires, and parents provided data (characteristics of home and family and parenting behaviors) via computer assisted telephone interviews and in person interviews. As shown in Table 3.2, ECLS-K:2011 used reading, mathematics, science, social testing, and executive functioning (working memory and cognitive flexibility) of the children. Results from these assessments enabled the researchers to measure growth from the fall of kindergarten 2010 through the spring of 2016. The direct cognitive assessments used already existing state and national standards as the foundation of the testing. The ECLS-K:2011 assessed the important knowledge and skills typically taught and developed in the students from kindergarten through fifth grade. The National Assessment of Educational Progress (NAEP) assessment framework, the state curriculum standards, and ECLS

frameworks were also used to create all assessments used in the ECLS-K:2011 (U.S. Dept. of Education, 2015a).

The direct cognitive assessments were administered individually in a two-stage system, with the exception of a spring kindergarten science assessment (U.S. Dept. of Education, 2018). Stage 1 consisted of a subject area test followed by a second-stage test that was adapted according to the academic level of the student. The scores on the direct cognitive assessments included broad reports, as well as specific scores within hierarchical skill levels. Scores from these assessments ranged from Item Response Theory (IRT), item cluster scores, number-correct scores, and standardized scores (T-scores). Determined by the child's performance on Stage 1, the second stage would be a low, middle, or high level of difficulty test. The purpose of the adaptive assessment design is to maximize accuracy of the measurement and to minimize the time needed for the testing as well as outliers (Linden & Glas, 2010; Schneider, Chen, & Nichols, 2021).

In order to address non-English learner students, the ECLS-K:2011 involved components that would assess children on their spoken language (Tourangeau et al., 2017). A language screener was administered in order to determine which language would be used predominantly. The language screener consisted of a Preschool Language Assessment scale (preLAS 2000), which involved two tasks: Simon Says and an Art Show task. The Simon Says task required children to follow simple instructions given by the assessor in English, and the Art Show task tested the children's expressive vocabulary by having children identifying pictures within vocabulary. Spanish-speaking children who did not perform at a baseline level on the screener were administered a reading assessment in Spanish that measured their Spanish early reading skills (SERS). The same

students were administered mathematics and executive function assessments in Spanish as well. Children who did not score at the appropriate level for either the English or Spanish test were not administered any cognitive assessments beyond the first set of reading items. Lastly, all tests were assessed in English regardless of home language for all students beginning in second grade.

Direct cognitive assessment – reading. The reading assessments administered to the students involved letter recognition, sight vocabulary, print familiarity, vocabulary knowledge, and reading comprehension. The reading comprehension required children to read passages and then to identify supporting details to make inferences across texts. The length and language complexity of all passages were appropriate for the grade level of the child. The reading passages represented a variety of literary genres including letters, fiction, nonfiction, and poetry. More specifically, the sections of questions included basic skills questions, vocabulary, interpretation and understanding questions, personal reflection, and questions on critical stance. A subset of the reading section was Spanish reading direct cognitive assessment for students who had Spanish as their first language. These above items plus the preLAS2000 items comprised the English basic reading skills (EBRS) section of the ECLS-K:2011. The internal validity of these testing items will be discussed in the validity section.

Direct cognitive assessment – math. The mathematics assessments weighed heavily on problem-solving and conceptual knowledge of age-appropriate mathematical content. The yearly assessments included these sections: number sense, measurement, geometry, spatial sense, data analysis, statistics, probability, patterns, function, and algebra. The math assessments consisted of a set of 18 questions that allowed the

researchers to place the children in either low, middle, or high difficulty groups as they progressed. In order to minimize the effect written English had on the children, the questions were read to the students by the assessors, in which students were allowed to use paper-pencil at any time.

Direct cognitive assessment – science. The science assessments only included questions related to scientific inquiry, life, physical, and environmental sciences. All levels of science tests were two-stage assessments, excluding the kindergarten science assessments which consisted of only 15-20 questions. The topics on the science assessments included: earth and space science, physical science, and life science. As in the math cognitive assessments, the students were placed low, middle, and high proficiency as they progressed through the assessment. The tests included various pictures, graphs, and labels to help minimize the effect that reading English had on the assessment.

Reliability and Validity

The reliability and validity of the instruments are extremely important in any study, but none more than when utilizing secondary data sets. This is because the researcher did not create or administer the instruments; therefore, precision is needed by the researcher to ensure the quality of the data. Reliability refers to the internal consistency of a set of items, that is, the extent items in a group relate to each other (Fraenkel & Wallen, 2008; Gay et al., 2012; Urban, 2017). According to Fraenkel and Wallen (2008), "a reliable instrument is one that gives consistent results….and gives the researcher confidence that the results actually represented the individuals involved" (p. 111). Additionally, validity refers to the extent scores actually represent a variable they

are intended to represent. Validity is more of a judgment based on various types of evidence.

Cronbach's Alpha

There are many different reliability statistics that researchers used to measure the level of reliability of an assessment, but the most commonly used is the Cronbach's alpha (symbolized with the Greek letter "α") (Urban, 2017). Cronbach's alpha, more commonly referred to as "alpha," is not necessarily a statistical test, but rather a coefficient of consistency (reliability). Calculating alpha is rather cumbersome; therefore, statistical programs such as SPSS are necessary in determining the reliability of any assessment or survey. Alpha gives the researcher the average correlations among a group and ranges from 0 to 1, with 1 being the strongest correlation. A correlation of .50 means that there is some evidence that the items are related to the underlying construct. Urban (2017) states that, "A common rule of thumb is that when a set of items have an alpha level of .70 or higher, it is considered acceptably reliable" (p. 222).

ECLS-K:2011 Cronbach's alpha values

Table 3.4, displays the actual alpha levels for the assessments used for the ECLS-K:2011, which ranged from .58 to .99. The direct assessments all have alpha scores in the "reliable" range, since the lowest value of .75 is still above the .70 threshold (Urban, 2017). It should be noted that the ECLS-K:2011 science assessments were found to have a lower alpha value than reading, math, and Spanish early reading. The science assessments contained fewer questions than the other assessments; therefore, the alpha was lower than the assessments that contained many more questions.

Table 3.4.

ECLS-K:2011 Assessment Reliability Cronbach's Alpha Values

Academic Measures	ECLS-K:2011
Direct Assessments	
Reading	.93-.95
Spanish Early Reading	.91-.99
Mathematics	.92-.96
Science	.75-.83
Teacher-Report Survey (Self-Control)	.73-.88
Teacher-Report Survey (Interpersonal Skills)	.85-.88
Teacher Report Survey (External Behaviors)	.86.-.89
Teacher Report Survey (Internalizing Behaviors)	.73-.79
Teacher-Report Survey (Learning Skills)	.91
Teacher-Report Survey (Children Behavior)	.83-.87
Teacher-Report Survey (Student Relationship)	.89
Teacher-Report Survey (Attentional Focus)	.83-.96
Teacher-Report Survey (Inhibitory Control)	.85-.87
Teacher-Report Survey (Closeness)	.86-.89
Teacher-Report Survey (Conflict)	.88-.90
Teacher-Report (Working Memory)	.91
Parent-Report (Working Memory)	.81
Parent-Report Survey (Self-Control)	.58-.73
Parent-Report Survey (Learning Skills)	.70-.74
Student-Report Survey (Self-Concept)	.81

Source: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 2010–11 (ECLS-K:2011)

Validity of Direct Cognitive Assessments

Evidence for validity of the direct cognitive assessments was derived from several sources: comparison with state and commercial assessments, judgments of curriculum experts who developed the test specifications, and the review of national state performance standards (Tourangeau et al, 2018).

Reading. The ECLS-K:2011 reading assessments were based on the 2009-2012 Reading Frameworks for NAEP (National Assessment Governing Board) with the oversight of content experts using curriculum standards for Texas, California, New Jersey, Florida, and Virginia; and the Common Core State Standards.

Mathematics. Similarly, the math assessments were based on the mathematics framework for the 2005 NAEP (National Assessment Governing Board, 2004a), National Council of Teachers of Mathematics *Principles and Standards* for school mathematics (2000), and the state standards from New Jersey, Tennessee, Virginia, California, and Texas. Starting in third grade, the ECLS-K:2011 mathematical assessment was determined by comparing the state or national standards from Virginia, Texas, the National Council of Teachers of Mathematics (NCTM), and NAEP. It should be noted that Common Core Standards were not using the comparison because they are extremely similar to the national standards set by NCTM and NAEP.

Science. The science skills and knowledge skills assessed in this longitudinal study were based on the 1996–2005 NAEP science framework (National Assessment Governing Board, 2004b). Since the NAEP science framework technically begins in fourth grade, the science standards of six states were analyzed to find common topics: Texas, Virginia, Florida, Arizona, California, and New Mexico. For each grade level, three to four standards were chosen from each of the four common content categories (life science, physical science, Earth and space science, and inquiry).

Procedures

After approval from the researcher's dissertation committee and the Institutional Review Board to begin the study, I downloaded the data files from the National Center of

Education Statistics (NCES) website. Since this research is a large national longitudinal study which contains over 18,000 rows of information, the procedures to perform this study focuses heavily on the data collection and analysis aspects to this research study.

SPSS statistical software was used to first organize the data in a manner that will be easiest to manipulate. The next step in the process was to segregate the data by deleting incomplete testing information and/or students that will not be used for data analysis (i.e., students that moved away, for example.). Because of the number of data points, multiple SPSS files were needed to be separated the data that allows for maximum organization.

Data Collection and Analysis

Following approval from the dissertation committee and Instructional Review Board (IRB) approval for Western Illinois University, the next step was securing the ECLS-K:2011 data files. See IRB approval in Appendix A. The data collection process for this study requires obtaining the ECLS-K:2011 data files from the NCES website. After obtaining these files, which come in a variety of formats, including SPSS, the organization process began. Because of the complexity and vastness of the data, the most updated version of the SPSS software was utilized to organize and perform statistical analyses. See Figure 3.1 for a visual representation of the data collection process.

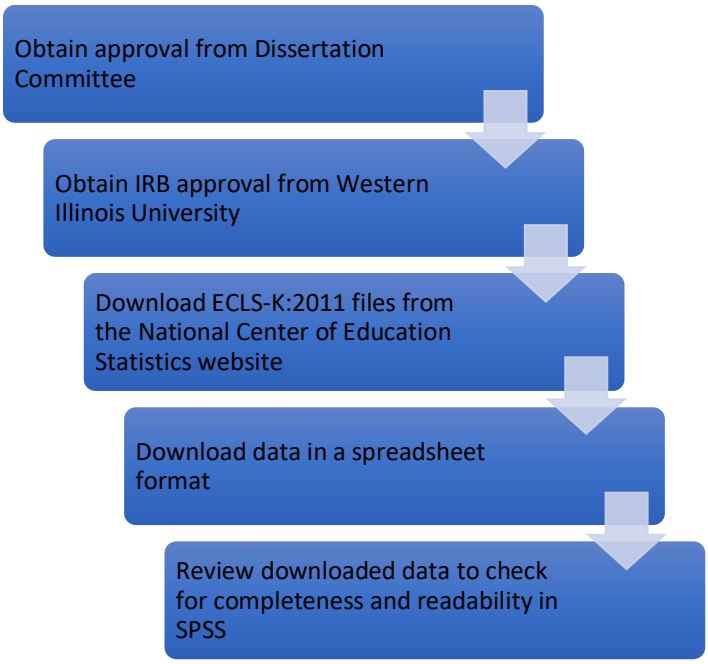


Figure 3.1. The order of the data collection process.

The data from the ECLS-K:2011 was entered and analyzed using SPSS statistical software. According to Garth (2008), The IBM SPSS software is perhaps the best statistical software to use when large data sets contain multiple variables that need to be analyzed. In this study, basic descriptive statistics were first calculated in order to compare multiple sets of factors. A variety of statistical calculations (ANOVA, *t*-tests, and regression analysis) and methods help to better answer the research questions.

A diversity of statistical analysis were performed on the data in order to answer the three research questions. For all research questions, basic descriptive statistics were calculated and used to start making inferences from the data. This basic information helped the researcher gain a better understanding of the data sets. Gray (2018) stated that "descriptive statistics are used to describe or summarize a set of data" (p. 139). The specific descriptive statistics used for this study were frequency, mean, and standard deviation. Each of the three research questions in this study involved the calculation of

these descriptive statistics, followed by other mathematical calculations for each of the research questions.

Answering the first research question, *What effect does the mother's education have on educational performance in kindergarten*? included determining the statistical significance and effect size with a *t*-test. This also involved performing a more-complicated analysis technique, one-way ANOVA (Analysis of Variance), which is used with more than two population groups (Connelly, 2021). A *t*-test gives an effect size, which illustrates if there is a large enough difference between two groups' averages to have practical meaning. The *t*-test also determines the statistical significance (*p*-value), which indicates if there is a difference between two group's averages, and if these differences actually reflect what is occurring in the population sampled. More precisely, the statistical significance is determined by the sample size, magnitude of group averages, and the standard deviation of the groups. For practicality, the statistical significance suggests if the studied populations are actually different. The ANOVA test was used to determine if more than two groups were statistically different from each other. In essence, an ANOVA is a series of *t*-tests performed on pairs of data in the population sets. The basic principle of an ANOVA is to test the variances among populations within a group proportionate to the variation between the groups.

The second research question, *What effect does a mother's education have on her children's academic development from kindergarten through fifth grade*? was answered using the same statistical tests as research question one. Data from kindergarten through fifth grade levels were analyzed to find the effect size, statistical significance, and probability (*p*-value) of the event occurring at the general population level.

The third and final research question, *How do background characteristics impact the children's academic development when in relation to the mother's education?* was answered using a regression analysis. A regression analysis explains the relationship between a dependent variable and multiple independent variables. A regression analysis creates an equation ($Y = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_k X_k$) where coefficients represent the relationship between the independent (x-values) and dependent (y-value) variable (Triola 2008; Urdan, 2017). The coefficients signify the average change in the y-value given a one-unit change in the x-value while controlling other x-values. Once the multiple regression equation is found, a *p*-value is calculated. If this *p*-value is low (usually < .05), the independent variable has a statistically significant influence on the dependent variable. The predictive ability of the regression is determined by calculating the coefficient of determination (R^2). The coefficient of determination lies between 0 and 1 and determines to what extent the variance of an independent variable explains the variance of the dependent variable. The higher the R^2 value, the stronger the model is at explaining the variation given the model's inputs. The data analysis procedures are summarized in Figure 3.2.

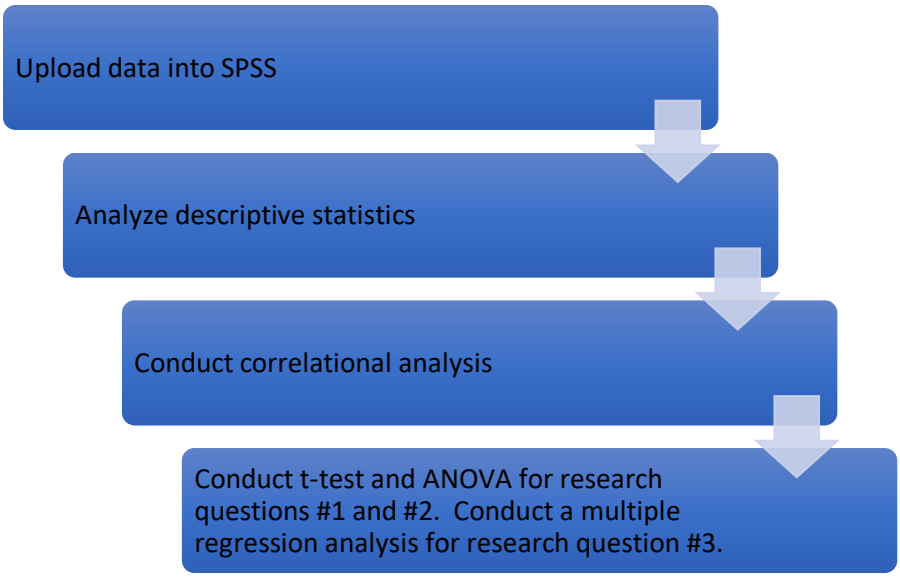


Figure 3.2. The order in which data analysis took place. The first step in the data analysis starts at the top and then flows down to the bottom level.

Summary of Methodology

This quantitative study investigated the relationship between the mother's educational attainment level and her child's academic attainment and growth from kindergarten through fifth grade as well as other characteristics that may affect student academic outcomes of over 18,000 students in the United States. The topic of a mother's education in relation to the academic levels of her children has not been widely studied, especially when a study focuses on the level of growth obtained in the first six years of schooling. This chapter first outlined the research methodology and design of the study. The chapter then provided details on the population and sample, instrumentation used, data collection procedures, and data analysis procedures. In order to answer the research questions, the study utilized existing data sets from the NCLS-K:2011 to determine answers to the research questions.

CHAPTER IV

DATA ANALYSIS

The purpose of this quantitative study is to examine the academic effect the mother's education has on her child in kindergarten, overall growth through schooling up to fifth grade, and other background characteristics that impact children's academic development. Using the 2010-2011 Kindergarten Class Early Childhood Longitudinal Study (ECLS-K:2011) from the National Center for Education Statistics (NCES) within the Institute of Education Sciences (IES) of the U.S. Department of Education, statistical analysis was performed on over 18,000 student information sets. The ECLS-K:2011 is third in a series of longitudinal studies performed from the NCES, with a fourth study projected to start in 2022 (NCES, 2020). The ECLS-K:2011 survey includes test scores, questionnaires, and perception surveys, which will be utilized to answer the study's research questions. The ECLS-K:2011 directly examines child development, early school experiences, and school readiness using direct testing data and questionnaires. The study was guided by the following three research questions:

1. What effect does the mother's education have on educational performance in kindergarten?
2. What effect does a mother's education have on her children's academic development from kindergarten through fifth grade?
3. How do background characteristics impact the children's academic development when in relation to the mother's education?

Overview of Data Preparation

Data for this study were obtained by downloading the ECLS-K:2011 data files from the NCES section of the IES webpages. The data were obtained starting with the 2010-2011 school year and proceeding through the end of the 2015-2016 school year. The ECLS-K:2011 was established to follow students through the end of 2018-2019 school year, but for the purpose of the study, and because the later data has not been released yet, only data up through the 2015-2016 school year was analyzed. Two major files were downloaded from the IES webpages: one containing the coding syntax file and the other containing all data. Other minor files were downloaded to help differentiate from the various coding methods used throughout the data analysis. After downloading and installing the coding syntax file, variables were sifted through and chosen for each of the three research questions. After each file was gathered, this information was then exported into SPSS to start the data analysis. The data was sorted, with the aid of the coding identification documents, by research question in order to start the analysis process.

Data Preparation of the Mother's Education Level

The ECLS-K:2011 study analyzed a total of 18,174 children from public and private schools in a variety of central and eastern USA states. For the purpose of the study, only information from the 13,319 children who attended public schools were used. The ECLS-K:2011 study also identified the mother's educational level into 17 separate educational categories, but for the purpose of this data analysis, this was narrowed to eight separate categories from middle school education up to Doctorate/professional degree (see Table 4.1 and Table 4.2).

Table 4.1

ECLS-K:2011 Mother's Education Levels Pre-Readjustment

Mother's Education Levels	Frequency	Percent of total
Not Ascertained	188	1.0
Don't Know	67	0.4
Refused	34	0.2
Grade 7 Or Less	439	2.4
Grade 8	150	0.8
Grade 9	322	1.8
Grade 10	300	1.7
Grade 11	452	2.5
Grade 12 But No Diploma	360	2.0
High School Diploma/Equivalent	402	2.2
High School Diploma	1919	10.6
Voc/Tech Prog After High School No Diploma	182	1.0
Voc/Tech Program After High School	588	3.2
Some College But No Degree	2372	13.1
Associate's Degree	1200	6.6
Bachelor's Degree	2708	14.9
Graduate/Professional School - No Degree	237	1.3
Master's Degree (Ma, Ms)	1205	6.6
Doctorate Degree (Ph.D., Ed.D.)	105	0.6
Professional Degree After Bachelor's Degree	169	0.9
Total	13,319	100

Table 4.2

ECLS-K:2011 Mother's Education Levels After Readjustment

Mother's Education Levels	Frequency	Percent of total
Middle School Education	589	5.7
Some High School	1434	13.9
HS Diploma	2321	22.5
Vocational	588	5.7
Associates Degree	1200	11.6
Bachelor's Degree	2708	26.2
Master's Degree	1205	11.7
Doctorate/Professional Degree	274	2.7
Missing/Not Used	3000	29.1
Total	13,319	100.0

Overview of Data Analysis

The data used for Research Question One involved the mother's education level for the 2010-2011 school year, which includes the fall and spring mathematics and reading scores of the kindergarten students. It should be noted that only a spring science assessment was given to the 2010-2011 kindergarten classes, therefore this data was not analyzed. The data used for Research Question Two involved the mother's educational level in 2010-2011 and also assessment data in the areas of mathematics, reading, and science for schools years starting at 2010-2011 and continuing through 2015-2016 school year. Lastly, Research Question Three utilized the mother's educational level in 2010-2011, assessment data for mathematics, reading, and science from school years 2010-2011 through 2015-2016, SES, and ethnicity of the child.

Analysis of Research Questions

This section will report the statistical analyses that were conducted in order to answer the study's three research questions. After data was sorted for each research

question, basic descriptive tests were computed to gain a better perspective of relationships when comparing groups of students testing scores and their associated mother's education levels. ANOVA and *t*-tests were then performed to determine if there were any statistical differences between the independent groups being analyzed. Eta-squared was then found in order to examine the relationship the mother's educational level has on her child's test scores in the area of mathematics, reading, and science. Multiple regression analyses was also performed in order to determine what variables predicted overall student achievement on the assessments when compared to the mother's education level.

Research Question One

The first research question was *What effect does the mother's education have on educational performance in kindergarten?* In order to illustrate the overall data analysis of this research question, demographic data information pertaining to the numbers of kindergarten students taking each mathematics and reading test were determined, as well as the overall average scores, standard deviation, and the minimum and maximum scores earned on these assessments (see Table 4.3).

Table 4.3

ECLS-K:2011 Kindergarten Assessment Data

Assessment Information	*N*	*M*	*SD*	*Min*	*Max*
Fall Reading Test	8516	54.37	12.02	33.14	116.78
Spring Reading Test	8845	69.08	14.92	32.39	133.54
Fall Mathematics Test	8499	35.66	11.94	11.96	132.66
Spring Mathematics Test	8426	49.84	13.63	11.75	112.54

The number of students taking the fall and spring tests ranged from 8426 to 8845, which is only a slight variation over the course of the school year. As expected, the

average assessment score for both mathematics and reading increased from 35.66 to 49.84 and 54.37 to 69.08, respectively. The standard deviation for the fall reading assessment was 12.02 and grew to 14.92 with the spring test. The standard deviation for the spring mathematics assessment also showed the same pattern with the fall test being 11.94 and the spring test standard deviation was 13.63. The increased standard deviation is attributed to the scores being more spread out from the mean for that assessment. Lastly, the minimum score value on the reading assessments were extremely similar, but the maximum assessment score on the spring assessment was much higher than the fall assessment. Perhaps the most interesting aspect to this data is that the mathematics minimum scores were similar, but the highest score on the later spring test was much lower than the fall test. This could be due to certain higher-achieving students not taking the assessment in the spring. If the overall mean on the spring mathematics test was lower than the fall, then the data would show a decreased aptitude on the spring assessment, but this is not the case here.

The mother's education level, separated into eight levels, were then paired with each fall and spring test in order to give descriptive statistics on the performance of children in each of the mother's education levels. Table 4.4 and Table 4.5 illustrates the mean test score, number of students taking that particular test, standard deviation, and standard error mean for each of the fall and spring tests for mathematics and reading, respectively.

Table 4.4

Kindergarten Mathematics Testing Descriptive Statistics

Mother's Education Level	Assessment	*M*	*N*	*SD*	*SE*
Middle School Education	Fall Math	27.71	526	9.32	0.41
	Spring Math	41.89	526	11.71	0.51
Some High School	Fall Math	29.29	1261	9.13	0.26
	Spring Math	42.97	1261	11.56	0.33
HS Diploma	Fall Math	32.43	2004	10.09	0.23
	Spring Math	46.45	2004	12.15	0.27
Vocational	Fall Math	34.54	497	9.43	0.42
	Spring Math	48.46	497	11.43	0.51
Associates Degree	Fall Math	36.64	957	10.65	0.34
	Spring Math	51.07	957	12.14	0.39
Bachelor's Degree	Fall Math	41.28	1930	11.62	0.26
	Spring Math	55.69	1930	12.75	0.29
Master's Degree	Fall Math	43.43	881	12.38	0.42
	Spring Math	58.32	881	13.02	0.44
Doctorate/Professional Degree	Fall Math	44.84	184	14.49	1.07
	Spring Math	59.22	184	15.45	1.14

Table 4.5

Kindergarten Reading Testing Descriptive Statistics

Mother's Education Level	Assessment	*M*	*N*	*SD*	*SE*
Middle School Education	Fall Reading	47.21	523	8.59	0.38
	Spring Reading	60.75	523	11.43	0.50
Some High School	Fall Reading	48.67	1267	7.79	0.22
	Spring Reading	62.39	1267	11.05	0.31
HS Diploma	Fall Reading	51.47	2008	9.47	0.21
	Spring Reading	65.79	2008	12.22	0.27
Vocational	Fall Reading	52.71	495	8.27	0.37
	Spring Reading	67.07	495	11.04	0.50
Associates Degree	Fall Reading	54.68	961	10.43	0.34
	Spring Reading	69.89	961	12.98	0.42
Bachelor's Degree	Fall Reading	59.45	1937	13.19	0.30
	Spring Reading	74.97	1937	16.06	0.36
Master's Degree	Fall Reading	61.96	884	14.28	0.48
	Spring Reading	77.76	884	16.67	0.56
Doctorate/Professional Degree	Fall Reading	63.05	185	16.65	1.22
	Spring Reading	79.14	185	19.13	1.41

The mean assessment scores of the children whose mothers had middle school education level are shown to have the lowest mean score of all the education levels in the fall and spring assessments at 27.71 for the mathematics fall assessment, 41.89 for the mathematics spring assessment, 47.21 for the reading fall assessment, and 60.75 for the reading spring assessment. The average score for both fall and spring math and reading assessment all showed an increase when compared with the increased level of the mother's education. The highest average test scores were earned by the children whose mothers have a doctorate/professional degree with a math average score of 43.32 in the fall and 44.69 in the spring. This was also the same pattern for the reading tests with scores of 63.05 in the fall and 79.14 in the spring. Figures 4.1 and 4.2 display the above chart information into a simplified bar graph in order to depict the increasing test scores at each level of the mother's education increases.

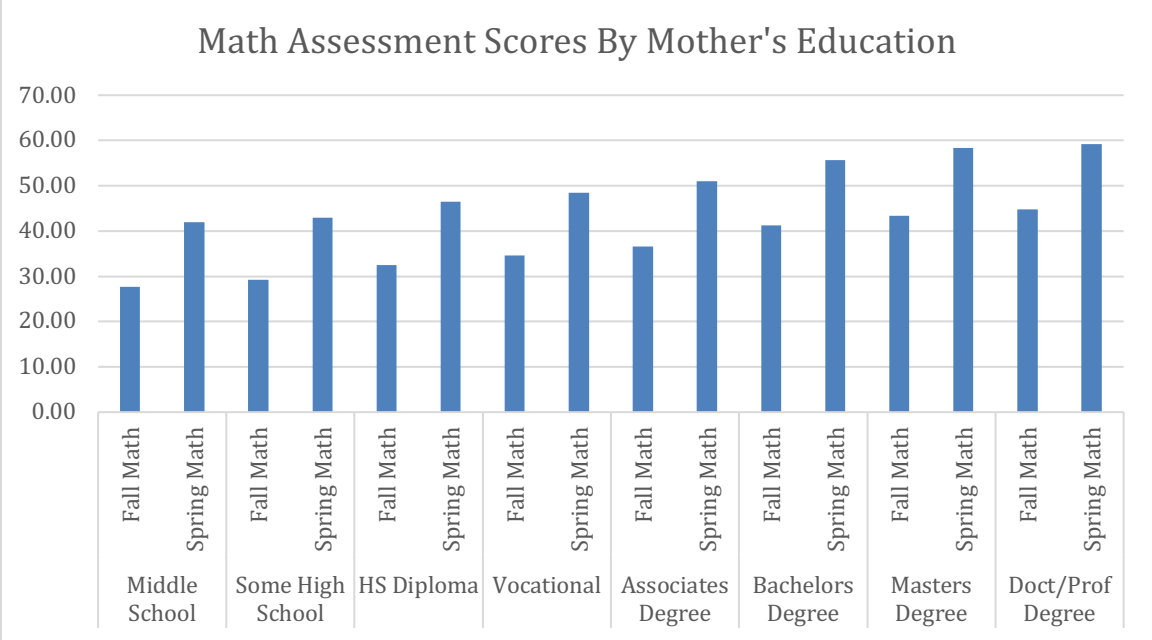


Figure 4.1. The average math test scores of kindergarten student separated into the mother's education attainment level.

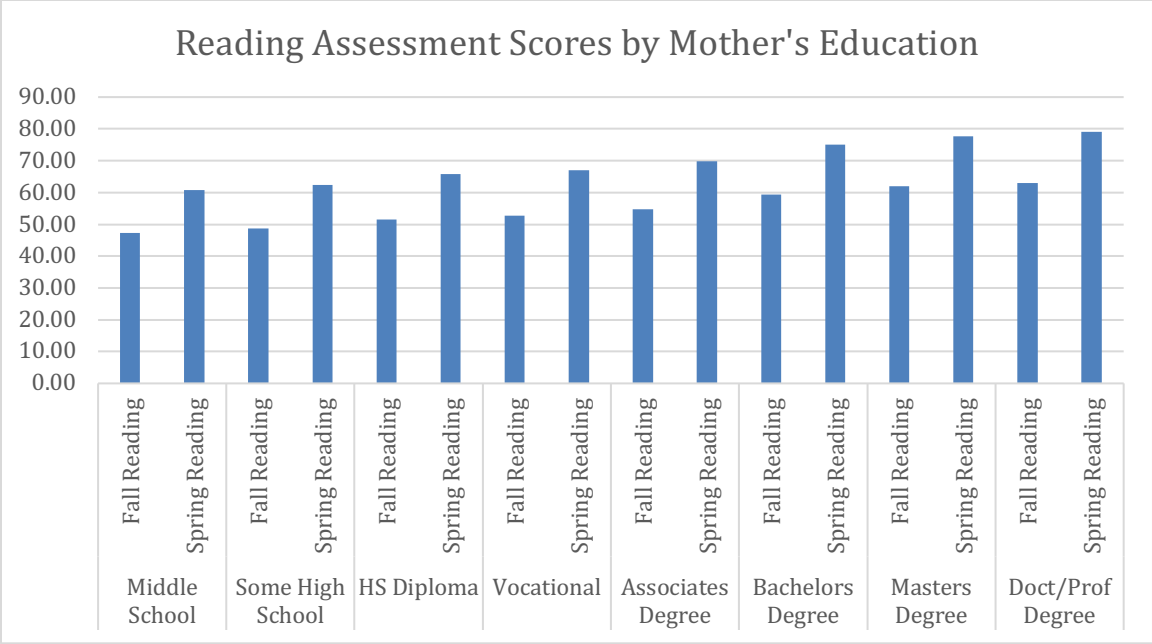


Figure 4.2. The average reading test scores of kindergarten student separated into the mother's education attainment level.

Tables 4.4 and 4.5 also display the standard deviations, which each test showed an increase in relation to the level of the mother's education level. The lowest standard deviations (spread of data from the mean) corresponds with the both the fall and spring math and reading test scores of children whose mother has a middle school education, some high school, and vocational education levels. Conversely, the highest standard deviation for both math and reading assessments belong to the mother's education levels of bachelor's, master's, and doctorate degrees. This refers to the assessments having higher and possibly lower scores than the average test score in that group.

The overall academic growth scores (improvement from fall to spring test) for each assessment was determined in order to establish baseline data that would be compared to the mother's education levels. Table 4.6 illustrates the difference, or growth, from the scores earned on the fall test compared to that of the spring test. The table shows negative values for the minimum values, which corresponds to at least once

test score being much less on the spring when compared to the fall scores. The maximum growth for the reading test was 74.20, with math showing a maximum growth score of 50.80. The reading assessment had the highest average growth score of 14.67, with math being 14.14. The growth score spread from the mean, or standard deviation, was also higher for the spring reading test compared to the math test.

Table 4.6

ECLS-K:2011 Kindergarten Assessment Growth Data

Assessment Information	*Min*	*Max*	*M*	*SD*
Fall to Spring Reading Test	-65.65	74.20	14.67	8.34
Fall to Spring Math Test	-21.27	50.80	14.14	7.56

The overall math and reading assessment growth from fall to spring for the kindergarteners is clarified in Table 4.7. The lowest overall average growth in the area of reading belongs to the students whose mother has an education level of middle school with a 13.54, then some high school with a 13.73, and then high school diploma with a 14.32. Conversely, the highest average growth on the reading assessment belongs to students whose mothers have their doctorate/professional degree with 16.09, followed by master's degree with a mean growth of 15.80, and then bachelor's degree with 15.52.

Table 4.7

Kindergarten Reading and Math Test Score Growth from Fall to Spring Assessments

Mother's Education Level	Assessment	*M*	*N*	*SD*	*SE*
Middle School Education	Reading	13.54	523	8.45	0.37
Some High School	Reading	13.73	1267	7.72	0.22
HS Diploma	Reading	14.32	2008	7.85	0.18
Vocational	Reading	14.36	495	7.64	0.34
Associates Degree	Reading	15.20	961	7.70	0.25
Bachelor's Degree	Reading	15.52	1937	9.14	0.21
Master's Degree	Reading	15.80	884	9.38	0.32
Doctorate/Professional Degree	Reading	16.09	185	10.14	0.75
Average or Total		14.77	8260	8.42	0.09
Middle School Education	Math	14.18	523	7.74	0.34
Some High School	Math	13.68	1267	7.58	0.21
HS Diploma	Math	14.02	2008	7.20	0.16
Vocational	Math	13.92	495	7.49	0.34
Associates Degree	Math	14.43	961	7.20	0.23
Bachelor's Degree	Math	14.41	1937	7.72	0.18
Master's Degree	Math	14.89	884	8.10	0.27
Doctorate/Professional Degree	Math	14.38	185	8.32	0.61
Average or Total		14.21	8240	7.56	0.08

Perhaps the most intriguing information presented in Table 4.7 is that the highest and lowest improvement of assessment scores in relation to the mother's education levels in math are not the same as they are in reading. The lowest overall average growth was shown to be the students with mothers having some high school education with 13.68, followed by vocational school education with 13.92, and then high school diploma with 14.02. The doctorate/professional degree showed to be the fourth highest average growth at 14.38, with Master's being the highest at 14.89, associate's being 14.43, and bachelor's having a mean growth value of 14.41 (see Figure 4.3).

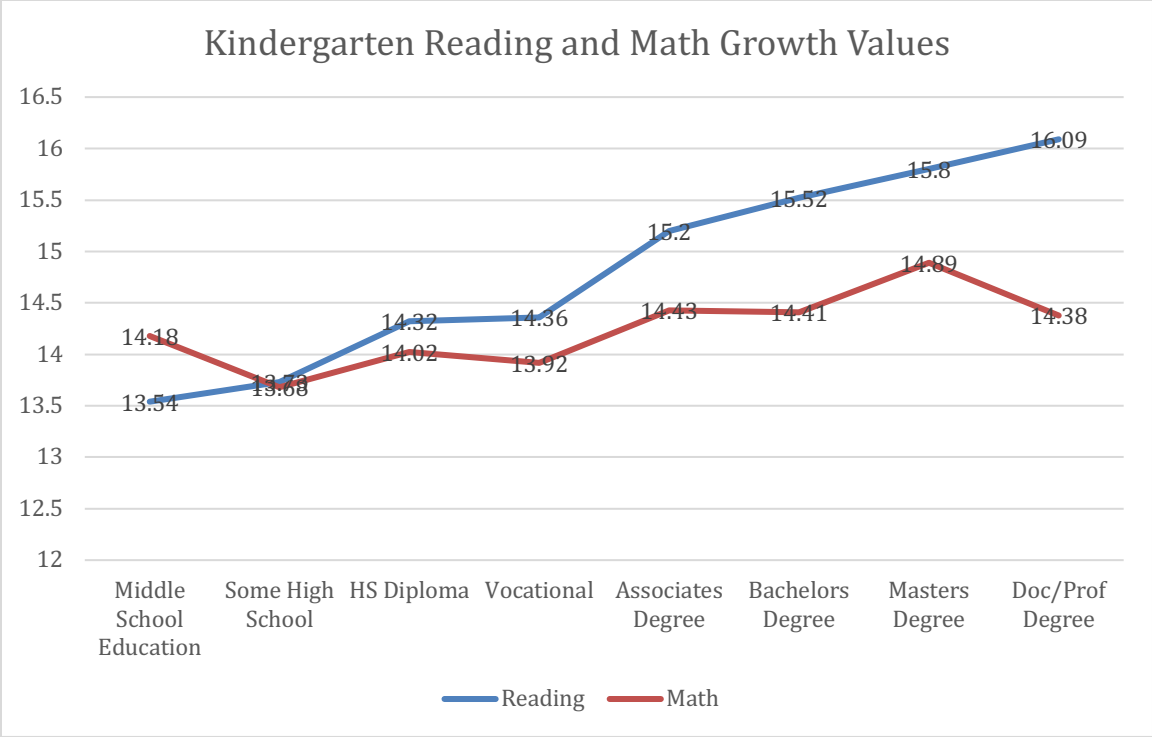


Figure 4.3. The average growth scores on the reading and math assessments of kindergarten students separated into the mother's education attainment level.

A one-way ANOVA test was performed for both math and reading growth scores in comparison to the mother's education level in order to determine whether the differences between the groups of data are statistically significant (Triola, 2008). Table 4.8 displays the results of the one-way ANOVA test, which shows the sum of squares, mean square, degrees of freedom, *F*-value, and significance level. The *F*-distribution, also known as Snedecor's distribution is used to derive the *F*-value and is used in conjunction with the *p*-value, which is the probability of getting a result at least as extreme as the one actually observed in order to determine statistical significance (Triola, 2008).

Table 4.8

One-Way ANOVA Results for the Kindergarten Reading and Math Growth

Mother's Education Level	*Sum of Squares.*	*Df*	*Mean Square*	*F*	*p*
K Reading Difference					
Between Groups	5180.414	7	740.0	10.52	<.001
Within Groups	580502.070	8252	70.34		
Total	585682.484	8259			
K Math Difference					
Between Groups	997.779	7	142.5	2.494	0.15
Within Groups	470396.794	8232	57.14		
Total	471394.573	8239			

The ANOVA results for the spring growth show an *F*-value of 10.520 with a significance value of less than .001, which is represented as $F(7,8259) = 10.520$, $p < .001$. The *p*-value is observed to be less than .001, which is less than the alpha value of .25 (Bonferroni adjusted alpha level), therefore the growth scores on the reading test when compared to the levels of mother's education, are significant. This means that the mother's education level has a significant effect on the growth of the students on the kindergarten reading test. In reference to the math growth scores, the results indicated that $F(7,8239) = 2.494$, $p < .015$. The observed *p*-value is less than .025 therefore the level of the mother's education level has a significant effect on the student's growth throughout the year on the math assessments. The *p*-value for reading is much less than the *p*-value for the math test, meaning the mother's education level has a much stronger impact on the reading growth scores.

The ANOVA test also gave information to determine the effect size, in essence the strength that mother's education level has on the growth of the students on the reading and math assessments. Table 4.9 displays the effect size as well as the confidence intervals for the results of the ANOVA test. According to Triola (2008), the

effect size when performing an ANOVA test is referred to as the eta-squared value (η^2). The effect size is considered small when $.01 \leq \eta^2 < .06$, medium effect size when $.06 \leq \eta^2 < .14$, and a large effect size will fall in the range when $.14 \leq \eta^2$. The calculated η^2 value is .009 for the reading assessments and .002 for the math assessments. Therefore the lower η^2 means that there is low variance (differences) between the growth scores in the levels of the mother's education. Essentially, the difference in the growth scores between all the levels of mother's education are small, therefore the overall growth testing scores are in the range expected when compared to the other levels of mother's education.

Table 4.9

One-Way ANOVA Effect Sizes for the Kindergarten Reading and Math Growth

Mother's Education Level	*Point Estimate*	*95% Confidence Interval*	
		Lower	*Upper*
K Reading Difference Eta-squared	.009	.005	.012
K Math Difference Eta-squared	.002	.000	.000

A paired *t*-test was performed on the data in order to give a depiction of the individual growths each set of students had according to the grouping by their mother's education level. Figure 4.4 displays the individual Cohen's *d* effect size for each level of education for both the reading and math tests. According to Brydges (2019), the Cohen's *d* effect size is considered small at .2, medium at .5, and large at .80. More precisely, the Cohen's *d* and here refers to the number of standard deviation units away from the mean for each test broken into mother's education levels. The highest effect size of 2.004 belongs to the children on the math test whose mothers have an associates degree as their

highest level of education. This is also the case with 1.974 as the Cohen's *d* effect size in reading. To simplify, the students who took math test in the spring scored 2.004 standard deviations greater than the average score of the fall assessment and 1.974 standard deviations in reading. The lowest effect size for both math and reading tests are for the children's whose mothers have a doctorate/professional degree, with 1.728 and 1.586, respectively All effect sizes for both math and reading are above the "large" mark of .8, therefore regardless mother's educational level, kindergarten children had large learning gains from fall to spring

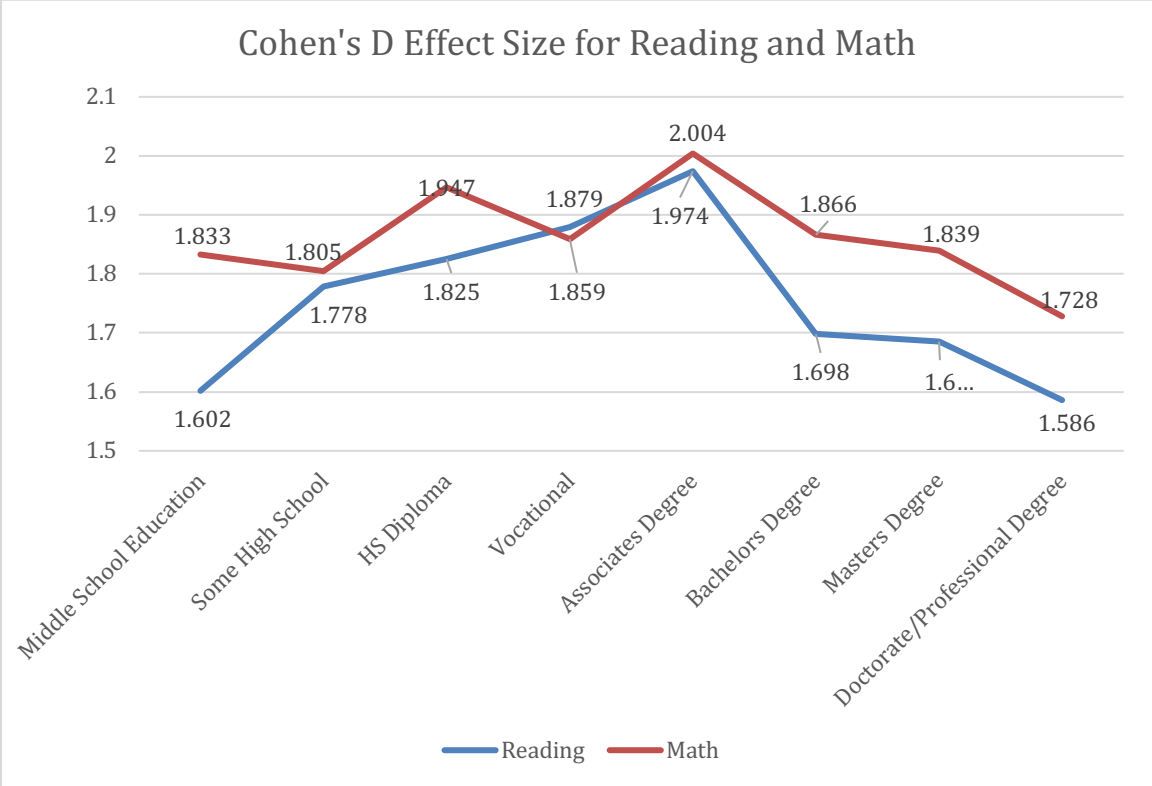


Figure 4.4. The Cohen's *d* effect size for the kindergarten reading and math tests.

Summary Results for Research Question One

The data analysis of the first research question, *What effect does the mother's education have on educational performance in kindergarten?*, yielded a variety of interesting results. The student mean value of test scores increased from fall testing to spring testing for both math and reading. The largest improvement from the fall to spring assessment belonged to the reading assessment. When the data was separated by mother's educational level, the average test score was lowest when the mother's educational level was at a middle school level for both math and reading. The highest test average for both math and reading belong to the children whose mothers had a doctorate/professional degree. The lowest overall average growth in the area of reading belongs to the students whose mother has an education level of middle school, some high school, and high school diploma, respectively. An analysis of the math scores displayed the lowest overall growth belonged to the students with mothers having some high school education, followed by vocational school education, and then high school diploma. The highest overall growth for math belongs to the mother's with a master's degree, followed by associates degree, and then bachelor's degree. The highest average growth on the reading assessment belongs to students whose mothers have their doctorate/professional degree, followed by master's degree, and then bachelor's degree.

The one-way ANOVA test results illustrates that the mother's educational level has a greater impact on the reading scores when compared to math scores. The effect sizes for both math and reading are extremely small, therefore the lower effect size means that there is low variance (differences) between the growth scores in the levels the mother's education. Essentially, the overall growth testing scores are in the range

expected when compared to the other levels of mother's education. The results of the paired *t*-test illustrates the highest effect size belongs to the mothers with associates degree for both math and reading. The overall results of the paired *t*-test show there is a strong learning gain in reading and math for each of mother's educational level. To simplify, the mother's education level has a very strong relationship to the growth and overall aptitude performance of her kindergarten child's math and reading assessments, with reading being impacted more according to the mother's education level.

Research Question Two

The second research question was, *What effect does a mother's education have on her children's academic development from kindergarten through fifth grade*? In order to answer this question, basic demographic information was determined for all students from kindergarten through fifth grade who took the spring assessments. The kindergarten, first grade, and second grade students took a fall and spring assessments for both math and reading, but only took the spring science assessment. Students in third, fourth, and fifth grades only took the spring assessment in the subject areas of mathematics, reading, and science. Because of the lack of fall testing, only the spring testing for mathematics, reading, and science are analyzed in order to answer this research question. Each of the assessments areas are separated in the analysis because of the breath of the data being presented.

The basic descriptive statistics for the spring reading, math, and science assessments are illustrated on Tables 4.10, 4.11, and 4.12. The average score on the individual assessment, standard deviation, minimum assessment score, and the maximum assessment scores are used as a baseline in order to start the comparisons and then to

build the foundation of the data analysis. All the tables, 4.10-4.12, illuminate the mean assessment scores increasing as the students progressed from kindergarten through fifth grade. The data shows kindergarten having the lowest average, then followed by progressively increasing averages through the grade levels as the students experienced more schooling. The Table 4.10 data hints at the fact there may be outlier scores as the highest reading assessment score in third grade surpassed the fourth grade highest score and the minimum score on the fourth grade assessment is higher than the minimum score on the fifth grade assessment. This is also reciprocated on Table 4.11 with the minimum third grade math score being the highest minimum math score of all presented grade levels. Table 4.12 illustrates the minimum science kindergarten science score being higher than the minimum first and second grade levels and also the third grade minimum value on the third grade assessment was higher than the fourth grade minimum value.

Table 4.10

ECLS-K:2011 K-5th Grade Reading Assessment Data

Assessment Information	*M*	*SD*	Min	Max
Kindergarten Spring Reading	68.74	14.38	32.98	133.55
First Grade Spring Reading	94.30	17.71	32.74	139.21
Second Grade Spring Reading	111.67	16.98	45.91	146.42
Third Grade Spring Reading	120.33	15.58	65.54	156.47
Fourth Grade Spring Reading	128.70	14.87	73.40	155.49
Fifth Grade Spring Reading	135.79	15.55	72.27	158.86

Table 4.11

ECLS-K:2011 K-5th Grade Math Assessment Data

Assessment Information	*M*	*SD*	Min	Max
Kindergarten Spring Math	49.05	13.32	11.75	112.54
First Grade Spring Math	71.63	15.74	12.27	137.42
Second Grade Spring Math	89.14	18.32	18.42	139.10
Third Grade Spring Math	103.09	18.23	43.41	147.89
Fourth Grade Spring Math	111.69	18.19	25.73	147.90
Fifth Grade Spring Math	119.04	18.12	26.76	148.04

Table 4.12

ECLS-K:2011 K-5th Grade Science Assessment Data

Assessment Information	*M*	*SD*	Min	Max
Kindergarten Spring Science	33.11	7.38	19.19	55.28
First Grade Spring Science	41.96	10.39	18.42	74.94
Second Grade Spring Science	51.60	11.88	17.83	86.87
Third Grade Spring Science	59.10	12.20	23.38	88.67
Fourth Grade Spring Science	65.88	12.24	21.35	89.36
Fifth Grade Spring Science	72.69	13.17	25.73	90.15

With the descriptive statistical baseline data for each grade level determined, the students were separated into categories for each assessment according to their mother's educational level. Table 4.13 illustrates the number of students whose mothers fit into a certain educational attainment level for each different assessment are consistent. There are a few variations in the overall testing numbers in the categories, this could be due to certain students being absent from certain assessments or students moving in and out of the testing districts.

Table 4.13

ECLS-K:2011 Number of Students in Each Mother's Level of Education

Mother's Education Level	Reading	Math	Science
Middle School Education	409	408	414
Some High School	786	786	788
High School Diploma	1338	1335	1346
Vocational	324	324	326
Associates Degree	645	645	647
Bachelor's Degree	1399	1396	1403
Master's Degree	659	659	660
Doctorate/Professional	143	143	143
Total	5703	5696	5727

Reading assessments. After determining the basic descriptive statistics and the corresponding number of students that belong to each category of mother's educational level, individual assessment data statistics (mean, number of students, and standard deviation) were determined for each spring assessments. Table 4.14 displays these values for the spring reading assessments. As expected, the mean score on the spring assessment becomes greater as the student progress through the grade levels. These mean values only refers to the average score per grade level according to the mother's educational level, but does not show if there is an actual statistical significance between these average scores.

Table 4.14

Spring Reading Assessment Data in Relation to Mother's Educational Level

Grade	Mother's Education Level	*M*	*N*	*SD*
K	Middle School Education	60.12	409	11.30
	Some High School	62.44	786	11.33
	HS Diploma	65.96	1338	11.97
	Vocational	66.74	324	10.64
	Associates Degree	70.15	645	13.08
	Bachelor's Degree	75.10	1399	16.06

	Master's Degree	77.47	659	16.25
	Doctorate/Professional Degree	78.84	143	18.96
	Total/Average	69.47	5703	14.92
1st	Middle School Education	81.54	409	16.02
	Some High School	85.54	786	16.32
	HS Diploma	90.83	1338	16.77
	Vocational	93.03	324	15.92
	Associates Degree	97.20	645	15.43
	Bachelor's Degree	102.27	1399	16.31
	Master's Degree	105.55	659	15.64
	Doctorate/Professional Degree	107.31	143	15.63
	Total/Average	95.20	5703	17.93
2nd	Middle School Education	99.77	409	16.68
	Some High School	103.09	786	16.59
	HS Diploma	108.04	1338	16.33
	Vocational	110.28	324	14.56
	Associates Degree	114.42	645	14.87
	Bachelor's Degree	119.73	1399	14.42
	Master's Degree	122.47	659	14.54
	Doctorate/Professional Degree	124.63	143	14.36
	Total/Average	112.57	5703	17.18
3rd	Middle School Education	109.55	409	15.70
	Some High School	112.72	786	14.97
	HS Diploma	116.76	1338	15.05
	Vocational	119.10	324	13.60
	Associates Degree	122.66	645	13.53
	Bachelor's Degree	127.64	1399	13.16
	Master's Degree	130.52	659	12.88
	Doctorate/Professional Degree	133.02	143	12.62
	Total/Average	121.15	5703	15.71
4th	Middle School Education	118.39	409	16.36
	Some High School	120.87	786	15.00
	HS Diploma	125.49	1338	14.61
	Vocational	127.73	324	14.10
	Associates Degree	130.76	645	13.00
	Bachelor's Degree	135.54	1399	11.93
	Master's Degree	138.33	659	11.22
	Doctorate/Professional Degree	140.15	143	10.26
	Total/Average	129.39	5703	15.05
5th	Middle School Education	125.54	409	16.51

Some High School	128.12	786	16.45
HS Diploma	132.37	1338	15.46
Vocational	134.98	324	14.75
Associates Degree	138.46	645	13.50
Bachelor's Degree	142.70	1399	12.11
Master's Degree	144.95	659	11.54
Doctorate/Professional Degree	146.29	143	11.04
Total/Average	136.47	5703	15.59

A visual representation of the Table 4.14 is displayed as Figure 4.5. This figure shows the increasing, almost linear trend, among mother's educational level on all spring reading assessments, differentiated among grade levels. Figure 4.5 displays the linear trend of reading assessment scores by all of the students in specific levels according to the level of their mother's educational level. This same data was used to create Figure 4.6, with each linear trend corresponding to each grade level. This figure shows the actual differences among the grade levels, especially the growth from the lowest level of educational attainment, middle school education, to the highest level of doctorate/professional degree. The data does show there were only slight increases in several of the educational attainment areas when comparing consecutive education attainment levels.

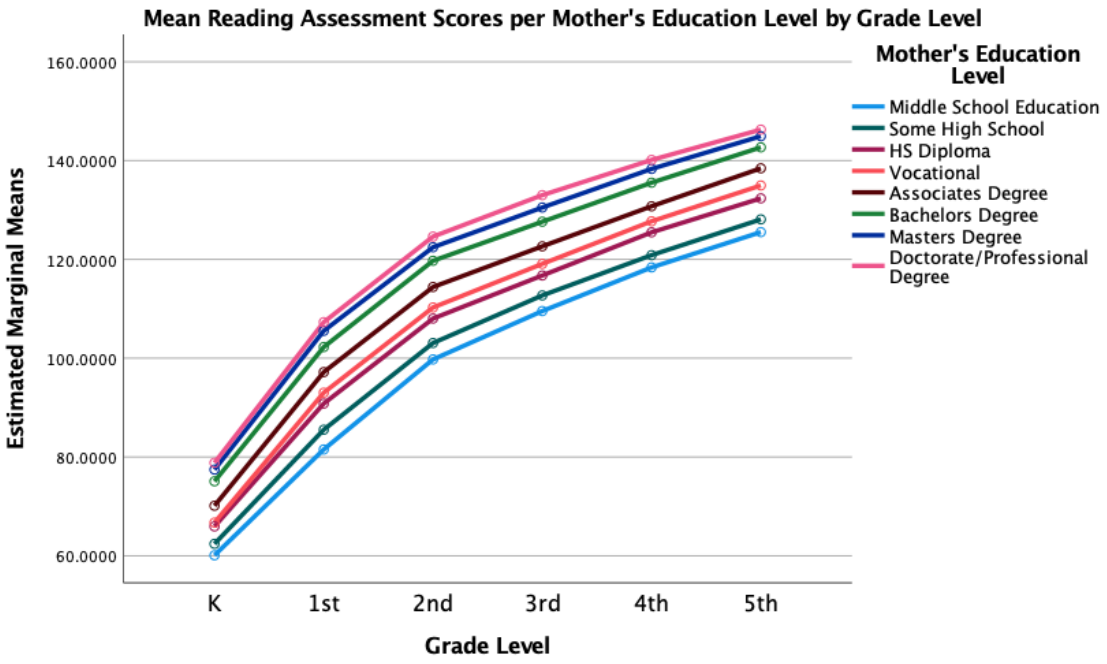


Figure 4.5. Mean reading assessment scores per mother's education level by grade level.

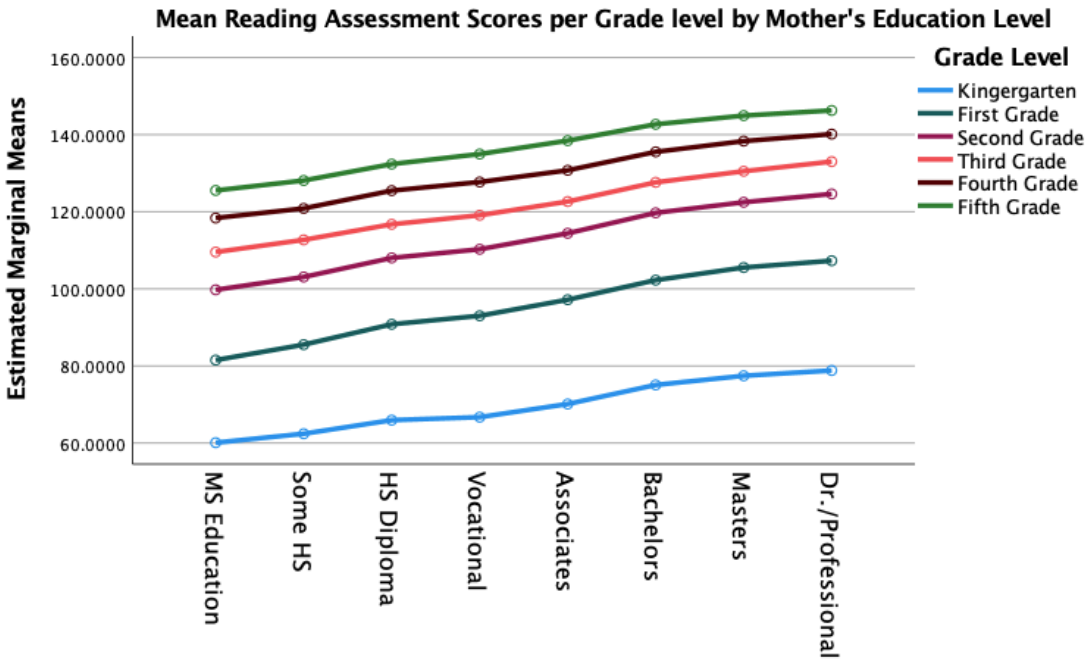


Figure 4.6. Mean reading assessment scores per grade level by mother's education level.

To gain an understanding of the significance of the reading scores, repeated measures ANOVA tests were performed on the data in order to calculate the effect size (partial eta-squared). According to Pierce, Block, and Aguinis (2004), the partial eta-squared (effect size), when performing an ANOVA analysis, is considered small at .01, medium at .06, and large at or above .14. These repeated measured ANOVA tests measure within-subject variations according to the time progressing though the grades. Table 4.15 presents the partial eta-squared values for the spring reading assessments broken into student groups who belong at certain education levels according to the mother's education.

Table 4.15

ECLS-K:2011 ANOVA Within-in Subject Effect Sizes for Reading

Children Sorted by Mother's Education Level	Partial Eta-Squared
Middle School Education Group	.907
Some High School Group	.915
High School Diploma Group	.915
Vocational Group	.916
Associates Degree Group	.917
Bachelor's Degree Group	.910
Master's Degree Group	.908
Doctorate/Professional Group	.899
Average	.911

Note. Eta-Squared are estimated on the fixed model effect.

These effect sizes refer to the actual percent impact that time has on each student group (sorted by mother's education level). This *time* involves the actual schooling, curriculum, assistance at home on academics, etc. have on student performance on the reading assessments from when the student enters kindergarten and until they leave fifth grade. For example, students who belong to the mother's middle school education attainment group show 90.7% of the student growth on the reading assessments from

kindergarten through fifth grade being attributed to factor of time. The table shows that the largest effect size of .917 is associated with students whose mothers have an associates degree, while the smallest effect size corresponds with children whose mothers have a doctorate/professional degrees. Overall, the data analysis shows that 91.1% of the growth for all students from kindergarten through fifth grade is attributed to the actual time progressing though school. It should be noted that these *time* effect sizes have numerous factors involved and do not solely represent the effect the mother's education has on these students, but is a factor.

Table 4.15 presents the overall effect size, or impact, that the time progressing through the grades, per education grouping, has on student assessment scores for reading growth from kindergarten through fifth grade. In order to determine the effect size in relation to the impact the mother's education has on the actual student performance from kindergarten through fifth grade, a one-way ANOVA test was performed. Table 4.16 displays the eta-squared values and the 95% confidence intervals for each grade level in relation to the mother's education level. At the kindergarten level, the mother's education attributed to 15.1% of the variation in student performance on the reading assessments. The effect size of .151 is considered large, therefore a mother's educational attainment has a significant effect on the student scores on the reading assessment. The largest effect size of .192 is at the fourth grade level. This means that 19.2% of the differences in the student reading assessments is associated to the level of the mother's education. All effect sizes are considered large; therefore mother's educational level has a large impact on the reading assessment scores for each individual grade level.

Table 4.16

One-Way ANOVA Reading Effect Sizes for Each Grade Level in Relation to Mother's Education Level

Grade Level	Point Estimate Effect Size	95% Confidence Interval	
		Lower	Upper
Kindergarten	.151	.137	.164
First Grade	.178	.163	.192
Second Grade	.186	.170	.201
Third Grade	.190	.174	.206
Fourth Grade	.192	.174	.208
Fifth Grade	.177	.159	.193
Average	.179		

Note. Eta-Squared are estimated on the fixed model effect.

Table 4.17 breaks down each grade level and compares the means at each mother's educational level with the next educational level in the progression. These *pairwise comparisons* of means determines if there is a significant difference among the difference of means between two consecutive educational levels. The calculations display a range of interesting details about correlation of each level of mother's educational on reading assessment performance when compared to the next level of education. The data shows that on the kindergarten test, that there is no statistical difference between the children's reading assessment scores when their mother has a middle school education vs. some high school education, high school diploma vs. vocational schooling, and master's degree vs. doctorate/professional degrees. On the first, second, and third grade assessments there are no statistical significance between the high school diploma vs. vocational and master's degree vs. doctorate/professional degrees. The fourth grade analysis shows a slightly different pattern with there being no statistical difference among the middle school educational vs. some high school

educational levels, high school diploma vs. vocational, bachelor's vs. master's degrees, and master's degree vs. doctorate/professional degrees. Lastly, the fifth grade data shows there is no statistical difference among the average test score difference among the middle school education vs. some high school, high school diploma vs. vocational, and master's degree vs. doctorate/professional degree educational levels. Although there are several areas of no statistical significance, the overall trend does show that the reading performance increases with the increase in mother's educational level.

Table 4.17

Educational Levels Compared in Each Grade Level on the Reading Assessment

Grade	Mother's Educational Level	Compared Educational Level	*M* Difference	*p*
K	Middle School Education	Some High School	-2.321	0.158
	Some High School	HS Diploma	-4.300*	<.001
	HS Diploma	Vocational	-0.779	1
	Vocational	Associates Degree	-3.409*	0.008
	Associates Degree	Bachelor's Degree	-4.949*	<.001
	Bachelor's Degree	Master's Degree	-2.370*	0.007
	Master's Degree	Doctorate/Professional Degree	-1.37	1
1st	Middle School Education	Some High School	-3.999*	0.001
	Some High School	HS Diploma	-5.287*	<.001
	HS Diploma	Vocational	-2.202	0.786
	Vocational	Associates Degree	-4.168*	0.004
	Associates Degree	Bachelor's Degree	-5.077*	<.001
	Bachelor's Degree	Master's Degree	-3.279*	<.001
	Master's Degree	Doctorate/Professional Degree	-1.753	1
2nd	Middle School Education	Some High School	-3.318*	0.012
	Some High School	HS Diploma	-4.954*	<.001
	HS Diploma	Vocational	-2.245	0.526
	Vocational	Associates Degree	-4.139*	0.002
	Associates Degree	Bachelor's Degree	-5.310*	<.001
	Bachelor's Degree	Master's Degree	-2.741*	0.005
	Master's Degree	Doctorate/Professional Degree	-2.155	1
3rd	Middle School Education	Some High School	-3.165*	0.006

	Some High School	HS Diploma	-4.038*	<.001
	HS Diploma	Vocational	-2.348	0.2
	Vocational	Associates Degree	-3.556*	0.006
	Associates Degree	Bachelor's Degree	-4.978*	<.001
	Bachelor's Degree	Master's Degree	-2.877*	<.001
	Master's Degree	Doctorate/Professional Degree	-2.505	1
4th	Middle School Education	Some High School	-2.482	0.073
	Some High School	HS Diploma	-4.617*	<.001
	HS Diploma	Vocational	-2.236	0.212
	Vocational	Associates Degree	-3.037*	0.027
	Associates Degree	Bachelor's Degree	-4.777*	<.001
	Bachelor's Degree	Master's Degree	-2.791	<.001
	Master's Degree	Doctorate/Professional Degree	-1.813	1
5th	Middle School Education	Some High School	-2.581	0.078
	Some High School	HS Diploma	-4.256*	<.001
	HS Diploma	Vocational	-2.607	0.082
	Vocational	Associates Degree	-3.477*	0.009
	Associates Degree	Master's Degree	-6.493*	<.001
	Bachelor's Degree	Master's Degree	-2.251*	0.021
	Master's Degree	Doctorate/Professional Degree	-1.337	1

Table 4.17 displays each grade level divided in the assessment scores for each level of the mother's education achieved. A more generalized view of just the mother's educational levels for *all* grade levels is displayed on Table 4.18. This table presents the average assessment score across each level of mother's education attainment as well as the 95% confidence intervals. Overall the data shows the average student assessment scores on the reading test increases as the level of mother's education progresses from middle school education up to doctorate/professional degree. Moreover, the increase in the reading scores is statistically significant for each pair of successive educational levels compared except for the two highest educational levels, master's degree and doctorate/professional degree.

Table 4.18

Mean Reading Assessment Scores and Confidence Intervals by Mother's Educational Level

Mother's Educational Level	*M*	95% CI Lower Bound	95% CI Higher Bound
Middle School Education	99.15	97.92	100.39
Some High School	102.13	101.24	103.02
HS Diploma	106.57	105.89	107.26
Vocational	108.64	107.26	110.03
Associates Degree	112.28	111.29	113.26
Bachelor's Degree	117.16	116.50	117.83
Master's Degree	119.88	118.91	120.86
Doctorate/Professional Degree	121.70	119.61	123.79

Math assessments. The analysis of the math assessment data was performed using the same methods as the reading assessment data. Table 4.19 illustrates the average, number of students, and standard deviation for each grade level of assessments, broken down by the level of the mother's educational attainment. The data shows that for all grades, kindergarten through fifth grade, all mean assessment scores were lowest for students of the mothers with a middle school education and then increased as the levels of the mother's educational attainment increased. It should be noted that although the means were greater for next proceeding level of the mother's educational attainment, this data does not show if there is any statistically significant differences among the math assessment scores when comparing two consecutive levels of the mother's educational attainment.

Table 4.19

Spring Math Assessment Data in Relation to Mother's Educational Level

Grade	Mother's Education Level	*M*	*N*	*SD*
K	Middle School Education	41.35	408	11.53
	Some High School	43.38	786	11.80
	HS Diploma	46.63	1335	12.12
	Vocational	49.02	324	11.21
	Associates Degree	51.49	645	12.38
	Bachelor's Degree	55.82	1396	12.93
	Master's Degree	58.46	659	13.16
	Doctorate/Professional Degree	59.56	143	15.47
	Total	50.44	5696	13.69
1st	Middle School Education	61.60	408	13.21
	Some High School	64.77	786	14.15
	HS Diploma	68.90	1335	14.16
	Vocational	71.51	324	13.28
	Associates Degree	74.36	645	15.03
	Bachelor's Degree	79.28	1396	14.85
	Master's Degree	82.56	659	14.89
	Doctorate/Professional Degree	84.55	143	16.92
	Total	73.09	5696	16.00
2nd	Middle School Education	78.12	408	15.94
	Some High School	81.16	786	17.12
	HS Diploma	85.63	1335	16.86
	Vocational	88.98	324	15.63
	Associates Degree	92.32	645	17.29
	Bachelor's Degree	98.43	1396	16.26
	Master's Degree	101.36	659	15.29
	Doctorate/Professional Degree	103.28	143	16.75
	Total	90.82	5696	18.27
3rd	Middle School Education	92.03	408	17.08
	Some High School	95.36	786	17.63
	HS Diploma	99.80	1335	17.40
	Vocational	103.66	324	16.37
	Associates Degree	105.74	645	16.59
	Bachelor's Degree	111.86	1396	15.09
	Master's Degree	115.23	659	14.25
	Doctorate/Professional Degree	115.80	143	15.75
	Total	104.66	5696	18.01

4th	Middle School Education	100.91	408	17.47
	Some High School	103.73	786	17.90
	HS Diploma	108.28	1335	17.98
	Vocational	111.45	324	16.39
	Associates Degree	114.74	645	15.88
	Bachelor's Degree	120.50	1396	14.43
	Master's Degree	123.14	659	13.30
	Doctorate/Professional Degree	125.35	143	13.15
	Total	113.18	5696	17.85
5th	Middle School Education	108.15	408	17.62
	Some High School	110.20	786	18.42
	HS Diploma	115.58	1335	17.56
	Vocational	118.38	324	16.59
	Associates Degree	121.97	645	15.66
	Bachelor's Degree	127.71	1396	14.12
	Master's Degree	130.78	659	12.23
	Doctorate/Professional Degree	132.31	143	12.89
	Total	120.34	5696	17.75

A visual graph representation of the Table 4.19 is illustrated as Figure 4.7. This figure shows the increasing, almost linear trend, among mother's educational level on all spring math assessment, differentiated among grade levels. This visual graph representation gives a better perspective on the starting, ending, and trajectory of the students in each grade, separated by the mother's educational level. Figure 4.8 is another visual graph representation of the data from Table 4.19. The figure shows linear trends by grade level, in which the major data points are the averages at each level of the mother's educational level. The figure does show the separation between each level of mother's educational attainment, with a deeper analysis needed via ANOVA test to determine the significance of consecutive educational attainment categories in relation to the overall mean.

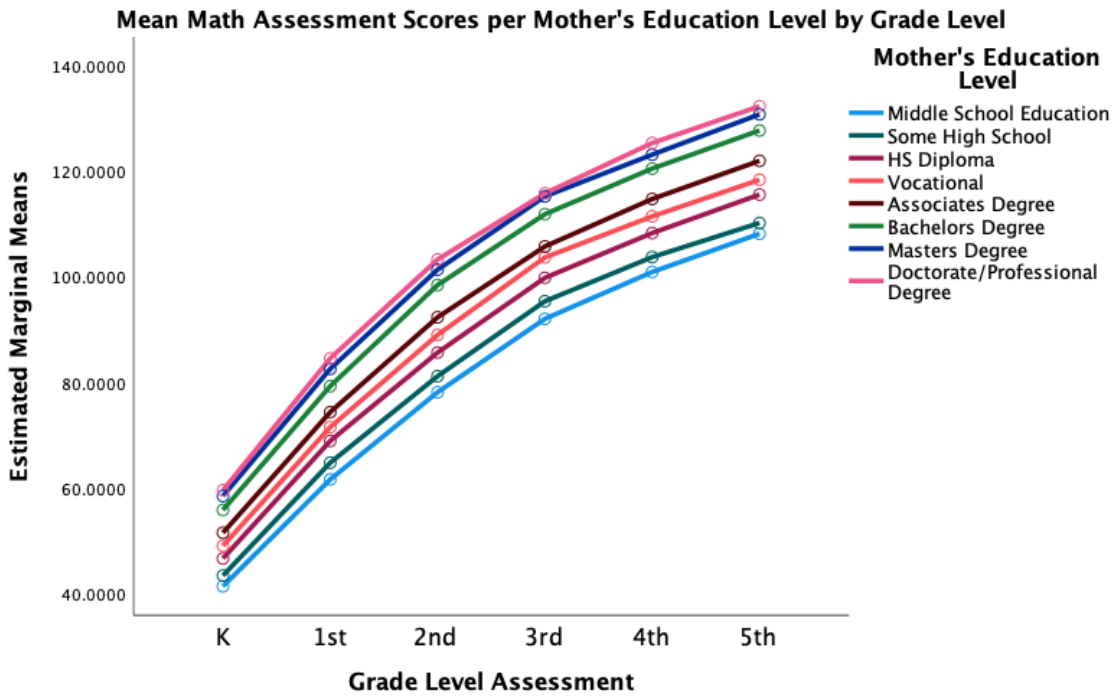


Figure 4.7. Mean math assessment scores per mother's education level by grade level.

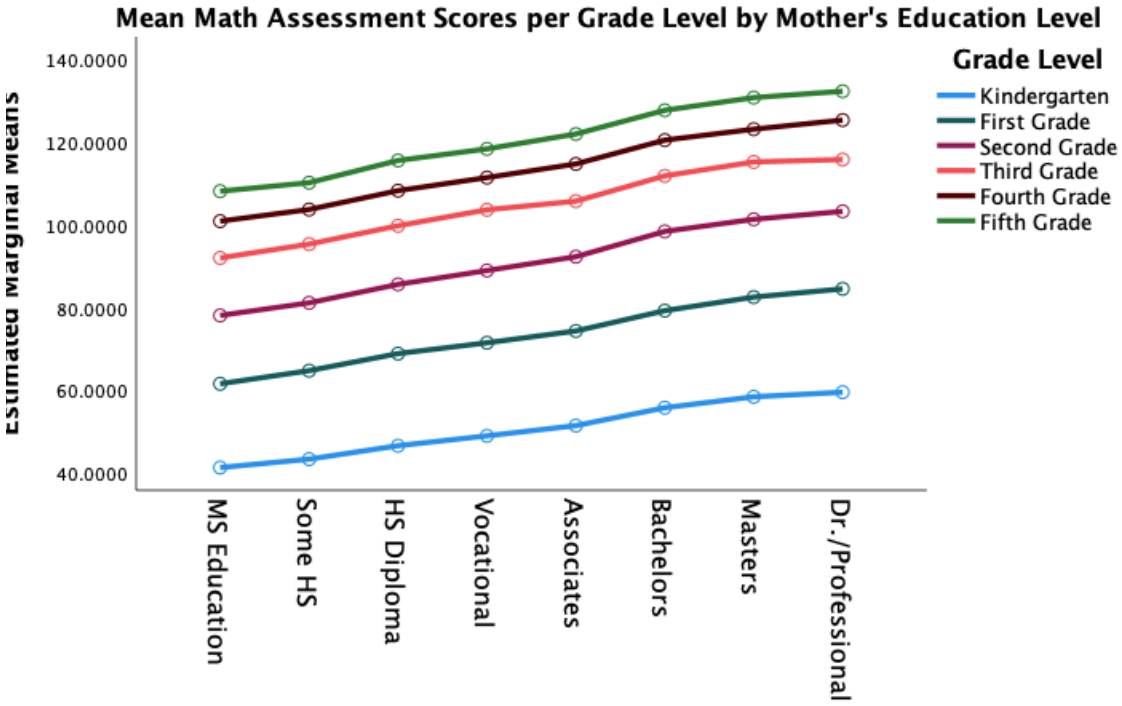


Figure 4.8. Mean math assessment scores per grade level by mother's education level.

Although Table 4.19 and Figure 4.7, show an increasing average score as the student progressed through grades, separated into mother's educational levels, the overall significance of these increases was found with repeated measures ANOVA test, with the results of the within-subjects ANOVA test being illustrated on Table 4.20. These partial eta-squared values represent the effect size, which in this situation, represents the proportion of variance that time progressing from kindergarten through fifth grade has on math performance in certain mother's educational groupings. The largest effect size of .940 is associated with the children whose mothers have a bachelor's degree and the smallest effect size is associated with children whose mothers have a middle school education. The average effect size for the math assessment from kindergarten through fifth grade is .931, which refers to 93.1% of the math assessment results are attributed to the time progressing through the grades.

Table 4.20

ECLS-K:2011 ANOVA Within-in Subject Effect Sizes for Math

Children Sorted by Mother's Education Level	Partial Eta-Squared
Middle School Education Group	.919
Some High School Group	.918
High School Diploma Group	.927
Vocational Group	.930
Associates Degree Group	.936
Bachelor's Degree Group	.940
Master's Degree Group	.939
Doctorate/Professional Group	.939
Average	.931

Note. Eta-Squared are estimated on the fixed model effect.

Table 4.20 illustrates the ANOVA effect sizes for mathematics when using time progression as the primary factor. Within each level of mother's education, the effect size is considered large, therefore there is a large learning gain in the math assessments from

kindergarten through fifth grade at each level of mothers education. Table 4.21 displays the effect sizes when using the level of mother's education as the primary factor broken down by grade level. The smallest effect size of .173 is found at the kindergarten grade level, meaning that 17.3% of the math performance can be attributed to the mother's education level. The mother's educational level has the largest impact on math performance at the fifth grade level with partial eta squared at 19.0%.

Table 4.21

One-Way ANOVA Math Effect Sizes for Each Grade Level in Relation to the Mother's Education Level

Grade Level	*Point Estimate*	*95% Confidence Interval*	
	Effect Size	*Lower*	*Upper*
Kindergarten	.173	.158	.186
First Grade	.177	.162	.192
Second Grade	.185	.169	.200
Third Grade	.177	.161	.193
Fourth Grade	.176	.159	.191
Fifth Grade	.190	.172	.207
Average	.180		

Note. Eta-Squared are estimated on the fixed model effect.

Table 4.22 represents the grade level difference of means when comparing consecutive educational attainment levels. These *pairwise* comparisons, with the aid of the *p*-value, allows the data to be analyzed to determine if there is a statistical significance among consecutive educational attainment levels. As stated earlier, if the *p*-value is less than .05, there is a statistical significance involved in this data set. In analyzing Table 4.22, the data shows there is no statistical difference among the math assessment scores in kindergarten for those students whose mothers have a middle school education when compared to some high school education, high school diploma vs. vocational, vocational vs. associates degree, and master's vs. doctorate/professional

degree. In first grade there is no statistical significance between these areas of educational attainment: high school diploma vs. vocational, vocational vs. associates degree, and master's vs doctorate/professional degree. Second grade only shows master's vs. doctorate/professional degree as the non-statistically significant consecutive pair. Third grade has two consecutive educational of no statistical significance: vocational vs. associates degree and master's vs. doctorate/professional degree. At the fourth grade level, middle education vs. some high school, vocational vs. associates degree, and master's degree vs. doctorate/professional degree are the three consecutive pairs with no statistical difference in their means. Lastly, at the fifth grade level, middle school vs. some high school, high school diploma vs. vocational, and master's degree vs. doctorate/professional degree have no statistical significance difference among their means.

Table 4.22

Educational Levels Compared in Each Grade Level on the Math Assessment

Grade	Mother's Educational Level.	Compared Educational Level	*M* Difference	*p*
K	Middle School Education	Some High School	-2.033	0.208
	Some High School	HS Diploma	-3.247*	<.001
	HS Diploma	Vocational	-2.384	0.055
	Vocational	Associates Degree	-2.476	0.097
	Associates Degree	Bachelor's Degree	-4.326*	<.001
	Bachelor's Degree	Master's Degree	-2.640*	<.001
	Master's Degree	Doctorate/Professional Degree	-1.105	1
1st	Middle School Education	HS Diploma	-7.301*	<.001
	Some High School	HS Diploma	-4.128*	<.001
	HS Diploma	Vocational	-2.612	0.101
	Vocational	Associates Degree	-2.853	0.107
	Associates Degree	Bachelor's Degree	-4.914*	<.001
	Bachelor's Degree	Master's Degree	-3.281*	<.001
	Master's Degree	Doctorate/Professional Degree	-1.988	1

2nd	Middle School Education	Some High School	-3.037	0.071
	Some High School	HS Diploma	-4.473*	<.001
	HS Diploma	Vocational	-3.347*	0.029
	Vocational	Associates Degree	-3.343	0.082
	Associates Degree	Bachelor's Degree	-6.109*	<.001
	Bachelor's Degree	Master's Degree	-2.925*	0.005
	Master's Degree	Doctorate/Professional Degree	-1.92	1
3rd	Middle School Education	Some High School	-3.335*	0.023
	Some High School	HS Diploma	-4.442*	<.001
	HS Diploma	Vocational	-3.862*	0.004
	Vocational	Associates Degree	-2.077	1
	Associates Degree	Bachelor's Degree	-6.116*	<.001
	Bachelor's Degree	Master's Degree	-3.369*	<.001
	Master's Degree	Doctorate/Professional Degree	-0.578	1
4th	Middle School Education	Some High School	-2.816	0.121
	Some High School	HS Diploma	-4.555*	<.001
	HS Diploma	Vocational	-3.164*	0.045
	Vocational	Associates Degree	-3.295	0.078
	Associates Degree	Bachelor's Degree	-5.758*	<.001
	Bachelor's Degree	Master's Degree	-2.642*	0.015
	Master's Degree	Doctorate/Professional Degree	-2.204	1
5th	Middle School Education	Some High School	-2.049	0.995
	Some High School	HS Diploma	-5.376*	<.001
	HS Diploma	Vocational	-2.802	0.13
	Vocational	Associates Degree	-3.593*	0.027
	Associates Degree	Bachelor's Degree	-5.740*	<.001
	Bachelor's Degree	Master's Degree	-3.063*	0.001
	Master's Degree	Doctorate/Professional Degree	-1.536	1

Table 4.22 presents each grade level divided by the assessment scores for each level of the mother's education attainment achieved. A more global view of just the mother's educational levels for *all* grade levels is displayed on Table 4.23. This table displays the average assessment score across each level of mother's education attainment as well as the 95% confidence intervals. Similar to the reading assessment results, the overall data shows the average student assessment scores on the math test increases as the

mother's education progresses from middle school education up to doctorate/professional degree.

Table 4.23

Mother's Educational Levels Mean Math Assessment Scores and Confidence Intervals

Mother's Educational Level	*M*	95% CI Lower Bound	95% CI Higher Bound
Middle School Education	80.36	79.01	81.71
Some High School	83.10	82.13	84.07
HS Diploma	87.47	86.73	88.22
Vocational	90.50	88.98	92.02
Associates Degree	93.44	92.37	94.51
Bachelor's Degree	98.93	98.20	99.66
Master's Degree	101.92	100.86	102.98
Doctorate/Professional Degree	103.48	101.19	105.76

Science assessments. The data analysis of the science assessment data was performed using the same methods as the reading and math assessments. Table 4.24 displays the mean assessment score, number of students, and standard deviation for all students broken down by grade level and then by mother's educational attainment level. The data illustrates that all grades, kindergarten through fifth grade, had increasing mean science assessment scores as they progressed through the grades. The data also shows the average science assessment scores increasing as the level of mother's education level advanced. The data shows increasing mean scores at all levels, but does not show if there are any statistical significance to the differences in mean assessment scores in consecutive levels of mother's education attainment. More advanced statistical analysis were performed in order to determine if the data is statistically significant.

Table 4.24

Spring Science Assessment Data in Relation to Mother's Educational Level

Grade	Mother's Education Level	*M*	*N*	*SD*
K	Middle School Education	23.09	414	11.42
	Some High School	27.94	788	9.88
	HS Diploma	31.30	1346	8.40
	Vocational	33.03	326	8.52
	Associates Degree	34.73	647	7.21
	Bachelor's Degree	36.82	1403	7.74
	Master's Degree	38.20	660	6.69
	Doctorate/Professional Degree	38.31	143	7.19
	Total	33.05	5727	9.46
1st	Middle School Education	31.49	414	10.99
	Some High School	36.55	788	9.84
	HS Diploma	40.15	1346	9.86
	Vocational	42.16	326	9.54
	Associates Degree	44.10	647	9.42
	Bachelor's Degree	47.27	1403	9.89
	Master's Degree	49.56	660	9.17
	Doctorate/Professional Degree	50.97	143	10.32
	Total	42.69	5727	11.16
2nd	Middle School Education	41.65	414	11.03
	Some High School	45.50	788	11.16
	HS Diploma	49.49	1346	11.07
	Vocational	52.00	326	10.08
	Associates Degree	53.49	647	10.65
	Bachelor's Degree	57.58	1403	11.05
	Master's Degree	59.70	660	10.82
	Doctorate/Professional Degree	61.69	143	12.12
	Total	52.43	5727	12.34
3rd	Middle School Education	49.66	414	12.42
	Some High School	53.12	788	11.71
	HS Diploma	56.59	1346	12.00
	Vocational	58.07	326	10.21
	Associates Degree	60.72	647	11.42
	Bachelor's Degree	65.49	1403	10.74
	Master's Degree	67.53	660	9.90
	Doctorate/Professional Degree	69.69	143	10.71

	Total	59.93	5727	12.66
4th	Middle School Education	56.70	414	13.43
	Some High School	60.04	788	12.47
	HS Diploma	63.33	1346	12.49
	Vocational	65.60	326	10.93
	Associates Degree	68.08	647	11.16
	Bachelor's Degree	71.53	1403	10.79
	Master's Degree	73.99	660	8.76
	Doctorate/Professional Degree	75.87	143	9.69
	Total	66.61	5727	12.72
5th	Middle School Education	63.67	414	13.28
	Some High School	66.95	788	13.41
	HS Diploma	69.81	1346	14.16
	Vocational	72.20	326	12.29
	Associates Degree	74.83	647	12.08
	Bachelor's Degree	78.78	1403	10.79
	Master's Degree	80.67	660	9.56
	Doctorate/Professional Degree	81.44	143	9.76
	Total	73.41	5727	13.48

A visual representation of the Table 4.24 is illustrated as Figure 4.9. This figure shows the increasing, linear trend, among mother's educational level on all spring science assessments, differentiated among grade levels. This visual representation gives a better perspective on the starting, ending, and trajectory of the students in each grade, separated by the mother's educational level. Table 4.24 and Figure 4.9, indicate an increasing average science assessment score as the student progressed through grades, broken down by mother's educational levels.

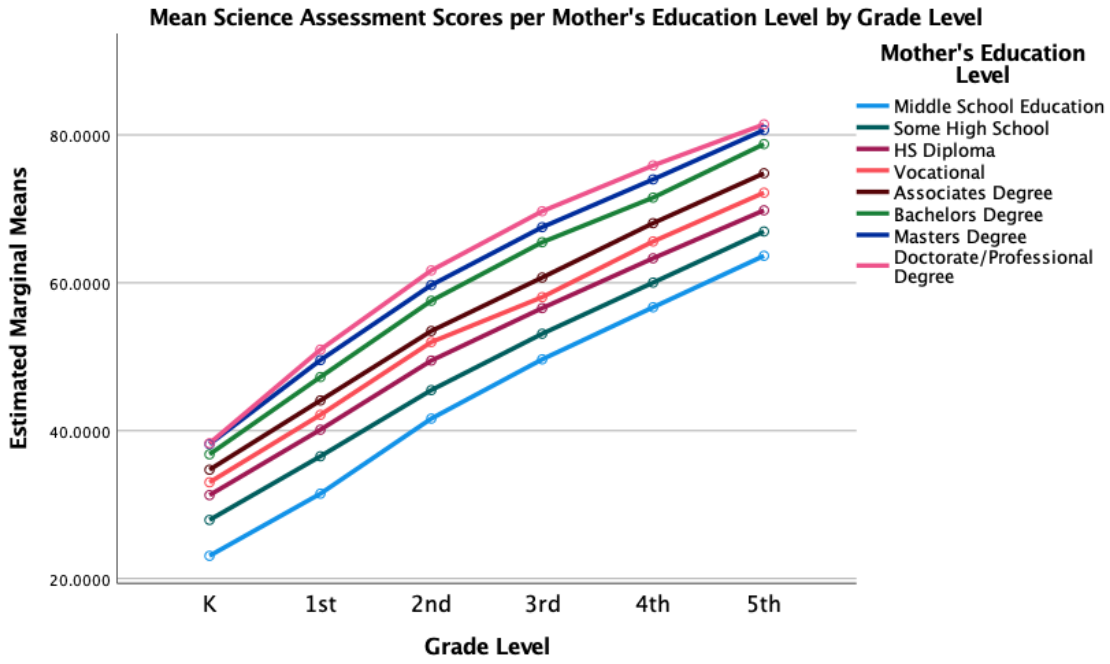


Figure 4.9. Mean science assessment scores per mother's education level by grade level.

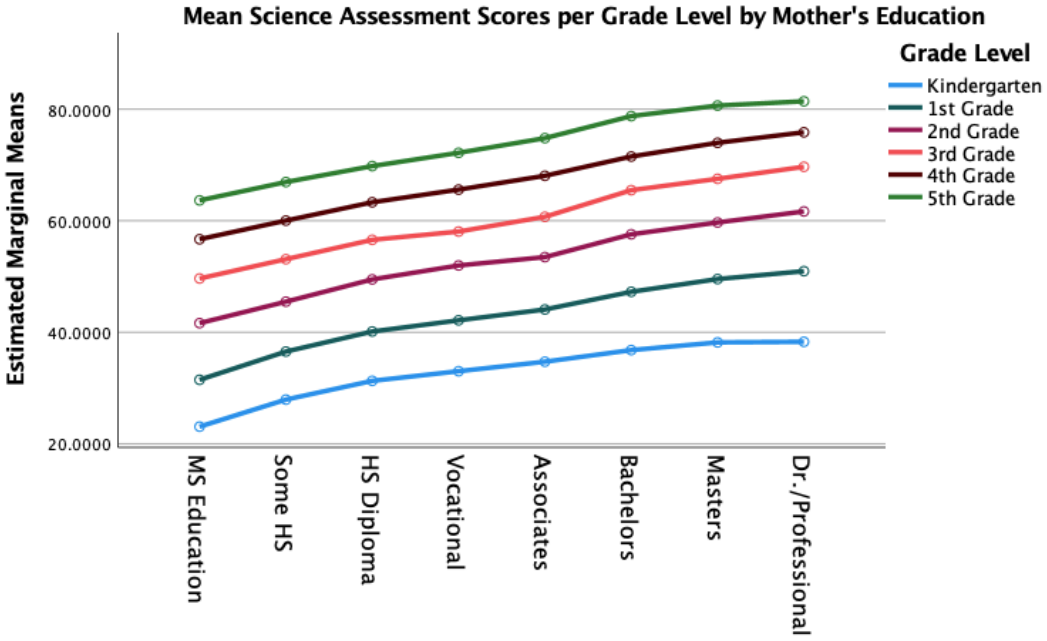


Figure 4.10. Mean science assessment scores per grade level by mother's education level.

Figure 4.10 is another visual representation of the data from Table 4.24. Figure 4.9 and Figure 4.10, both display the same data, but with the reversal of the x and y axis designation. The figure shows linear trends by grade level, in which the major data points are the averages at each level of the mother's educational level. The figure does show the spacing between each level of mother's educational attainment. Figure 4.10 shows a steady growth for each grade level as the levels of mother's education moved from one level to the next. The kindergarten linear regression does show a leveling out of mean assessment scores when comparing master's to doctorate/professional degrees.

Table 4.25

ECLS-K:2011 ANOVA Within-in Subject Affect Sizes for Science

Children Sorted by Mother's Education Level	Partial Eta-Squared
Middle School Education Group	.853
Some High School Group	.858
High School Diploma Group	.866
Vocational Group	.881
Associates Degree Group	.890
Bachelor's Degree Group	.901
Master's Degree Group	.906
Doctorate/Professional Group	.903
Average	.880

Note. Eta-Squared are estimated on the fixed model effect.

The effect sizes for the within-subjects ANOVA test are illustrated on Table 4.25. These partial eta-squared values represent the effect size, which corresponds to the relationship between time progressing from kindergarten through fifth grade and student performance when broken into mother's educational attainment grouping. The largest effect size of .940 is associated with the children whose mothers have a bachelor's degree and the smallest effect size is associated with children whose mothers have a middle school education. The average effect size for the science assessments from kindergarten

through fifth grade is .931, which indicated 93.1% of the science assessments results are attributed to the time progressing through the grades for *all* levels of educational attainment.

Table 4.26

One-Way ANOVA Science Effect Sizes for the Each Grade Level in Relation to Mother's Education Level

Grade Level	Point Estimate Effect Size	95% Confidence Interval	
		Lower	Upper
Kindergarten	.199	.184	.213
First Grade	.219	.203	.234
Second Grade	.213	.197	.229
Third Grade	.213	.195	.228
Fourth Grade	.198	.180	.214
Fifth Grade	.188	.170	.204
Average	.205		

Note. Eta-Squared are estimated on the fixed model effect.

Table 4.26 displays the effect sizes when using the level of mother's education as the primary factor broken down by grade level. The smallest effect size of .188 is found at the fifth grade level, meaning that 18.8% of the performance on the science assessment can be attributed to the mother's education level. A mother's educational level for the science assessments has the largest impact on performance at the first grade level with 21.9% of the overall resting results being explained by mother's education level.

Table 4.27 represents the grade level difference of means when comparing consecutive educational attainment levels. These *pairwise* comparisons, with the aid of the *p*-value, allows the data to be analyzed to determine if there is a statistical significance among consecutive educational attainment levels. At stated earlier, if the *p*-value is less than .05, there is a statistical significance involved in this data set. In analyzing Table 4.27, the data shows there is no statistical difference among the science

assessment mean differences for kindergarten, first grade, and second grade students for these consecutive educational levels: vocational vs. associates degree and master's vs. doctorate/professional degrees. At the third grade level, the two areas that have no statistical difference are the student's whose mothers have a high school diploma vs. vocational and also for master's degree vs. doctorate/professional degrees. Both the fourth grade and fifth grade levels show there is no statistical difference among student's whose mothers have a master's degree vs. doctorate/professional degree.

Table 4.27

Educational Levels Compared in Each Grade Level on the Science Assessment

Grade	Mother's Educational Level	Compared Educational Level	*M* Difference	*p*
K	Middle School Education	Some High School	-4.848*	<.001
	Some High School	HS Diploma	-3.359*	<.001
	HS Diploma	Vocational	-1.733*	0.024
	Vocational	Associates Degree	-1.703	0.08
	Associates Degree	Bachelor's Degree	-2.083*	<.001
	Bachelor's Degree	Master's Degree	-1.383*	0.014
	Master's Degree	Doctorate/Professional Degree	-0.105	1
1st	Middle School Education	Some High School	-5.059*	<.001
	Some High School	HS Diploma	-3.596*	<.001
	HS Diploma	Vocational	-2.010*	0.026
	Vocational	Associates Degree	-1.944	0.1
	Associates Degree	Bachelor's Degree	-3.165*	<.001
	Bachelor's Degree	Master's Degree	-2.289*	<.001
	Master's Degree	Doctorate/Professional Degree	-1.415	1
2nd	Middle School Education	Some High School	-3.849*	<.001
	Some High School	HS Diploma	-3.996*	<.001
	HS Diploma	Vocational	-2.502*	0.006
	Vocational	Associates Degree	-1.499	1
	Associates Degree	Bachelor's Degree	-4.087*	<.001
	Bachelor's Degree	Master's Degree	-2.124*	0.001
	Master's Degree	Doctorate/Professional Degree	-1.981	1
3rd	Middle School Education	Some High School	-3.460*	<.001

	Some High School	HS Diploma	-3.468*	<.001
	HS Diploma	Vocational	-1.485	0.919
	Vocational	Associates Degree	-2.649*	0.015
	Associates Degree	Bachelor's Degree	-4.771*	<.001
	Bachelor's Degree	Master's Degree	-2.039*	0.004
	Master's Degree	Doctorate/Professional Degree	-2.156	1
4th	Middle School Education	Some High School	-3.337*	<.001
	Some High School	HS Diploma	-3.288*	<.001
	HS Diploma	Vocational	-2.274*	0.037
	Vocational	Associates Degree	-2.476*	0.042
	Associates Degree	Bachelor's Degree	-3.454*	<.001
	Bachelor's Degree	Master's Degree	-2.465*	<.001
	Master's Degree	Doctorate/Professional Degree	-1.88	1
5th	Middle School Education	Some High School	-3.284*	<.001
	Some High School	HS Diploma	-2.864*	<.001
	HS Diploma	Vocational	-2.383*	0.047
	Vocational	Associates Degree	-2.628*	0.046
	Associates Degree	Bachelor's Degree	-3.950*	<.001
	Bachelor's Degree	Associates Degree	3.950*	<.001
	Master's Degree	Doctorate/Professional Degree	-0.769	1

Table 4.27 shows each grade level divided by the science assessment scores for each level of the mother's education attainment achieved. A more global view of just the mother's educational levels for *all* grade levels is displayed on Table 4.28. This table displays the average science assessment score across each level of mother's education attainment as well as the 95% confidence intervals. Just as the reading and math assessment results, the overall data shows the average student assessment scores for science increases as the levels of mother's progresses from middle school education to doctorate/professional degree.

Table 4.28

Mother's Educational Levels Mean Science Assessment Scores and Confidence Intervals

Mother's Educational Level	*M*	95% Confident Intervals	
		Lower	Upper
Middle School Education	44.38	43.48	45.27
Some High School	48.35	47.70	49.00
HS Diploma	51.78	51.28	52.27
Vocational	53.84	52.84	54.85
Associates Degree	55.99	55.28	56.71
Bachelor's Degree	59.58	59.09	60.06
Master's Degree	61.61	60.90	62.32
Doctorate/Professional Degree	62.99	61.48	64.51

Summary Results for Research Question Two

Research Question Two, *What effect does a mother's education have on her children's academic development from kindergarten through fifth grade*?, was answered by analyzing data from the ECLS-K:2011 study conducted by the U.S. Department of Education. Basic demographic information for the students and mothers were first organized in a manner best conducive for data analysis. The mother's educational attainment levels were narrowed down and only the spring assessments were used in the data analysis because the students took the science assessment every spring, with the fall assessment only given at the kindergarten, first, and second grade levels.

The overall data analysis for the reading, math, and science assessments determined that the average student score increased as the students moved to a higher grade level. The data reaffirmed that the higher the level of the mother's educational attainment, the higher the students scored on all three assessments. The ANOVA analysis depicted that time was a great factor in the average student growth scores, that is

the students increased on their assessment scores as they progressed through the grades according to the mother's educational grouping. The analysis also showed a statistical significance of the positive effect the mother's education level had on her child's assessment scores. The ANOVA test results illustrated that the level of mother's education can explain 15.1% to 21.9% of the student assessments results on the reading, math, and science spring assessments. In essence, students whose mothers had higher levels of education scored higher than students whose mothers had lower levels of educational attainment.

All three assessments were fitted to linear regression models, in which showed a linear trajectory of average scores as the students progress through the grades as well as showed increased scores as the levels of education increased. Pairwise comparisons determined statistical significance each level of education had on the average assessment scores. Each grade level showed to have several levels of education that were not statistically significant in showing *improvement* in the overall averages. Although there were several consecutive education categories with no statistical significance, the overall trend shows the performance of the students on all assessments does increase as the levels of mother's education progresses.

Research Question Three

The third research question was *How do background characteristics impact the children's academic development when in relation to the mother's education*? In order to answer this research question, background variables were first determined to allow for proper data analysis. Race and SES (socioeconomic) of the children were chosen as the background characteristics to data analyses because of their impact on student learning.

However, after running a series of advanced mathematical tests in SPSS, it was determined that the SES of the children would not be the most favorable background characteristic to analyze. According to the ECLS Codebook, SES was computed using household level data from the parent interviews that took place (Tourangeau et al., 2018). The SES variable was created with information relating to the mother's education, father's education, parental occupational prestige score, and overall household income. This SES variable did not just contain the overall income, but several other factors that created an SES score. SES was not used in the regression model because of potential multicollinearity resulting from the high correlation between SES and mother's education. Therefore, race and mother's education were used as predictors in the regression analyses.

In order to first perform the data analysis, the list of ethnicity/races referenced in the ECLS-K:2011 had to be inspected. Overall there were eight races separated in the original study, and they these were condensed to a total of seven races: White, Black/African American, Hispanic, Asian, Native Hawaiian, American Indian, and multiracial. The original classification contained both Hispanic "race included" and Hispanic "race not included", since these areas were determined with parental response or lack of parental responses to the specific race, it was decided to combine this to create one category for Hispanic.

Reading assessments. After determining that the ethnicity background characteristics utilized for data analysis, basic descriptive statics were calculated for each race at each grade level of spring assessment testing. Table 4.29 displays the number of students involved, mean assessment score, and standard deviation. The total number of student data analyzed ranged from 13,510 kindergarten students to 9,142 fifth grade

students. The overall highest mean score belongs to the Asian group followed by multiracial, and then the White group for all grades kindergarten through fifth. The overall lowest mean average on the spring reading assessment belongs to the American Indian group for kindergarten, Hispanic for first and second grade, and Black/African American for third, fourth, and fifth grades. The overall averages were very close to each other for Asian, White, and multiracial for the high end of averages and the American Indian, Hispanic, and Black/African American races were close in averages for the lower end of the mean scores.

Table 4.29

Descriptive Statistics for Each Grade Level by Race on the Reading Assessment

Race	Statistic	K	1st	2nd	3rd	4th	5th
White	Number	6262	5572	5160	4816	4501	4282
	Mean	70.56	97.41	114.82	123.62	131.81	139.12
	SD	14.11	17.28	16.39	14.97	13.76	14.13
Black/African American	Number	1827	1509	1315	1175	1057	912
	Mean	65.31	88.66	105.46	112.96	121.68	127.98
	SD	12.66	16.65	16.32	14.42	14.51	16.56
Hispanic	Number	3585	3276	3093	2940	2803	2709
	Mean	63.84	87.36	105.29	114.6	123.38	130.18
	SD	12.55	17.28	17.27	15.53	15.27	16.33
Asian	Number	1035	954	880	819	772	743
	Mean	74.71	99.98	116.46	124.47	133.93	141.11
	SD	18.27	16.97	15.03	14.1	13.42	13.47
Native Hawaiian	Number	74	62	51	46	43	41
	Mean	65.89	91.68	109.54	118.82	129.03	138.5
	SD	14.18	17.89	16.05	14.51	11.87	13.86
American Indian	Number	129	118	103	97	95	92
	Mean	63.17	88.42	105.82	117.14	125.4	132.44
	SD	12.18	18.15	17.74	15.65	16.37	17.53

Multiracial	Number	598	523	456	418	386	363
	Mean	70.93	97.66	115.27	124.3	131.89	139.45
	SD	15.82	18.22	17.23	15.34	14.83	15.44
Total/Avg.	Number	13510	12014	11058	10311	9657	9142
	Mean	68.3	93.67	111.09	119.85	128.35	135.47
	SD	14.4	17.93	17.25	15.75	15.03	15.85

Table 4.29 sets the stage with basic descriptive stats, but does not give information on the overall impact in relation to the mother's education level. In order to determine the strength of relationship between the race of a child, their mother's educational level, and the impact this has on the spring assessments, a regression analysis was calculated in order to find the statistical significance and the R^2 value. R^2, also referred to as the coefficient of determination, ranges from zero to one and is the statistical measure that determines the proportion of variance in the dependent variable that can be explained by the independent variable (Triola, 2008).

A regression analysis was performed on the data set to determine the impact race and then mother's education has on the spring assessment scores. The R^2 values for each grade level are listed on Table 4.30. These R^2 explain the overall impact each variable has on the spring reading assessment scores. For the kindergarten children, the analysis shows that 8.1% of the difference in reading assessment scores can be explained with this variable. More precisely, race accounts for 8.1% of the student performances on the reading assessment. Also the mother's education level accounts for 9% of the student performances on the spring reading assessment *beyond* what was account for by race. When these values are combined, race and mother's education level accounts for 17.1% of the student performance on these assessments. The largest impacted grade when using

race as a variable is at the fourth and fifth grade levels at 10.7%. The largest impact that mother's education has above and beyond the impact of race is at the second and third grade levels. When race and mother's education are combined, the largest impact occurs at the fourth grade level at 10.9.

Table 4.30

R^2 Value for the Regression Analysis of the Impact Race and Mother's Education have on the Spring Reading Assessment Scores

Grade Level and Variables	R^2
Kindergarten	
Race	.081*
Mother's Educational Level	.090*
Overall Impact	.171*
First Grade	
Race	.091*
Mother's Educational Level	.104*
Overall Impact	.195*
Second Grade	
Race	.093*
Mother's Educational Level	.109*
Overall Impact	.202*
Third Grade	
Race	.104*
Mother's Educational Level	.109*
Overall Impact	.213*
Fourth Grade	
Race	.107*
Mother's Educational Level	.108*
Overall Impact	.215*
Fifth Grade	
Race	.107*
Mother's Educational Level	.096*
Overall Impact	.203*

Note. *$p < .001$

Math assessments. A total of 13,472 students were included in the kindergarten spring math results, with the number of students decreasing to 9,140 students at the fifth

grade level. Table 4.31 outlines the basic descriptive statistics by race for all students that took the grade level tests. The table highlights the number of students that took each assessment, the overall mean of the assessment per grade level, and also the standard deviation of each assessment by grade level. The Asian students had the highest mean score on the spring math assessments at all grade levels, followed by White and then multiracial, respectively. The Black/African American groups mean on the spring math assessments were the lowest of the test races at all grade levels, followed by the Hispanic group of students.

Table 4.31

Descriptive Statistics for Each Grade Level by Race on the Math Assessment

Race	Statistic	K	1st	2nd	3rd	4th	5th
White	Number	6255	5567	5156	4815	4501	4281
	Mean	52.19	75.87	93.93	108.12	116.58	124.05
	SD	13.03	15.42	17.35	16.5	16.22	15.89
Black/African American	Number	1827	1507	1313	1173	1057	911
	Mean	43.83	64.13	78.38	91.04	99.37	106.82
	SD	11.71	12.91	15.84	17.13	18.28	18.79
Hispanic	Number	3578	3271	3092	2942	2806	2709
	Mean	44.5	65.84	82.61	96.84	105.71	112.57
	SD	12.04	13.94	16.66	17.52	17.56	17.78
Asian	Number	1014	954	880	819	773	743
	Mean	54.43	77.53	98.58	111.76	120.72	127.89
	SD	13.74	15.75	17.43	15.98	15.66	14.99
Native Hawaiian	Number	73	62	51	46	43	41
	Mean	46.23	67.36	86.37	101.08	110.98	120.28
	SD	11.8	12.73	16.11	16.04	15.66	13.75
American Indian	Number	129	118	103	97	95	92
	Mean	45.74	68.72	85.03	100.22	109.56	116.13
	SD	13.01	16.17	18.38	18.43	18.52	18.44

Multiracial	Number	596	523	456	418	386	363
	Mean	51.52	74.81	93.42	106.97	114.55	121.67
	SD	13.86	16.85	18.83	18.15	18.05	17.94
Total/Avg.	Number	13472	12002	11051	10310	9661	9140
	Mean	49.06	71.64	89.15	103.09	111.7	119.05
	SD	13.32	15.73	18.31	18.22	18.18	18.11

The basic descriptive statistics in Table 4.31 relays basic information on how each racial group performed on the math spring assessments at each grade level, but does not indicate the overall effect the race and mother's education variables have on the overall assessment results. A regression analysis was performed on the data to understand the actual impact each of these variables has on the assessment results (see Table 4.32). The R^2, coefficient of determination, was calculated in order to determine the percentage of the assessment score results are due to the race and mother's educational level variables. This percentage corresponds to the impact each variable has on the overall outcome of the assessments.

Table 4.32

R^2 Value for the Regression Analysis of the Impact Race and Mother's Education has on the Spring Math Assessment Scores.

Grade Level and Variables	R^2
Kindergarten	
Race	.103*
Mother's Educational Level	.096*
Overall Impact	.199*
First Grade	
Race	.125*
Mother's Educational Level	.091*
Overall Impact	.216*
Second Grade	
Race	.146*
Mother's Educational Level	.090*
Overall Impact	.236*
Third Grade	
Race	.151*
Mother's Educational Level	.085*
Overall Impact	.236*
Fourth Grade	
Race	.146*
Mother's Educational Level	.085*
Overall Impact	.231*
Fifth Grade	
Race	.150*
Mother's Educational Level	.093*
Overall Impact	.243*

Note. * p <.001

According to Table 4.32, race has an R^2 value of .103, thus meaning race can explain 10.3% of the results on the spring math assessments. When the mother's education is added, we find the R^2 value being .096, therefore 9.6% of the assessment results are due to the mother's educational level. Combining these values determines the overall impact the race and mother's educational level has on the spring kindergarten math assessment scores, which refers to 19.9% of the assessment results are explain by

these two variables together. The largest R^2 for race is found at the third grade level at .151, followed by the fifth grade at .150. The largest R^2 for mother's education is found at the kindergarten level at .096, followed by fifth grade at .093. The highest combined impact occurs at the fifth grade level, with 24.3% of the spring math assessment results can be explain by race and the mother's education level.

Science assessments. The basic descriptive statistics of number, mean, and standard deviation for the spring science assessments are displayed on Table 4.33. A total of 13,310 student assessment results were analyzed at the kindergarten level and this declined to 9,134 at the fifth grade level. The White racial group have the largest mean scores on the spring science assessments at the kindergarten, first, second, and fourth grade levels showed, with multiracial being the highest mean at the third grade level, and the Asian group having the highest average assessment score at the fifth grade level. The Hispanic groups showed the lowest mean average at the kindergarten level, with Black/African American group having the lowest mean score on the science assessments for the remaining grades of first through fifth grade.

Table 4.33

Descriptive Statistics for Each Grade Level by Race on the Science Assessment

Race	Statistic	K	1st	2nd	3rd	4th	5th
White	Number	6238	5563	5151	4811	4499	4280
	Mean	36.21	45.94	55.47	62.92	69.71	76.52
	SD	6.68	9.34	10.63	10.81	10.53	11.08
Black/African American	Number	1821	1507	1310	1172	1054	908
	Mean	30.02	37.07	45.49	52.1	58.49	64.05
	SD	6.29	8.55	10.16	11.21	12.09	14.03
Hispanic	Number	3452	3257	3092	2941	2804	2709
	Mean	29.28	37.08	46.62	54.23	61.18	68.12
	SD	6.56	9.69	11.47	11.96	12.21	13.53
Asian	Number	1006	952	879	819	772	742
	Mean	31.7	42.02	54.35	62.63	69.43	76.73
	SD	7.34	10.82	12.5	11.64	11.5	11.54
Native Hawaiian	Number	73	62	51	46	43	41
	Mean	29.73	37.15	47.09	54.91	63.81	71.23
	SD	7.06	9.32	11.89	11.62	11.03	11.3
American Indian	Number	126	118	103	97	95	91
	Mean	32.54	41.05	49.71	57.34	65.08	70.35
	SD	7.21	10.05	11.5	11.17	12.22	13.9
Multiracial	Number	594	521	456	416	386	363
	Mean	35.25	45.38	55.03	63.05	68.89	75.62
	SD	6.83	10.19	11.55	11.96	11.95	13.01
Total/Avg.	Number	13310	11980	11042	10302	9653	9134
	Mean	33.11	41.99	51.61	59.1	65.88	72.69
	SD	7.38	10.39	11.88	12.2	12.24	13.17

The basic descriptive statistics for the spring science assessments are illustrated on Table 4.33, but a more detailed data analysis was performed with the results being displayed on Table 4.34. A regression analysis yielded a R^2 value for each grade level in

relation to race and mother's educational level. This R^2 gives a percentage value for the impact each variable has on the overall spring testing results at each grade level. The largest R^2 of .194 is found at the kindergarten level for race, which corresponds to 19.4% of the spring science assessment results being explained because of race, followed by first grade at 17.5%. The lowest R^2 value for race is found at the fifth grade level at .141, which reflects 14.1% of the spring science assessments results can be explained because of the impact race has on the results. The largest mother's education R^2 is found at the third grade level at .105, which refers to 10.5% of the spring science results can be explained when the level of mother's education is included. The lowest R^2 value for the mother's educational level is found at the kindergarten level at .088, meaning that 8.8% of the assessment results can be explained by the level of mother's education level. When the race and mother's educational variable are combined, the highest combined R^2 correlates to the kindergarten level at .282, thus 28.2% of the overall spring assessment results are explained by the race and mother's education variables.

Table 4.34

R^2 Value for the Regression Analysis of the Impact Race and Mother's Education has on the Spring Science Assessment Scores.

Grade Level and Variables	R^2
Kindergarten	
Race	.194*
Mother's Educational Level	.088*
Overall Impact	.282*
First Grade	
Race	.175*
Mother's Educational Level	.103*
Overall Impact	.278*
Second Grade	
Race	.157*
Mother's Educational Level	.104*
Overall Impact	.261*
Third Grade	
Race	.155*
Mother's Educational Level	.105*
Overall Impact	.260*
Fourth Grade	
Race	.151*
Mother's Educational Level	.095*
Overall Impact	.246*
Fifth Grade	
Race	.141*
Mother's Educational Level	.093*
Overall Impact	.234*

Note. *$p < .001$

Summary Results for Research Question Three

The third research question, *How do background characteristics impact the children's academic development when in relation to the mother's education*?, was answered by performing a basic descriptive analysis of the ECLS-K:2011 data in relation to race as well as performing a regression analysis. The regression analysis of the data showed the impact of race and mother's educational level has on reading, math, and the

science spring assessments. Each assessment was separately investigated, but yielded similar results throughout.

Generally speaking, Asian, White, and multiracial groups scored the highest mean average on the three assessments, with Hispanic and Black/African American having the lowest average means. In order to take a deeper dive into the data, a regression analysis was performed on the data to determine what percentage of assessment results can be explained by race and mother's educational level. The regression analysis yielded a R^2 value, which refers to the percentage of the overall assessment scores that are determined by the individual race and mother's education variable.

The regression analysis for the three spring assessments of reading, math, and science, yielded a R^2 value that helps to explain the impact race and mother's educational level has on the assessment results. Generally speaking the race of the child can explain 8.1% to 10.7% of the assessment results for reading, 10.3% to 15% for math, and 14.1% to 19.4% for reading. When adding the level of the mother's education level, it was found that on the reading test that 9% to 10.9% of the assessment data can be explained *beyond* the impact race has on the assessment. The mother's education level can account for 8.5% to 9.3% beyond race on the math assessment, and 8.8% to 10.5% of the results on the science assessment can be explained beyond the impact of race. Overall, the largest combined impact that race and mother's education level has on the reading assessment occurred at the fourth grade with 21.5%. For the math assessment, race and mother's education can explain 24.3% of the overall assessment results at the fifth grade level. The largest combined R^2 value for the science assessment can be found the

kindergarten level, with 28.2% of the science assessment results can be explained by the race and mother's education variables.

Summary of Research Questions

This study's three research questions sought to determine the academic effect the mother's education attainment level has on her child as they enter and progress through grades kindergarten through fifth as well as inspecting what background variables have an effect on the child's academic performance. For each research question, data from spring math, reading, and science assessments were organized and then analyzed using the IBM SPSS software. Basic descriptive statistics were determined for each research question as well as a series of ANOVA tests, *t*-tests, and regression analysis were performed on the data in order to answer the research questions. The ANOVA and regression analysis gave the effect size, in which is a numerical value that gives the strength, or percent relationship, among a set of variables.

Research Question One sought to determine how kindergarten students performed on the fall and spring math and reading assessments in relation to the level of their mother's education level. The data showed that the lowest average student assessment scores belonged to the students whose mother's had the lowest level of education and then increased as the level of mother's education increased. Also found was the growth on the assessments from the beginning of the year to the end belonged to the education in the middle of the levels, this is because students with mothers of higher education levels already started with a higher average assessment score on the spring assessment. Overall, mother's education has a large impact on student performance on the assessments, with

reading being more impacted than mathematics by the level of the mother's education level.

Research Question Two looked to examine the impact the mother's education attainment level has on her child as they progressed from kindergarten through fifth grade. The spring reading, math, and science tests were examined with a series of ANOVA tests to determine the effect size, or impact the mother's education level has on the child's academic performance. Students whose mothers had higher levels of education scored higher than students whose mothers had lower levels of educational attainment. Overall, the ANOVA results found that 15.1% to 21.9% of the student assessments results on the reading, math, and science spring assessments can be explained by the mother's education level. All three assessments were fitted to regression models, in which showed a linear trajectory of assessment scores, with children having the highest levels of education, performing higher than other children whose mothers had lower levels of education attainment. The ANOVA results determined there is a statistical significance of mother's education in relation to the child's performance on the assessments. Each grade level did have several levels of education that were not statistically significant in showing *improvement* in the overall averages. Although there were several consecutive education categories with no statistical significance, but the overall trend shows the performance of the students on all assessments are higher for those who has mother's with higher levels of education.

Research Question Three looked to examine the effect other background characteristics have on the children's academic outcomes according to the mother's education level. Overall, students in the Asian, White, and multiracial categories had the

highest assessment average on all three assessment categories. Student belonging to the Hispanic and Black/African American groups had the lowest average assessment scores. Regression analysis showed that the race of the child can explain 8.1% to 10.7% of the assessment results for reading, 10.3% to 15% for math, and 14.1% to 19.4% for science. When adding the level of the mother's education level, the reading assessment results displayed that 9% to 10.9% of the assessment data can be explained *beyond* the impact race has on the assessment. The mother's education level can account for 8.5% to 9.3% beyond race on the math assessment and 8.8% to 10.5% of the results on the science assessment can be explained beyond the impact of race. Overall, the largest combined impact that race and mother's education level on the reading assessment occurred at the fourth grade with 21.5%, occurred at the fifth grade level with 24.3% for math, and occurred the kindergarten level with 28.2% for science.

Summary of Data Analysis

A large public longitudinal data set was utilized to answer this study's three research questions. ECLS-K:2011 data files and software were download from the U.S. Department of Education's National Center of Education Statistics in order to start the data analysis process. Specific data files were created and then imputed into SPSS in order to complete the data analysis. After the initial input, data had to be reorganized, with the levels of mother's education and race being condensed into more user-friendly groupings. In order to answer each research question, basic descriptive tests, ANOVA tests, *t*-tests, and regression analysis were performed. The overall results did show that all kindergarteners showed growth on all the math and reading assessments as they progressed through the grade.

When inspecting the impact the mother's education level has on the assessment scores, it was found that children with mothers at the low end of education, performed lower than those students whose mothers had more education. The same theme was found when inspecting the spring assessment scores on the math, reading, and science assessments. The higher level education of the mother, the better the students performed on all assessments. More precisely, 15.1% to 21.9% of the student assessments results on the reading, math, and science spring assessments can be explained by the mother's education level. When inspecting the impact of race and mother's education on the overall student assessment performance, it was found that race can explain 8.1% to 19.5% of the student performance, in which race has the largest impact on reading. Also, after isolating for race, the mother's education level could explain an *additional* 8.5% to 10.5% of the performance on the three spring assessments. Overall, race and mother's education can account for 21.5% of the student performance on the reading assessment, 24.3% on the math assessment, and 28.2% on the science assessment. Summarizing, there is a strong statistical significance of the effect the mother's education attainment level has on her child's assessment scores entering kindergarten, progressing through kindergarten, and progressing from kindergarten through fifth grade for all races in the analysis.

Looking Ahead to Chapter V

Chapter V will further review the study's three research questions and summarize the study's methodology. Results from the study will be analyzed with several conclusion being drawn from the results. Recommendations based on the conclusions of

the study will be made for educators and researchers, as well as contributions to the literature.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The effect parental education has on their child's academic success in schooling has been the focus of various studies, but gained momentum after a longitudinal study was conducted in New York in 1960 (Eron, Walder, & Lefkowitz, 1971). This study followed 856 third graders to determine their educational and occupational success when the students were 19, 20, and 48 years old. The results found there was a very strong indirect effect between the level of parental education and the child's educational and occupational success in life (Dubow, Boxer, & Huesmann, 2009). Sewell and Shah (1968) examined the effect the parents' educational level has on their high school senior when it related to their college aspirations and achievements. The study found that children of parents with higher levels of education had a more positive outlook on their college aspirations and overall achievement. Magnuson (2007) discovered there was a link to a mother's educational attainment and her child's overall outcomes when it comes to academic achievement. McLeod and Kaiser (2004) also used the mother's educational attainment in their research, instead of the father's, because they determined most childhood and adolescence outcomes correlated with the mother's level of education. Zhao and Yiyue (2018) studied the effects the mother's education level has on her college student's depression level, which found less depression in children whose mothers had higher levels of education. Lastly, studies by Chen and Li (2009), Thomas, Strauss, and Henriques (1991), Abuya and Ciera (2012), all used the mother's education level as a controlling variable in relation to the child's health, such as nutrition, height, and obesity.

These three studies all found a correlation between the mother's education and the child's health. Davis-Kean (2005) found that an increase in maternal education would have positive effects on supplemental income programs because of the implication of improving the lives of their children.

The previous ECLS studies have been used to investigate a variety of topics because of the breadth and diversity of data involved, longitudinal design, and the overall advanced design of the studies (West, 2017). Bassok, Latham, and Rorem (2016) analyzed both the ECLS-K:1999 and ECLS-K:2011 in order to conclude how vastly different kindergarten has become over the last two decades. Several studies (Fryer & Levitt, 2010; Ganley & Lubienski, 2016; Husain & Millimet, 2009; Penner & Paret, 2008; Robinson & Lubienski, 2011) inspected the academic achievement gap in reading and mathematics between the genders. The topic of summer learning gaps were also studied in order to determine what causes the summer learning gap for children in the ECLS-K:1999 studies (Downey, Von Hippel, & Broh, 2004). Most of the existing research reported findings about the general importance of the mother's educational attainment and her children's overall success, but very few studies have analyzed longitudinal data to determine the significance that the mother's educational level has on the child as they enter and progress through the elementary school grades.

The purpose of this quantitative study was to determine the effect the mother's educational attainment level has on her children's academic performance in kindergarten, performance and growth in kindergarten through fifth grade, and examining background characteristics that may affect student outcomes on math, reading, and science assessments. This study used publicly available data from the ECLS-K:2011 study,

which included over 18,000 student information sets, in order to answer the three research questions. Results of the reading, math, and science assessments were analyzed using the IBM SPSS software to answer the three research questions.

This chapter includes a summary of the methodology and data analysis for each of the three research questions. The researcher describes conclusions from this study and gives recommendations for educators and researchers. The chapter also provides an explanation of how this study contributes to the existing body of research involving the impact the mother's education has on children in schooling. Lastly, the researcher proposes ideas for future research, with concluding remarks to finish the chapter.

Research Questions

The ECLS-K:2011 data for this study was used to answer the following three research questions.

1. What effect does the mother's education have on educational performance in kindergarten?
2. What effect does a mother's education have on her children's academic development from kindergarten through fifth grade?
3. How do background characteristics impact the children's academic development when in relation to the mother's education?

Summary of Methodology

This quantitative study used a longitudinal secondary data set with a complex correlational design to examine the relationship the mother's education attainment level has on her children's academic progress and attainment in grades kindergarten through fifth grade as well as inspecting background characteristics that may impact children

academic performance. The ECLS-K:2011 longitudinal survey is a multistage, stratified, clustering design survey that followed over 18,000 students attending 1,036 public schools in various central and eastern states as students progressed from kindergarten through eighth grade. For the purpose of this study, only student data from kindergarten through the fifth grade were inspected because the data for the middle school grades have not been released at the time of the data analysis. The ECLS-K:2011 is a multi-source, multi-method survey that includes interviews with teachers, parents, and daycare workers, direct child assessments, indirect child assessments, and self-administered questionnaires for parents, children, teachers, and daycare workers. For the purpose of this study, only direct assessments were analyzed, specifically in the areas of reading, mathematics, and science.

Summary of Data Analysis

This study analyzed the effect the mother's educational attainment level has on her children's academic performance in kindergarten, performance and growth in grades kindergarten through fifth grade, and examined background characteristics that may affect student academics. More than 18,000 students in 1,036 public schools were analyzed in the ECLS-K:2011 survey conducted by the U.S. Department of Education. With the aid of SPSS software, hundreds of variables were organized to create the master data files used for the data analysis of the three research questions. To answer question one, the kindergarten student demographic data and performance data set for mathematics and reading assessments were analyzed using basic descriptive statistics as well as a series of ANOVA and *t*-tests. Research question two involved student assessment data in the areas of mathematics, reading, and science, which were analyzed using descriptive

statistics and a series of ANOVA tests. Question three inspected the variables of race and mother's education attainment level and compared these to student performance on the spring math, reading, and science assessments. Unlike the other two research questions, question three utilized a series of regression analysis to determine the R^2 values that were used to help explain the impact the background characteristics had on student academic performance.

Research Question One Summary

Research Question One examined the relationship between kindergarten performance on reading and mathematics assessments compared to that of their mother's education level. As expected, the mean assessment scores of the students grew throughout their kindergarten year on both math and reading, with reading showing the most growth. When the mother's education attainment level was added, it was found that students with mothers of higher educational attainment performed better than those children whose mothers had lower levels of education. The lowest overall growth belonged to the children whose mothers had a middle school level education for both the math and reading assessments. The largest overall growth throughout kindergarten on the math assessment belonged to the master's degree group and the largest growth on the reading assessment belonged to the doctorate/professional degree group. The one-way ANOVA test concluded that the mother's education level has the largest impact on the reading assessment scores. The paired *t*-test showed for each level of mother's education there was a very strong student growth on the spring assessments. To simplify, the mother's education level has a weak relationship to the growth but a very strong relationship to overall aptitude performance of their kindergarten child's math and

reading assessments, with reading being impacted more when referencing the mother's education level.

Research Question Two Summary

Research Question Two examined the relationship between student academic growth from kindergarten through fifth grade and their mother's education level. The findings in research question two mirrored the kindergarten results pertaining the overall growth of students and their mother's education level. In general, the overall student performance on the spring reading, math, and science assessments increased as the students progressed through the grades. The ANOVA analysis depicted that time was a major factor in the average student growth scores, that is the students increased on their assessment scores as they progressed through the grades. When the mother's education was included in this calculation, the ANOVA test results illustrated that the level of mother's education can explain 15.1% to 21.9% of the student assessments results on the reading, math, and science spring assessments. ANOVA anlyses determined there was an overall statistical significance to student academic performance on the three assessments in relation to their mother's education level. Although there were several levels of education that were not statistically significant in showing *improvement* in the overall averages, the overall trend shows the performance of the students on all assessments does increase as the levels of mother's education progresses.

Research Question Three Summary

Research Question Three examined the relationship between certain background characteristics and how these correlate to student academic performance on the spring reading, math, and science assessments. Generally speaking, Asian, White, and

multiracial groups scored the highest average on the three assessments, with Hispanic and Black/African Americans having the lowest average. Several regression analysis were performed in order to determine how much race and also the mother's education can explain the student assessment results. The race of the child can explain 8.1% to 10.7% of the assessment results for reading, 10.3% to 15% for math, and 14.1% to 19.4% for science. When the level of the mother's education level is included, it was determined that 8.5% to 10.9% of the assessment data can be explained *beyond* the impact race has on the assessment because of the mother's education attainment level. Overall, the largest combined impact that race and mother's education level has on the reading assessment occurred at the fourth grade with 21.5%, occurred at the fifth grade in math at 24.3%, and occurred at the kindergarten level with 28.2% of the science assessment results being explained by the race and mother's education.

Conclusions

This research looked at the relationship between the mother's education and her child's academic success in kindergarten, from kindergarten through fifth grade, and background characteristics that affect academic outcomes. Since there are a variety of factors that affect children's academic success, the mother's education level was chosen because most American mothers, instead of fathers, are actively engaged in their children's lives, especially in relation to academics (Jackson, Kiernan, & McLanahan, 2017; Kantomaa, Tammelin, Demakakos, Ebeling, & Taanila, 2010; McLoed & Keiser, 2004; OECD, 2001). The impact of the mother's education on her children's academic performance was analyzed in this study by analyzing a longitudinal study that tracked thousands of students as they entered and progressed through the elementary school ages.

Conclusion One: The mother's education has a significant relation to the academic outcomes of her children at the kindergarten level. This conclusion is supported primarily by the data analysis of Research Question One, with supporting data found in the results for Research Question Two. Children whose mothers have higher levels of education entered kindergarten at a higher academic level and had the overall highest average assessment score on the ECLS-K:2011 reading, math, and science assessments. These results were also verified with the analysis of Research Question Two when inspecting the end of the year kindergarten assessments results to the results of students entering first grade.

The results of Research Question One mirror the results from other various studies involving kindergarten success. Gregory and Rimm-Kaufman (2008) found that the mother's social and academic interaction with their children at the kindergarten level can predict academic and social outcomes when the children reach high school. Casey et al. (2016) also found that mothers in general have great influence on their child's math (even more than reading) academic success as they enter and progress through kindergarten, although the study did not separate into educational attainment categories of the mothers education, nonetheless, they reaffirmed mothers with positive educational experience regularly spent more time with their children.

Conclusion Two: The mother's education has a significant effect on her children's academic outcomes and the effect is sustained throughout the elementary grades. This conclusion is supported by the analysis of Research Questions One and Two, with the results of Research Question Two providing the most supportive data. The data analysis found that mothers with higher levels of education had children

who performed better on the academic assessments on reading, math, and science. The results of this data analysis depicted that children whose mothers are at the highest levels of education performed 38% higher on average on the math assessments when compared to the mothers with lower levels of education when starting kindergarten and a 29% difference when exiting kindergarten. There was a 29% difference among these children entering kindergarten on the reading assessments and a 23% difference among the children when exiting kindergarten. A statistical analysis found that the average score on the reading assessment for all kindergarten through fifth grade children whose mothers have the highest level of education was 18.5% higher than children whose mothers had the lowest level of education on the reading assessments, 22.5% difference on the math assessments, and 29.5% difference on the science assessments.

The findings were consistent with the general findings by Crosnoe, Johnston, and Cavanagh (2021). Their research involved tracking 35,400 children from several countries, including the United Stated, in which they came to the conclusion that women who attains more education tend to have children with more education opportunities, higher assessment scores, and the transmission of educational advantages that reach across generations. Similar studies found the mother's education has an intergenerational transmission that occurs through many channels, including the resources that educational attainment often brings to the child's development (Davis-Kean, 2005; Gennetian, Magnusonm, & Morris, 2008). Bleeker and Jacobs (2004) found similar results with their analyses of longitudinal relations between mother's perceptions of education, which is tailored by their own experiences. They determined that their children have better self-efficacy and attitudes about math and science as they progressed into the high school

ages. Although this study focused on early high school students, their overall findings are applicable.

Conclusion Three: Although race is a factor in the academic outcomes of children in elementary school, the mother's level of education explains a comparable amount of variation in academic performance. This conclusion is based on the results of Research Question Three. In this study, race and then the mother's education were analyzed to determine to what extent these variables can explain the variation in the children's academic scores on the reading, math, and science assessments. First, Asians, White, and multiracial students scored on average higher than Hispanic and Black/African American students on reading, math, and science in all grades from kindergarten through fifth grade. On average it was found that the three higher achieving racial groups scored 12.5% higher than the lower achieving groups on the reading assessments, 18.5% higher in mathematics, and 12.1% higher on the science assessments. When the level of the mother's education level was included in the statistical analysis, it was determined that 8.5% to 10.9% of the assessment data can be explained *beyond* the impact race has on the assessment because of the mother's education attainment level. Therefore, no matter the race, the mother's education can explain a comparable amount of variation on the academic assessments in reading, math, and science.

This research study's findings show that the mother's education level is important regardless of race, therefore reducing the racial achievement gap may be part of the efforts to maximize education for Hispanic and Black/African American families (Assari et al., 2021; Kuhfeld, Gershoff, & Paschall, 2018; Wu, 2022). Conwell and Doren (2021) assessed the racial reading differences of kindergarten children by analyzing the ECLS-

K:2011. In order to determine to what extent the variation in family patterns affect reading scores, the researchers isolated each racial group into similar levels of mother's education in order to make inferences about the results. They determined that Black and Hispanic mothers had significant different family formation patterns when compared to same-education White mothers. When controlling for family characteristics, this sometimes fully reverses significant Black-White achievement gaps in reading, and to a lesser extent, reverses the Hispanic-White gaps.

Contributions to Literature

This research contributed two major additions to the literature on how the mother's educational level influences the academic outcome of her children in elementary school. First, this study presents a complex statistical analysis of a national longitudinal dataset, ECLS-K:2011, which yielded results pertaining the actual child performance levels on reading, mathematic, and science assessments when broken down into mother's educational attainment levels. Very few research studies used a national data set to compare the mother's educational attainment (by grouping) to that of her child's longitudinal performance on assessments. The overall academic growth of the children progressing from kindergarten through fifth grade was statistically calculated to yield results that can be useful for other research studies.

The second major contribution to the literature centers around the impact race and mother's education have on her child's academic performance in elementary school. This research study used a series of ANOVA test and regression analysis to determine what percentage of the child's academic success on the reading, math, and science assessments can be explained by race as well as the mother's education. The analysis of

Research Question Three yielded that the race of a child can explain 8.1% to 10.7% of the assessment results for reading, 10.3% to 15% for math, and 14.1% to 19.4% for science. When the level of the mother's education level is included, 8.5% to 10.9% of the assessment data can be explained *beyond* the impact race has on the assessment because of the mother's education attainment level. Both race and mother's education affect the child's academic performance in kindergarten through fifth grade, with mother's education being a strong factor beyond the impact of race.

Recommendations

It is important for any research to include recommendations for practice and future research to educators and researchers. This allows others to utilize the findings of the research in order to enhance future research on the topic. This study makes three recommendations for educators as well as five recommendations for researchers.

Recommendations for Educators

Schools cannot change the demographics of their students, but they can be cognizant of data in relation that mother's education and race have on the child's academic outcomes. This study gives statistical data showing the correlation of these variables, which can allow educators to plan accordingly and perhaps find new ways for disadvantaged groups to gain the resources and supports needed.

Recommendation One: As children starting out in kindergarten already vary in achievements, perhaps the question is how to distribute educational resources equitably to support families who are in need. This research study showed statistically that children start kindergarten at different academic levels in relation to the mother's education and race. No matter the academic level of the mother's, students still improved

on the assessments each year, but many times these improvements are not to the level of other students that come from more advantaged family backgrounds. Schools must find ways to help mother's achieve higher levels of education, perhaps holding educational classes at school for mothers (and fathers) which can work towards earning further educational attainment.

Educators may want to also offer more education opportunities for all parents and guardians that would allow parents to give more aid to their children academically before kindergarten and as their children progress through the grades. Support groups could be created in order to share information about the successes and failures when it comes to helping their children prepare for schooling. This could include understanding how to help on homework, enjoying educational activities and field trips that would allow for the parents to understand the learning mindset and the research-based theories that would allow their children to gain any lost ground when comparing other children whose mothers have more education.

Recommendation Two: Greater learning gains are needed for students coming from disadvantaged backgrounds. This research study shed light on the disadvantages certain students have according to the level of their mother's education as well as their racial background. Regardless of mother's educational level, children have experienced significant learning gains from kindergarten through fifth grade but there is a performance difference between levels of mother's education. For children whose mothers have a lower level of education, they will need to experience higher learning gains to catch up with the performance level of children whose mothers have a higher level of education. This research has mentioned the various research studies and meta-

analyses that gave more insight on how impactful the mother's education is on her child's academic success (Augustine, 2017; Bassok, Latham, and Rorem, 2016; Godah et al., 2021; Kantomaa, Tammelin, Demakakos, Ebeling, & Taanila, 2010; McLeod and Kaiser, 2004; OECD, 2001). Educators can focus on how to minimize the achievement gap when starting school as well as the summer learning loss that students encounter during the period between the schooling years. Early childhood and summer school programs have been deemed successful in helping these disadvantaged students improve on their overall skills as well as the socio-emotional gains needed to handle the rigor of advancing through the grades (Bowers & Schwarz, 2018; Campbell, Sutter, & Lambie, 2019; Geltner, Law, Forehand, & Milles, 2011)

Recommendation Three: Mothers need to be taught practical ways to expand their roles in the schooling of their child(ren). There is a plethora of studies that allude to the fact children with families engaged in their education are more likely to earn higher grades and test scores, graduate from high school and attend post-secondary education, develop self-confidence and motivation in the classroom, and have better social skills and classroom behavior (American Psychological Association, 2014; Hill & Tyson, 2009; Sheldon & Jung, 2015). Children of engaged families are also less likely to suffer from low self-esteem, require redirection in class, and develop behavior issues in comparison to children from less engaged families in relation to education (Sheldon & Jung, 2015). Schools should find creative ways in order to teach families on how to expand their roles in educating their own children at home and being present in school activities.

The National Parent Teacher Organization (PTA) (2019) published a report that found there are several practical ways for parents to expand their role in schools. These include being present at school when possible, showing interest in kids' schoolwork, and keeping a positive attitude towards education. Various school districts have found success in enhancing family engagement of the district families with actions from the educators (DeSpain, Conderman, & Gerzel-Short, 2018). Schools should first connect with parents by building a positive relationship and communicating the school's vision. This allows for everyone to be in line with the district's philosophy on academic and socio-emotional success of the students. Schools should also engage parents by providing activities that involve the parents, increase communication with parents with social media, mailings, school meetings as well as virtual meetings, and encourage parents to be part of the decision-making that takes place at school and the community.

Recommendations for Future Research

The current study offers insight on the relationship between child academic outcomes in elementary school and their mother's educational attainment level. It is the researcher's hope that future researchers continue to research in order to find ways to determine avenues that would allow for all students to become more academically successful, no matter the race, as well as maximizing efforts to allow for increased maternal education.

Recommendation One: Future research is needed to look at the non-academic outcomes on the ECLS studies. The ECLS studies have a wealth of areas to research, one being the indirect assessments. These indirect assessments include information about children's social, emotional, and physical development as they

progressed from kindergarten through eighth grade. Researchers are able to use both qualitative and quantitative approaches with these indirect assessments because of the nature of the ECLS study. The gathered data was interpreted in a manner that allows data analysis because of the advanced instrumentation being used. An example of this can be found in the research by Lichtman-Sadot and Bell (2017). These researchers used the ECLS studies to determine the effectiveness of California Paid Family Leave Program on reducing children being overweight, diagnosed with ADHD, and hearing related programs. Their research verified the effectiveness of this new program in combating certain health deficiencies.

Recommendation Two: Future research is needed to examine how maternal education affects their children's academic outcomes in middle school and beyond. This research analyzed the academic outcomes of children from kindergarten through fifth grade, but the ECLS studies have information pertaining to children up through the eighth grade level. At the time of this research, the ECLS-K:2011 have only released data up through the fifth grade level. Another researcher could also analyze the sixth through eighth grade data to get a better understanding on how the mother's education affects her child's academic outcomes at the middle school level. Research by Lynch, An, and Mancendido (2021) is an example of this. These researchers performed a meta-analysis of 37 previous research studies to make conclusions about summer learning loss in mathematics for students kindergarten through 12th grade, which included previous ECLS studies. Kim and Quinn (2013) performed a meta-analysis of research on summer reading interventions conducted in the United States and Canada from 1998 to 2011, which found that there are potentially positive impact of classroom and home-based

summer reading interventions on the reading comprehension ability of low income children from kindergarten through eighth grade.

Recommendation Three: Future research is needed to inspect how the father's education affects his child's academic outcomes. This research chose to analyze the mother's education level because past research has determined that the mother has more effect on child academic performance when compared to the father's education (Kantomaa, Tammelin, Demakakos, Ebeling, & Taanila, 2010; McLeod & Kaiser, 2004; OECD, 2001)**.** The ECLS studies contain information about the father's education levels, thus the same data analysis could be performed to determine the effects the father's education has on their children. Perhaps the outcome of this research may shed light on how the academic level of the father's education affects his child's academic success. Jeynes (2015) performed a meta-analysis of 66 studies about how the father's education affects his children. The results showed that positive father interactions helped increase test scores in minority and nonminority students. Serafino and Tonkin (2014) also found that children are seven and a half times less likely to be successful at school academically if their father has low achievement scores, compared to three times less likely to that of the mother.

Recommendation Four: Future researchers may analyze more background variables that may impact student academic outcomes. This study began with the intention to investigate SES, race, and mother's education had on the child's academic outcomes in elementary school. Because the SES variable was actually a composite of several other factors, with one being the level of the mother's education, only race and mother's education were studied in relation to student academic outcomes. The ECLS

datasets have a variety of other background variables that could be analyzed including height, weight, socioemotional levels of the children, parental job categories, age, etc. Future researchers may use the wealth of background variables in the ECLS datasets to investigate the unique effects of these variables, in addition to the mother's education level, on student achievement.

Recommendation Five: Future researchers may use a qualitative analysis to further investigate this topic. This study was purposely correlational in nature with a quantitative approach. Although this study found actual statistical values that can be placed on child performance, the reason why children from more educated mothers performed better than the children from groups whose mother had less education was not inspected. Various other quantitative studies have addressed social interactions with mothers and fathers, involvement in child's academics, etc., but possibly not to the depth that a qualitative study may bring (Avnet, Makara, Larwin, & Erickson, 2019; Barger, Kim, Kuncel, & Pomerantz, 2019; Goshin, Dubrov, Kosaretsky, & Grigoryev, 2021; Lv, Yan, Lv, & Luo, 2019). A quantitative approach may yield results that would point toward the cause-effect mechanism taking place on why certain students perform better than others, but a further analysis with a qualitative study may explain the results that cannot be measured or counted. Pryde and Jahoda (2018) is an example of such qualitative study that focused on the mother's experiences supporting the sexual development of their sons with autism and intellectual disability. The study consisted of interviews with five mothers of sons, ranging from 16 to 24 years old, with autism and moderate to severe intellectual disability. The study yielded results concerning the mother's fears and apprehension of providing appropriate sex education that would not

lead to inappropriate sexual behavior. These mothers also requested support to improve their confidence in supporting their son, with their biggest fear being who would love their sons when they grow up. This qualitative study gave the reasoning behind their fears and dived deep into the thoughts and feeling of the mothers being studied.

Concluding Remarks

This quantitative research study allowed the researcher to analyze the effects the mother's education has on her children in kindergarten through fifth grade as well as determining the extent background characteristics affect the academic outcomes of her children. In addition, by analyzing the ECLS-K:2011 academic data, it was discovered that there is a large effect size when comparing the effect mother's education and race have on their children.

This study helped to provide statistical values associated with the impact mothers at certain education levels have on their children in kindergarten, progressing from kindergarten through fifth grade, and the impact race and the mother's education have on the children's academic outcomes in reading, math, and science. It is the hope of this researcher that this study provides essential data and clarity in relation to the mother's education level in her child's academic success in kindergarten through fifth grade. Because of the longitudinal design of the ECLS series of studies, the researcher felt this is the best data set to be used for this analysis to yield accurate results. An updated version of the ECLS study will start in 2024 which will examine more variables in order to give a complete picture of children's learning experiences. This new ECLS study would be another very useful data set for any researcher looking to gain more knowledge

about the effect a variety of factors have on a child's academic, social emotional, and overall development in kindergarten through eighth grade.

I believe this dissertation would not be complete without a message of hope for the future. There is hope that all students, no matter the race, income, or parental education, can have an opportunity to succeed just as their counterparts. Linda Cliatt-Wyman is a principal that has transformed three failing schools into success stories by utilizing basic leadership principles (Raz, 2007). She shared her May 2015 TED talk with the world entitled, "How to fix a broken school". She stated that a leader must lead fearlessly and "love hard" in order to create the high expectations for success. As principal, she led a high school in North Philadelphia to record breaking improvements on the math and literature state assessments. North Godwin Elementary School in Wyoming is also a high-poverty, low-performing school that increased their state reading and math scores by 30% by setting high expectations and using effective leadership techniques to motivate the staff and students to achieve at their highest potential (Bedi, 2017). North Godwin did not let the student's financial situation define their education, but rather motivate them to become the best. Both of these success stories reference that leadership is a strong indicator of a school's success or failure. Jacobson, Brooks, Giles, Johnson, and Ylimaki (2007) found several common themes among various schools that transformed their low-achieving high-poverty schools into high-achieving schools. They found that a school can turn around their low success by establishing a safe nurturing environment for children and adults, setting high expectations, and holding students, faculty, and parents accountable for meeting those expectations. Hope is not lost, we

have the tools, but need everyone to come together as a team to help turn around the underachieving schools in order to level the playing field for the generations to come.

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APPENDICIES

APPENDIX A: ECLS-K:2011 INSTRUMENTATION

Actual Instrumentation used for ECLS-K:2011(active links to instrumentation)

Kindergarten Year (2010-11)

- Fall Parent Interview (1.5 MB)
- Fall Teacher Questionnaire – Child Level (379 KB)
- Fall Teacher Questionnaire – Teacher Level (382 KB)
- Spring Parent Interview (1.4 MB)
- Spring Classroom Teacher Questionnaire – Child Level (693 KB)
- Spring Classroom Teacher Questionnaire – Teacher Level (398 KB)
- Spring Special Education Teacher Questionnaire – Child Level (273 KB)
- Spring Special Education Teacher Questionnaire – Teacher Level (219 KB)
- Spring New Teacher Supplement (241 KB)
- Spring School Administrator Questionnaire (376 KB)
- Spring Child Care Questionnaire – Child Level (231 KB)
- Spring Center Care Director Questionnaire (244 KB)
- Spring Center Care Questionnaire – Provider Level (221 KB)
- Spring Home Care Questionnaire – Provider Level (245 KB)

First-Grade Year (2011-12)

- Fall Parent Interview (349 KB)
- Fall Teacher Questionnaire – Child Level (269 KB)
- Spring Parent Interview (1.3 MB)
- Spring Classroom Teacher Questionnaire – Child Level for children in first grade (292 KB)
- Spring Classroom Teacher Questionnaire – Child Level for children in kindergarten (326 KB)
- Spring Classroom Teacher Questionnaire – Teacher Level for first-grade teachers (340 KB)
- Spring Classroom Teacher Questionnaire – Teacher Level for kindergarten teachers (425 KB)
- Spring Special Education Teacher Questionnaire – Child Level (225 KB)
- Spring Special Education Teacher Questionnaire – Teacher Level (205 KB)
- Spring School Administrator Questionnaire A for new schools (360 KB)
- Spring School Administrator Questionnaire B for continuing schools (338 KB)

Second-Grade Year (2012-13)

- Fall Parent Interview (377 KB)
- Fall Teacher Questionnaire – Child Level (219 KB)
- Spring Parent Interview (1.2 MB)
- Spring Classroom Teacher Questionnaire – Child Level (2.3 MB)
- Spring Classroom Teacher Questionnaire – Teacher Level (4.5 MB)

- Spring Special Education Teacher Questionnaire – Child Level (1.8 MB)
- Spring Special Education Teacher Questionnaire – Teacher Level (1.7 MB)
- Spring School Administrator Questionnaire A for new schools (3.3 MB)
- Spring School Administrator Questionnaire B for continuing schools (3.1 MB)

Third Grade (Spring 2014)

- Child Questionnaire (290 KB)
- Parent Interview (2 MB)
- Classroom Teacher Questionnaire – Child Level (2 MB)
- Classroom Teacher Questionnaire – Teacher Level (2.3 MB)
- Classroom Teacher Questionnaire – Subject Level (640 KB)
- Special Education Teacher Questionnaire – Child Level (1.9 MB)
- Special Education Teacher Questionnaire – Teacher Level (1.6 MB)
- School Administrator Questionnaire A for new schools (3.2 MB)
- School Administrator Questionnaire B for continuing schools (2.1 MB)

Fourth Grade (Spring 2015)

- Child Questionnaire (312 KB)
- Parent Interview (1.7 MB)
- Reading Teacher Questionnaire – Child Level (550 KB)
- Math Teacher Questionnaire – Child Level (377 KB)
- Science Teacher Questionnaire – Child Level (374 KB)
- Teacher Questionnaire – Teacher Level (239 KB)
- Special Education Teacher Questionnaire – Child Level (324 KB)
- Special Education Teacher Questionnaire – Teacher Level (288 KB)
- School Administrator Questionnaire A for new schools (408 KB)
- School Administrator Questionnaire B for continuing schools (393 KB)

Fifth Grade (Spring 2016)

- Child Questionnaire (438 KB)
- Parent Interview (2.7 MB)
- Reading Teacher Questionnaire – Child Level (557 KB)
- Math Teacher Questionnaire – Child Level (293 KB)
- Science Teacher Questionnaire – Child Level (283 KB)
- Teacher Questionnaire – Teacher Level (263 KB)
- Special Education Teacher Questionnaire – Child Level (265 KB)
- Special Education Teacher Questionnaire – Teacher Level (222 KB)
- School Administrator Questionnaire (361 KB)

APPENDIX B – IRB APPROVAL

Western Illinois University

April 18, 2022

Bridget Sheng
Educational Leadership

RE: *THE EFFECT A MOTHER'S EDUCATIONAL ATTAINMENT HAS ON THEIR CHILD'S ACADEMIC GROWTH AND ATTAINMENT IN PRIMARY SCHOOL*
IRB Proposal Number: 079-22

Dear Dr. Sheng:

Thank you for submitting your project entitled *THE EFFECT A MOTHER'S EDUCATIONAL ATTAINMENT HAS ON THEIR CHILD'S ACADEMIC GROWTH AND ATTAINMENT IN PRIMARY SCHOOL*. Your project was assigned Institutional Review Board (IRB) Protocol Number 079-22 and reviewed. Since you have indicated that all data is publicly available, you will not have to sign a data use agreement, and you will not be tracking students at the individual level, it has been determined that this project as described does not meet the definition of human subjects research as defined in 45CFR46(d)(f) or at 21CFR56.102(c)(e) and does not require IRB approval.

This determination only applies to the research study as submitted. Please note that modifications to your project need to be submitted to the IRB for review and status determination or approval before the modifications are initiated.

We appreciate your commitment to university polices and regulations regarding human research. If you have any questions about the IRB process, or if you need assistance at any time, please feel free to contact me or visit the Compliance website at http://www.wiu.edu/sponsored_projects/compliance/.

Sincerely,

Rebecca Van Tine

Rebecca Van Tine, M.S.
Institutional Review Board // Compliance Specialist

Office of Sponsored Projects
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EDUCATIONAL HISTORY

Western Illinois University, Macomb, Illinois, Doctorate of Educational Leadership, December 2022.

Northern Illinois University, DeKalb, Illinois, CSBO, May 2018.

Western Illinois University, Macomb, Illinois, Educational Specialist in Educational Leadership, December 2016.

Bradley University, Peoria, IL, M.A. in Educational Leadership, December 2013.

Illinois State University, Bloomington, IL, B.A. in Mathematics Ed., May 2002.

CERTIFICATIONS

Illinois Professional Educator License

- Specialist – Superintendent
- Specialist – CSBO (Chief School Business Official)
- General Administration w/ teacher and principal evaluator certification
- Teacher – Secondary Education – Mathematics
- Teacher – Middle School Education – Mathematics and Social Sciences

EMPLOYMENT HISTORY

2021 – Assistant Superintendent & CSBO, Canton CUSD #66, Canton, IL

2019 – 2021 High School & MS Principal, Stark County, Stark County, IL

2016 – 2019 High School Principal, West Carroll High School, Savanna, IL

2013 – 2016 High School Assistant Principal**,** Geneseo High School, Geneseo, IL

2002 – 2013 High School Mathematics Teacher

- Champaign Centennial High School, Champaign, IL
- Spoon River Valley High School, London Mills, IL
- Farmington High School, Farmington, IL
- Tremont High School, Tremont, IL