

ASSESSING KINDERGARTEN READINESS

**Assessing Kindergarten Readiness: Evaluating the Impact of Preschool Exposure on
School Age Student Achievement**

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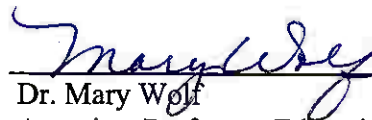
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Dedication

To my husband, Ben, whose unwavering support, patience, and encouragement made this professional goal possible. Throughout this journey, you created a home environment filled with stability and love, allowing me the space and support needed to pursue this achievement. You stepped into every role needed to help our family thrive, including becoming the true chef of our home, ensuring that even during the busiest moments, our family remained connected around the table. Most importantly, thank you for modeling positivity and for our boys. Through your actions, you have shown them the importance of supporting the people you love, embracing challenges, and finding joy in the everyday moments. This accomplishment reflects not only my commitment to professional growth but also the strength of the partnership we have built together.

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Abstract

Kindergarten readiness is a critical predictor of future academic success; however, students enter school with varied early learning experiences due to inconsistent access to preschool opportunities. Within a rural Pennsylvania school district experiencing a decline in available preschool programming, this study examines the relationship between preschool participation and kindergarten readiness to determine whether preschool exposure is associated with improved early academic achievement and to support district decision-making regarding the development of a district-operated preschool program. The study addresses three research questions focused on the relationship between preschool attendance and kindergarten performance, the impact of preschool participation on achievement over two years, and evidence supporting a potential preschool location. A quantitative research design was used to analyze de-identified district data, including preschool attendance records, Renaissance STAR Early Literacy assessment scores, enrollment data, facility information, and geographic indicators. Students were grouped using stratified sampling to compare preschool and non-preschool experiences across three elementary schools. Data analysis included independent sample t-tests, a two-way ANOVA, and a decision matrix to evaluate findings. Results demonstrated statistically significant achievement differences between students with preschool experience. Students who attended preschool entered kindergarten with stronger readiness skills and maintained academic advantages into first grade. Findings support the importance of early learning opportunities and provide evidence to guide district planning, resource allocation, and future preschool programming decisions.

CHAPTER I

Introduction

Kindergarten readiness has emerged as a critical focal point in predicting long-term academic success. Students enter school with markedly different early learning experiences that shape their developmental trajectories. In the absence of universal preschool access, school districts must serve children whose exposure to structured early childhood education varies widely, often resulting in observable disparities in literacy, numeracy, and foundational learning behaviors upon school age entry. This study examines the relationship between preschool experience and early academic outcomes within the district's primary schools. By analyzing kindergarten performance metrics and tracking student achievement in literacy and numeracy over a two-year period, this research seeks to determine the extent to which preschool participation contributes to sustained academic advantages. Additionally, the study aims to provide empirical evidence to guide district decision making regarding the most strategic and equitable placement of a future preschool program, ensuring that early learning investments are aligned with demonstrated student need and educational impact.

Background

In Pennsylvania, the absence of statewide regulations for preschool attendance results in kindergarten classrooms composed of students with widely varying early childhood educational experiences. A study by Johnson et al. (2023) found preschool attendance boosted children's academic outcomes in literacy, language, and math. Identifying trends in student achievement between kindergarten and first grade provides a roadmap for longitudinal planning focused primarily on student growth and development.

The district's Kindergarten Transition Liaison role serves and supports incoming students and families during a critical developmental transition period by strengthening the connection between early childhood experiences and formal schooling. This role provides a unique, systems level perspective on how variations in preschool access and experiences influence kindergarten readiness and early academic performance across the district's primary schools. Ongoing research surrounding kindergarten readiness is crucial for understanding how variations in early learning experiences affect student outcomes and for informing equitable decision-making regarding early childhood interventions.

Capstone Focus

This study will provide critical insight into the relationship between early childhood education participation and later school-age academic achievement. The targeted district for this research is facing a significant decline in available preschool programming for families within district boundaries, exacerbating educational inequities and limiting early childhood development opportunities. According to the Annie E. Casey Foundation (2023), data suggest that over half of preschool-aged children in the United States are not participating in preschool programs, with enrollment continuing to fall short of pre-pandemic figures. The district continues to lose preschool programming options for families within school boundaries. This research supports a deeper look into whether the loss of these critical early learning programs contributes to a persistent and widening gap in academic foundational skills among kindergarten and first-grade students.

One key priority challenge identified through the lengthy comprehensive planning process during the 2024-2025 school year was the wide gap in terms of foundational

skills, both social and academic, among students entering kindergarten every year.

Ideally, one of our district's visions includes the creation of an internal preschool program to increase preschool participation and to build partnerships with families within an earlier timeframe to support foundational development. Addressing this issue is crucial to achieving the district's goal of increasing preschool participation and establishing earlier partnerships with families to support long-term student success.

Research Questions

The following questions will examine preschool experience in relation to kindergarten readiness and the longevity of student growth and achievement:

1. How do Kindergarten performance metrics across our district primary schools correlate with the presence or absence of prior preschool experience among incoming students?
2. To what extent does preschool exposure/experience translate into student achievement advantages in literacy and numeracy skills over a two-year span?
3. What evidence supports the district in determining the most strategic location for a preschool program?

Expected Outcomes

This study supports the district and community in determining whether trends in student achievement support the development of longitudinal plans for student growth and achievement. The study is significant in relation to early childhood education participation, as the scope is intentionally limited to identifying and examining trends and outcomes associated with attendance in early childhood programs, along with the longevity of student achievement through comparative measures. This study does not

examine the quality or instructional characteristics of individual preschool programs or evaluate program-level implementation or fidelity.

Findings from this analysis will inform future district preschool program planning and contribute to a broader understanding of factors that support long-term student development. The results of this study will be shared with district administrators to help determine if student achievement trends support the need for a district-funded preschool program. Findings from the decision matrix will guide the selection of an initial program location within one of the three catchment areas.

Fiscal Implications

This research study holds significant value in relation to early childhood education participation, as it evaluates the return on investment in early childhood programs. Researching trends in student achievement supports longitudinal planning for student growth through the feasible creation of a district-run preschool program. The study's findings will support the district in determining the most strategic location for a preschool program. The study will evaluate the return on investment in early childhood programs through the analysis of early school-age achievement. Prioritizing resources according to the likelihood of success is essential for school districts with budgetary limitations. Based on cost comparisons across the western portion of Pennsylvania, programming costs range from \$150,000 to over one million dollars, depending on the size of the district and number of classrooms. Budgeting considerations include staffing, facilities and maintenance, meals, curriculum and academic supplies, technology needs, marketing, transportation, licensing fees, and professional development. Educational

triage takes center focus when researching whether recommendations for preschool programming are fiscally sound as part of the proposal.

Summary

Chapter I provides an overview of why studying the impact of preschool participation on kindergarten readiness and early elementary academic achievement within a Pennsylvania school district experiencing a decline in available preschool programming is necessary. Given the lack of statewide preschool attendance requirements, students enter kindergarten with varying levels of early learning experiences, contributing to gaps in foundational academic and social skills. This research will explore achievement trends from kindergarten through first grade to determine whether preschool exposure is associated with sustained academic advantages. The study also examines the role of coordinated transition supports, the need for equitable access to early learning, and the fiscal implications of establishing a district-run preschool program. Findings will inform district decision-making related to early childhood program development, strategic program placement, and long-term investment in student success. The following chapters will provide a review of the literature related to assessing kindergarten readiness, explain the methodology surrounding the quantitative study, and present a description of the results based on data analysis, along with conclusions detailing how the district will utilize the findings to inform future decision-making.

CHAPTER II

Literature Review

The transition into kindergarten marks a critical period in a child's educational trajectory, as early academic and social readiness can influence long-term achievement. Evaluating the role of preschool exposure in shaping student performance upon kindergarten entry and beyond paints a picture of how current structures impact student success. The literature surrounding early childhood education highlights both the short- and long-term benefits of structured preschool experiences, particularly in fostering foundational literacy and numeracy skills. However, the extent and longevity of these advantages are blurred by multiple factors presented in the studies. As districts continue to face disparities in equity and achievement, thoughtful decisions about preschool access, program placement, and transition supports remain essential for promoting strong starts in kindergarten and sustained success throughout a child's educational journey. A growing body of research demonstrates the powerful role preschool plays in preparing children for kindergarten. These findings align with theoretical frameworks from the late 1900s that underscore the lifelong learning and earning advantages linked to universal early childhood programming. Studies also address the relevance to kindergarten readiness with a particular focus on how preschool experiences correlate with student outcomes in early primary educational settings. This chapter synthesizes current evidence to inform both practice and policy considerations for early learning initiatives.

Preschool Theoretical Frameworks

The foundations of preschool practice are built on influential theories that explain how children think, grow, and connect with the world around them. Numerous theories approach preschool practices differently. Theories and frameworks such as those of Jean Piaget, Lev Vygotsky, Urie Bronfenbrenner, Dr. Maria Montessori and Guiseppina Pizzigoni provide valuable perspectives and emphasize the importance of creating early learning experiences that are both developmentally appropriate and genuinely engaging for young learners.

Cognitive development plays a key role in shaping a child. One early study surrounding Jean Piaget's framework focuses on the development of mental structures through the lens of cognitive functioning, with findings correlate to the successful sequence of stages (Swinson, 1965). Piaget's 1936 four stage model includes the sensorimotor stage from birth to two years old, the preoperational stage from two to seven years old, the concrete operational stage from seven to eleven years old, and the formal operational stage from twelve years and older. Sensory and motor development play a key role, as well as language development. Piaget's framework highlights the step-by-step progression of children's thinking and learning during the early years of development. The first stage, sensorimotor, focuses on infants understanding that objects still exist, even if they are out of sight. Preoperational, stage two, is when a child's language begins as well as pretend play. In stage three, the concrete operational stage, children think more logically and grasp conversation. During the formal operational stage, fourth in Piaget's framework, children can solve problem at a higher abstract

level. During the school age phase, increased concrete and logical thinking occurs. Keeping this progression of development in mind, hands on learning and discovery-based activities are key factors in preschool programs based on age-appropriate concepts.

Building on the importance of social interaction in early learning, Lev Vygotsky's work provides a key theoretical foundation for preschool education. Based on this concept, learning is a social process that creates a foundation for cognitive development (Vygotsky et al., 1978). His theory focuses on learning as a social endeavor, adults guiding children toward more advanced understanding, language as a key tool for learning, and culture as an influence for how and what children learn. Vygotsky focuses on how children learn through social interaction, including speaking with adults to support thinking and problem-solving. Vygotsky's concept, Zone of Proximal Development, focuses on what children can do on their own versus what they need help with. A study focusing on Vygotsky's Zone of Proximal Development using a scaffolded theory-based curriculum, Tools of the Mind, was conducted to review its effectiveness from a teacher's lens (Bodrova & Leong, 2007). The study concluded student academic achievement increased due to improvements in self-regulation, executive function, reading, and writing skills. Additionally, these concepts serve as mediators to help children build understanding and regulate their own thinking. Vygotsky's framework influences modern preschools by emphasizing the role of guided social interactions in fostering early learning.

Another theory surrounds Urie Bronfenbrenner's three stage evolution from ecological to bioecological frameworks (Rosa et al., 2013). During stage one, the

Ecological Systems Theory, also known as the Developmental Systems Theory, children develop in layers, having influences including family, school, friends, home values, and community involvement. The Developmental Systems Theory is also described as a constructive enterprise shaped by ongoing, reciprocal interactions between children's biology, their developing brains, and their physical and social contexts (Osher et al., 2018), supports the idea of resilience, learning, and well-being in the early stages. In stage two, the Bioecological Systems Theory, the evolution shifts to how a child's own traits shape their personality, abilities, and how they interact with others. Stage three, the Person, Process, Context, Time (PCCT) Model, focuses on what drives child development including daily interactions, traits, environment, and both short- and long-term change over time. Although the three versions vary, the cohesion of interactions discussed in each, related to students, families, home, and school provides context for the impact developed in the preschool years. Development happens through repeated, meaningful interactions between the child and the environment, over time. Together, these frameworks emphasize the interconnected factors that shape early childhood development.

During the twentieth century, Dr. Maria Montessori and Guisepina Pizzigoni introduced scientific pedagogical design structures into Italian school culture breaking down barriers in education (Chistolini, 2020). Montessori's theoretical framework encompasses a holistic approach to child development. Cognitive, social, emotional, and physical development are part of this progressive approach. Pizzigoni's extension focuses on nature and real-world problem solving through a creative lens. In 1907, she created the fundamental guidelines for "La Rinovatta," also known as *The Renewed*

School (Chistolini, 2020). Through this formulation of principles and concepts, along with the refinement of teaching methods (Chistolini, 2020), Montessori and Guiseppina contributed to the transformation of schools. Prior to this transformation, preschool classrooms centered on teacher-centered instruction, lectures, and rote-memorization techniques. Montessori and Pizzigoni's approaches laid a foundation for innovative, student-centered learning that reshaped early education. Preschool theoretical frameworks offer essential lenses for understanding how young children think, learn, and grow. As described through each structure, early learning experiences must be both developmentally appropriate and engaging for young students.

History of Kindergarten

The work of numerous educators and reformers helped to shape kindergarten over the centuries. A review of history outlines the significant focus and development of kindergarten programming, with key timelines shaping systems for academic support.

Studies by Eschner (2017), Shirakawa and Saracho (2021), Nishida (2022), Aksoy Kumru (2024), Sassower (1982), Barrientos (2024), support the progression starting as early as the 1800s during Friedrich Froebel's era. The starting point connects from Friedrich Froebel's philosophy on childhood and education emphasizing relationships, the value of childhood, creativity, play, and nature (Froebel Trust, 2022).

Kindergarten looks very different today compared to the 1800s, when the idea turned into reality. According to the Gale Group, Inc. (2008), the concept of kindergarten was created by a German reformer and educator, Friedrich Froebel, during the nineteenth century, who believed in the importance of stories, play, and children learning through circle activities as a collective group. Froebel opened the first kindergarten in the world

in 1837 in Blankenburg, Germany (Eschner, 2017). Due to German political revolutions of 1848, Froebel's concepts were deemed too modern and radical, viewing them as a threat to traditional social order, and banned. After his concept was banned in Germany in 1851, many of the teachers relocated to other countries, creating an outlet for expansion, including access to the United States (Shirakawa & Saracho, 2021). These educators, known as *Froebelians*, took Froebel's kindergarten principles, translated them into different languages, and adjusted them to fit the cultures where they attempted to start new kindergarten programs (Nishida, 2022). Froebelian approaches encompass early childhood practice based on Friedrich Froebel's philosophy on childhood and education emphasizing relationships, the value of childhood, creativity, play, and nature (Froebel Trust, 2022). One Froebelian, Annie L. Howe, created *Glory Kindergarten* in Japan, influenced by Froebel, where she integrated her Christian beliefs into her pedagogy and development of practice (Nishida, 2022). A study conducted by Aksoy Kumru (2024), explored the early years through children's participation through their Froebelian lenses in the Scottish context, highlighting the importance of these principles in Scottish educational policies. The study emphasized a growing practitioner movement embracing Froebelian values across Scotland focused on training opportunities promoting participatory approaches within early learning and childcare (Aksoy Kumru, 2024). Froebel laid the foundation for early childhood education by emphasizing the importance of meaningful learning. These developments contributed to the world-wide expansion of kindergarten.

In the United States, Margarethe Schurz founded the first private German-language kindergarten in Watertown, Wisconsin, in 1856. In 1860, Elizabeth Peabody

opened the first private English-speaking kindergarten program in the United States (Eschner, 2017), specifically in Boston, Massachusetts. Initially, most options included private entities, with no primary focus on academics. However, the Gale Group, Inc. (2008), states that the first American public school system to adopt kindergarten was established in St. Louis in 1873, under the leadership of Susan Blow. Over time, public school kindergarten programs outnumbered private ones, and by the 1900s, more than six percent of the kindergarten age population attended. Just as enrollment began to increase, families endured other struggles, creating a barrier for enrollment. Between 1930 and 1940 the Great Depression had a major negative impact on kindergarten programs in the United States. Due to economic hardship, enrollment decreased as families needed to keep children home, funding was reduced or eliminated, and government priorities shifted, along with age regulations focused on students turning five by November to attend. Over time, a heightened sense of academic pressure mounted in early education settings, with the educational expectations creating a sense of focus for the ongoing development of kindergarten programs. According to Sassower (1982) nearly thirty percent of kindergarten programming in the eighties, including both private and public, were full day programs. The Gale Group, Inc. (2008), states that during the 1980s, the focus shifted to academic preparation for first grade. Heightened requirements continue to take shape, and based on a more recent study, the Education Commission of the States' most comprehensive review from 2023 provides key takeaways based on the nature of essentials across the United States. As of 2024, seventeen states, along with the District of Columbia require children to attend kindergarten (Barrientos, 2024). Forty-four states plus the District of Columbia, require districts to offer at least half day

programs (Barrientos, 2024). Increasing academic pressure and formal requirements in the United States schools continue to shape the structure, balancing Froebel's emphasis on creativity and social development with the demands of standardized education.

The history of kindergarten reflects a dynamic evolution of early childhood education, from Froebel's vision of play-based, holistic learning, to the development of programs across the United States. Over time, kindergartens have existed in both private and public settings, each responding differently to societal expectations and resources. Understanding this history highlights how kindergarten has continually adapted to meet the needs of children and families, while maintaining its foundational role in early learning.

Importance of Kindergarten Transition

The transition to kindergarten represents a pivotal stage in early childhood education, creating a bridge between home, preschool environments, and formal grade level schooling. Adjusting to kindergarten can be both overwhelming and socially stressful for students and families. Rimm-Kaufman and Pianta (2000) in their study identify that 48% percent of children experience having trouble adjusting to school. This difficulty compels administrators and educators to create inviting opportunities for students and families to engage with the school system to respond to this difficulty with transition because academic success depends on a child's ability to fully engage in their kindergarten experience (Little et al., 2016).

Successful transition is crucial and numerous factors must be taken into consideration for a positive start to a child's educational experience. Factors must include understanding the relationships between a child and the school, peers, family and

neighborhoods (Rimm-Kaufman & Pianta, 2000). Early transitions, when focused on the right contexts, impact future academic and social outcomes (Rimm-Kaufman & Pianta, 2000). One supportive measure involves local preschools with strong relationships to the school district. Neighborhood programming fosters close contact and ongoing communication among programs. According to the Educational Research and Development Centers Program, both development and independence occur during this early age, typically between the ages of four and seven (Rimm-Kaufman & Pianta, 2000). Preschools can support recommendations for families to attend transition events, creating familiarity and independence with each visit leading up to the kindergarten year.

Preschool education plays a crucial role in providing children from diverse backgrounds with early learning experiences that foster their development. Strong preschool programs may be successful in reducing the achievement gap based on socio-economic conditions (Tucker-Drob, 2012). In one study, variations in achievement gaps between twins who attended preschool were examined during the transition phase to school with participant data drawn from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) twin sample (Snow et al., 2009). The study focused on twins born in the United States in 2001 with the sample consisting of 61% White; 16% African American; 16% Hispanic; 3% Asian; 1% Pacific Islander, American Indian, or Alaska Native; and 4% multiracial. Fifty-one percent of the twins were male, and 49% were female; 25% were at or below the poverty line at study entry. Three waves of data were included in the analysis including: age 2 years in 2003 and 2004, age 4 years (preschool age) in 2005 and 2006, and age 5 years (kindergarten age) in 2006. Results and preschool information are shared from 1,200 sets of twins within 600 families, with a focus on

whether they are identical or fraternal. (Snow et al. 2009). During the preschool phase, early math and reading skills were assessed. The results show that attendance in preschool may decrease achievement gaps caused by different family factors, even those not directly measured (Tucker-Drob, 2012). These results suggest that early educational experiences can have a lasting impact on academic equity, underscoring the importance of a smooth kindergarten transition.

A variety of transition practices exist to support children's adjustment to kindergarten. The Early Childhood Longitudinal Study–Kindergarten, (ECLS) examines the strategies schools use to make the transition to kindergarten easier for students (Little et al., 2016). Both low and high intensity practices are in place. Low intensity practices included sending home flyers to families about transition, while high intensity practices include preschool field trips to kindergarten classrooms. According to Schulting et al. (2005), the number of transition activities that a school employs is associated with higher student achievement scores at the end of kindergarten. The study was conducted using ECLS-K 1998–1999 data, focusing on student competence in reading, mathematics, and general knowledge categories. The findings connect directly to the impact on high-risk children and families, indicating transition practices boost academic success and encourage more parent participation in school activities in kindergarten (Schulting et al., 2005).

Focusing transition efforts on quality transition activities, including those that prioritize parent engagement over a volume of events for students, can create supportive measures for a successful kindergarten year. According to Cook and Coley (2017),

engagement in various practices is related to children's social and academic adjustment in kindergarten, as observed in a nationally representative sample. Providing time for students and families to enter the school, navigate surroundings, and spend time in the classroom can be impactful as part of the transition to kindergarten. Schulting et al. (2005) found during the third model of their study that parents and students who visit the kindergarten classroom before the school year starts is the only individual transition practice out of the seven tested to predict significantly heightened academic scores among children. The difference in single day events versus extended summer transition programming has been studied to compare parents' perceptions within the programming. "The Families First Program conducted in an urban study across thirteen sites, aimed to help students and their families build relationships, understand school routines, and learn what to expect in school" (Merideth et al., 2021, p. 1386). The program showed many benefits for both parents and children, including established positive school routines, reducing anxiety about school expectations, and improving academic skills in several areas (Merideth et al., 2021). Supporting families throughout the transition process, no matter the event offered, funding available, or the size of the district is an essential piece in the educational experience for all incoming kindergarten students and families.

Impact of Preschool on Kindergarten Outcomes

Preschool education plays a critical role in shaping children's early learning experiences, often serving as a foundational predictor of success in kindergarten and beyond. Multiple studies provide evidence backing this trend, showing gains in some form including Peisner-Feinberg et al. (2020), Duncan et al. (2007), Gormley et al. (2005), Magnuson et al. (2007), Ansari et al. (2020), and Johnson et al. (2023). The first

universal preschool program in the United States was established in 1997 (Bartik et al., 2012).

A Pennsylvania statewide evaluation focused on PreK Counts (PKC) programming found positive effects on language and math outcomes based on participation, including months of learning gains (Peisner-Feinberg et al., 2020). Kindergarten children who participated in Pennsylvania PKC demonstrated notably stronger language and math skills than those who did not attend (Peisner-Feinberg et al., 2020). The study highlights the importance of these findings, noting that language and math skills are key indicators of school readiness and strong predictors of future academic success (Peisner-Feinberg et al., 2020).

Patterns of school readiness have been studied in relation to predicting first grade outcomes. One Early Childhood Longitudinal Study- Kindergarten, ECLS-K, using national data from a student class from 1998-1999, found that school readiness is complex, requiring growth in both social and academic areas (Hair et al., 2006). According to Duncan et al. (2007), children's academic abilities when beginning kindergarten can forecast their future success in school. The study found that early math concepts, specifically knowledge of numbers, were the most powerful predictors of later learning (Duncan et al., 2007). The collective approach to encompassing school readiness supports preparation and success in formal schooling.

A study conducted by Gormley et al. (2005) found that Oklahoma's universal preschool program significantly improved school readiness for children in areas such as pre-reading, spelling, and math. The program helped children improve skills, with average gains of 52% in letter-word recognition, 27% in spelling, and 21% in applied

math compared to same-age peers who did not attend (Gormley et al., 2005). In a study conducted by Magnuson et al. (2007), academic outcomes for preschool attendees showed gains from the 50th percentile to the 57th percentile. Research consistently shows that children who attend preschool exhibit stronger academic outcomes, laying a lasting foundation for future learning success. Meta-analytic results from a study completed by Duncan et al. (2007) indicated early math concepts such as knowledge of numbers and ordinality, were the most powerful predictors of later learning. The study also found that math success correlates to later reading achievement because math encompasses both conceptual and procedural competencies (Duncan et al., 2007).

A 2020 study from Ansari et al. revealed that preschool graduates demonstrated greater academic and executive functioning abilities relative to peers who did not attend and confirmed the positive effects of preschool are sustained through the end of kindergarten. A study by Johnson et al. (2023) found preschool attendance boosted children's academic outcomes in literacy, language, and math. Although the study did not find specific gains in executive functioning, the advantages that preschool attendees had over non-attendees in kindergarten were consistently maintained through first grade (Johnson et al., 2023). The sustained benefits of preschool are based on a broad range of skills. Based on the evidence provided through these studies, there is a strong case for the positive impact of preschool on kindergarten outcomes.

Effects of Preschool Education and Policy Alignment

Examining the effects of preschool education through the lens of policy alignment provides critical insight into how systemic coherence can enhance student readiness and long-term achievement. Numerous studies are outlined in this section

including Pianta et al. (2009), Schulting et al. (2005), Liu (2021), and McCormick and Mattera (2022). “The field has become one of the most vibrant areas of scientific activity in terms of the connections among scientific advances and theory, program design, policy, and classroom practices” (Pianta et al., 2009, p. 49). A study conducted by Schulting et al. (2005) examined the impact of transition policies on parent-school involvement. The study examined whether a high level of parent-school involvement is associated with higher academic achievement. As hypothesized, parent-school involvement was a significant predictor. In 2008, Head Start, a federally funded public preschool program focused on supporting low-income families received between five and six billion dollars in state and federal funding combined (Pianta et al., 2009). According to Pianta et al. (2009), about 1.6 million four-year-olds attend private preschool programs compared to one million in public programs. In 2009, 450,000 four-year-olds were enrolled in Head Start in comparison to approximately 11,000 in PreK Counts. Aligning preschool programs with coherent policies, adequate funding, and active parent engagement is essential for maximizing school readiness and long-term academic achievement, highlighting the critical role of systematic support in early childhood education.

There are two primary reasons parents enroll their children in preschool programs. The first is to provide childcare to support parental employment, and the second is for developmental enhancement (Pianta et al., 2009). Regardless of reason for enrollment, preschool attendance can support development, even with inconsistent regulations. “The initial effect of preschool education is the equivalent of seven points on

an IQ test, or a move from the thirtieth to the fiftieth percentile for achievement test scores” (Pianta et al., 2009, p. 57).

Understanding the benefits of preschool and early learning highlights the importance of aligning educational policies, as these decisions directly shape the quality and accessibility of preschool and kindergarten experiences. The disconnect and inconsistencies in a system can have a negative impact on student readiness and long-term achievement. The United States policies are fragmented due to a lack of regulations, such as an inconsistent number of hours per program. Similar variations exist with some kindergarten programs offering half day sessions, while others provide full day sessions (Pianta et al., 2009). In other words, the disconnect in regulations impedes policy levers at the preschool stage, with a wide range of funding streams. Current public policies fall short of ensuring the majority of American children attend effective preschool programs (Pianta et al., 2009). Childcare centers, Head Start, and state preschools fall within this list. Conversely, the Chinese government has been implementing the policy of evaluating kindergartens for over thirty years, focusing on high quality systems (Liu, 2021).

Promoting access and stricter regulations, including the number of consistent school hours and length of the school day can support an increase in the number of children attending preschool. To gauge program effectiveness in fostering learning and development as investments in publicly funded preschool expand, policymakers and local leaders are turning increasingly to children’s skill assessments (McCormick & Mattera, 2022). The following section discusses how readiness assessments are leveraged, with the main objective of providing equitable access and opportunities to preschool programs.

Kindergarten Readiness Metrics

The concept of assessing students during the latter part of their preschool experience in preparation for kindergarten entry is a common practice. This data supports planning for the transition to kindergarten, as well as the identification of high need scenarios, equitable classroom makeup, and possible budgeting purposes. Metrics vary based on the district and preference for specific developmental or foundational data. Studies focused on accountability and measured outcomes include Snow and Van Hemel (2008), McBride et al. (2010), Macy et al. (2022), Conoley and Kramer (1989), Haught (2005), Cabell and Zucker (2024), and McCormick and Mattera (2022).

Snow and Van Hemel (2008) explain, publicly funded educational programs are now held more accountable by setting learning standards and monitoring student progress (Snow & Van Hemel, 2008). This underscores the importance of holding preschool programs accountable for measurable outcomes, ensuring children entering kindergarten have the foundational skills necessary for long-term academic success. “Attention was stimulated by the Reading First and Early Reading First components of the No Child Left Behind Act, (NCLB) and the legislative requirement that early reading programs must include assessments for screening, diagnosis, progress monitoring, and outcomes measurement” (McBride et al., 2010, p. 190). Subsequently, NCLB was replaced with the Every Student Succeeds Act (ESSA) in 2015 focused on accountability and improving student outcomes at the state and local levels.

Identifying metrics early can support ongoing data discussions, but only when efficient metrics are utilized. Snow and Van Hemel (2008) explain that purposefulness and systematic assessment is crucial, given the increasing frequency and range of

evaluations given to young students (Snow & Van Hemel, 2008). There are numerous assessments available to assess early literacy measures, with details provided in the following section.

A study conducted by McBride et al. (2010) with two hundred students from over seven states “examined four early reading measures: the Dynamic Indicators of Basic Early Literacy Skills (DIBELS), STAR Early Literacy (SEL), Group Reading Assessment and Diagnostic Evaluation (GRADE), and the Texas Primary Reading Inventory (TPRI)” (McBride et al., 2010, p. 189). All four assessments were administered to the same students in kindergarten through second grade over a five-week period, confirming the usefulness of adaptive tests such as STAR Early Literacy in efficiently and reliably assessing early reading skills. This study was of particular focus due to the current utilization of STAR Early Literacy as a diagnostic within many districts for kindergarten and first grade students. A cost analysis showed STAR Early Literacy is the most economical, with DIBELS costing three times more, and TPRI six to seven times more (McBride et al., 2010). The study also mentioned that teachers prefer STAR based on the data provided, as well as finding the reports more suitable for parent conferences. Efficiency and reliability are high priorities in kindergarten classrooms where teachers are constantly multitasking to support student learning at various levels.

Multiple other readiness assessment options have been reviewed in recent years. A study conducted by Macy et al. (2022), examined the AEPS-3 Ready Set, a newly developed kindergarten readiness assessment supporting readiness skills and learning goals. The use of this assessment yielded moderate positive outcomes as

indicated by teacher and parent ratings, with further research needed on the reliability of specific data sets (Macy et al., 2022). A study conducted by Haught (2005) utilized the Dial-R Test of Kindergarten Readiness. It is conducted through a rotation of centers, with metrics that compare percentile ranks. The DIAL-R measures motor, basic concepts, and language development of young children about to enter kindergarten (Conoley & Kramer, 1989). “The study concluded that children who attended preschool at least three times per week performed better on the DIAL-R Test of Kindergarten Readiness than children who did not attend” (Haught, 2005, p. 4). This screening tool has multiple versions, with the most recent being Dial 3.

Language skills are essential for students to understand conversations, books read aloud, and books they read themselves (Cabell & Zucker, 2024), and development must start early in life. The Reading Rope (Scarborough, 2001) is a graphic representation of the skills that underlie word recognition and language comprehension. The strands become increasingly integrated and coordinated as reading develops. Kindergarten readiness metrics increasingly highlight vocabulary development as a critical indicator of early academic preparedness. McCormick and Mattera (2022) completed a study focused on the initial impact of Head Start on vocabulary. The sustained scores through first grade suggest that Head Start offered long-term advantages (McCormick & Mattera, 2022). Vocabulary falls into an unconstrained category, which can create building blocks for continued vocabulary growth student’s lifetime (McCormick & Mattera, 2022). This reflects the central role of vocabulary development in shaping literacy skills and an overall learning path. Continued studies focus on whether gaining developmental skills before kindergarten predict success later in school, providing ongoing support in

favor of utilizing readiness metrics. By systematically measuring kindergarten readiness, schools can better identify developmental gaps and prepare for targeted interventions that support ongoing learning outcomes.

Critical Variations in the Effectiveness of Preschool

Numerous studies have focused on the effectiveness and benefits of preschool, as well as variations in programming. Curry and Thomas (1995), Puma et al. (2010), Duncan and Magnuson (2013), Yoshikawa et al. (2016), Schweinhart et al. (2005), Jiang et al. (2021), Datnow et al. (2023), Gormley et al. (2005), Bailey et al. (2017), Bassok et al. (2016), and Barnett (2011) all show variations within the range of preschool effectiveness. Some show a fade out effect, which can result in decreased gains as students transition to school age or into ongoing grade levels; however, most studies show positive results within the range of preschool effectiveness.

Head Start, which began in 1964, showed a 16-percentage point reduction in the probability of repeating a grade in a study by Currie and Thomas (1995). The per pupil cost in 1995 was \$3500, with over \$2.2 billion spent nationwide. Head Start, a federally funded program, focuses on supporting low-income families through preschool education and health services. According to Currie and Thomas (1995), both whites and African Americans showed substantial, meaningful gains in test scores in connection with Head Start services. A more recent impact study focused on 4,700 Head Start students following them through first grade (Puma et al., 2010). Puma et al. (2010) evaluated school readiness by administering standardized tests in language and literacy, pre-writing, and math at the end of each school year through the end of first grade. Based on the first follow up, the Puma et al. (2010) study found that children enrolled in Head Start at age

three had higher scores on four of eight measures of language and literacy, and one of two measures of math skills. Students who entered at age four saw fewer gains from entering kindergarten and through first grade (Puma et al, 2010). The difference in achievement levels based on enrollment age provides a significant point of reference for parents deciding at what age to enroll in a preschool program.

The research strongly suggests that early childhood education has the potential to shape the future of our nation. According to Duncan and Magnuson (2013), those who attend preschool show more than a full standard deviation of growth at the beginning of kindergarten with math and reading achievement gaps between children in the bottom and top income quintiles. The study explains that education programs boost cognitive ability and early school achievement in the short run.

Although research studies such as Duncan and Magnuson (2013) show positive results in relation to early childhood programs positively impacting learning, some studies indicate that these effects can diminish over time, with preschool benefits fading as children grow older. Fade out does not negate the value of early education, it identifies areas in need of further support to strengthen programs for lasting impact. Yoshikawa et al. (2016) found that over the course of elementary school years, children who attended preschool had test scores that align more closely with those of children who did not attend. With a specific focus on early childhood intervention, the impact can dissolve over time. In another example related to fade out, the Perry Preschool study found a significant decrease in IQ from a .75 standard deviation at age five to a .08 standard deviation by age 8 (Schweinhart et al., 2005). The latter result is based on multiple variations in preschool settings. This finding fits within the fade out concept, keeping

focus on areas in need of further support. For example, one targeted need centers on the fracture between how preschool programs are run, and the high academic expectations that arise when transitioning to kindergarten. According to Jiang et al. (2021), a reason for transition for frequent transition challenges is that children's prior experiences do not always match the structure and demands of kindergarten. Datnow et al. (2023) found that although early education can initially reduce achievement gaps, many disparities remain after first grade, and some children experience widening gaps as they progress through elementary school. This further clarifies the need to understand where the targeted disparities occur to support ongoing academic and foundational support. With respect to the variations in studies, achievement and growth, large or small, produce positive outcomes for students entering school age programs. Even if some effects fade, children who attend preschool often start ahead of their peers with advantages in key skills, social development, and school readiness.

Comparison of programming is a crucial part of studying the effective variations in preschool settings. A study conducted by Gormley et al. (2005) examined the diversity among programs such as Head Start, Perry Preschool, and the Abecedarian Project. "The percentage of students in intensive preschools scoring better than their average counterpart in comparison to other groups five years later on IQ and achievement tests represents an average long term IQ gain of approximately nine points" (p. 20). Essentially, intensive preschool support is a highly effective preventative measure. A focus on short term results correlates with a study reporting strong evidence that preschool attendance boosts language, literacy, and math skills (Yoshikawa et al., 2016).

Yoshikawa et al. (2016) also reported slight drops in grade retention, averaging six to eight percentage points.

A longitudinal data analysis conducted by Bailey et al. (2017) detecting impacts into adulthood has shown positive outcomes with less fadeout, creating skewed results as to how contradictory evidence in this area can be obtained from various environments. A study conducted by Bassok et al. (2016) shows that early childhood education influences later life outcomes and how classrooms are structured as well as what is taught can significantly shape children's learning. While the long-term effects may be smaller than the initial gains, they remain significant (Barnett, 2011). This reiterates the importance of early childhood programming that focuses on achievement, regardless of the gain. The wide range of outcomes across preschool programs shows that the effectiveness of preschool is not uniform. Multiple factors must be considered when focusing on children's early learning experiences and the impact those programs have on future education.

Academic Outcomes in Literacy and Numeracy

Participation in preschool and kindergarten programs has been widely examined for its influence on later academic outcomes, with particular focus on foundational gains in literacy and numeracy. Multiple studies, including those conducted by Barnett (2011), Bassok et al. (2016), Xiao (2025), Adornetti (2022), Kruk et al. (2013), Shvartsman and Shaul (2024), Ellison-Williamson (2019), and Gratz (2013) have investigated how these factors influence children's educational trajectories.

Traditionally, early childhood classrooms emphasized a mix of learning and developmental activities. Over time, there has been a noticeable shift. Preschool and

kindergarten classrooms are now more academically focused and less centered on play, exploration, and the arts. In the United States, “between thirty-five and forty-five percent of first-time kindergarteners are ill-prepared to succeed in school” (Barnett, 2011, p. 975). The heightened focus on academics has pulled play out of kindergarten classrooms. According to Bassok et al. (2016), practitioners, researchers, and media increasingly observe that over the past two decades, preschool and kindergarten classrooms have shifted toward academics and away from play, exploration, and social skills development. Bassok et al. (2016) also found a corresponding increase in literacy and math content instruction in kindergarten classrooms, with topics previously considered outside the scope of kindergarten.

As preschool programs place greater emphasis on literacy and mathematics instruction to bolster school readiness outcomes, the traditional role of play-based learning and social interactions has gradually diminished within early childhood classrooms. An early-stage concept to focus on literacy through language is to incorporate drawing into daily lessons. According to Xiao et al. (2025), a study conducted in a Chinese kindergarten focused on analyzing artwork in connection with language development and vocabulary through instructional scaffolding. The study revealed a significant correlation between oral language development and academic achievement (Xiao et al., 2025). Studies on children’s comprehension of both linguistic and visual narratives provide evidence that narrative coherence is closely tied to cognitive development and language processing (Adornetti et al., 2022). The results indicate that using visual and verbal cues encourages children to describe pictures in more detail, expanding their vocabulary and use of descriptive language including verbs, adjectives,

and metaphorical expressions, as well as enhanced vocabulary (Xiao et al., 2025). With a focus on reading achievement, a study conducted in Canada, found that lasting impacts are largely restricted to complex reading abilities that rely on language and world knowledge (Kruk et al., 2013). The study also found that students with significantly more time in preschool near the start of kindergarten had higher growth rates in decoding during their early years of elementary school.

Early childhood education plays a critical role in working memory. A study conducted by Shvartsman and Shaul (2024) examined 250 kindergarten profiles of working memory and academic achievement in early literacy and numeracy, as well as math and language skills. The study found, as they hypothesized, that those with higher working memory achieved higher performance compared to classmates while also finding simple working memory plays a key role in obtaining specific numerical skills (Shvartsman & Shaul, 2024). The purpose of a study in Tennessee was to determine if attending pre-school influenced students' literacy and math achievement. The study employed a two-way repeated ANOVA, with a sample size of seventy-six students, to demonstrate that academic achievement in preschool is a significant predictor of student gain in overall kindergarten experience (Ellison-Williamson, 2019). Collectively, findings across multiple studies demonstrate consistent and positive academic outcomes, reinforcing the lasting benefits of early educational experiences on children's school readiness and achievement. The Success by Six Program, a community-oriented children's initiative funded through United Way, is built to support families while preparing students for kindergarten. The common goal of Success by Six surrounds support for all children by the age of six to have the mental, physical, social, and

emotional foundation to grow into productive members of the community. According to a study completed by Gratz (2013), the Success by Six Program is considered successful in supporting children with limited readiness or social skills providing them with a stronger foundation (Gratz, 2013). The study utilized both control and treatment groups, and analysis of the pre and post test scores revealed a significant Success by Six gain. These gains can transfer to literacy and numeracy growth with a strong backbone in readiness skills. Evidence consistently indicates that preschool participation yields substantial benefits in both literacy and numeracy development, providing a critical foundation for future academic achievement.

Equity and Achievement Gaps

Examining issues of equity and achievement gaps within early childhood education, and the connection to kindergarten readiness reveals how access, quality, and systematic disparities continue to shape children's opportunities for academic success. Numerous studies including Heckman (2006), Nelson (2005), Schulting et al. (2005), Barnett (2011), Datnow et al. (2023), Melhuish (2011), Pesando et al. (2020), Gorey (2001), Bartik et al. (2012), and Iruka et al. (2025) are linked to how these factors play a key role in school readiness.

According to Heckman (2006), early family environments play a key role in shaping both cognitive and noncognitive abilities. Heckman's (2006) study found that skill gaps persist as early as ages four to six, particularly in environments that do not provide sufficient stimulation. Both home environment and preschool attendance have been researched to identify the level of influence on kindergarten achievement. Nelson (2005) studied the Early Childhood Longitudinal Study Kindergarten cohort database

to determine that both home environment and preschool attendance had a significant positive effect on approaches to learning, as well as children's reading and math achievement in kindergarten. The problem that Nelson (2005) identified is that students who come from "at-risk" homes scored lower than those who come from "risk free" homes, even if both groups attend preschool. Although achievement scores may be lower for those within "at risk" homes, Schulting et al. (2005) found the benefits of school transition support are greatest for low-income students, yet these children are the least likely receive support. This variation produces ongoing relevance to shape the importance of preschool attendance.

The Annie E. Casey Foundation (2023), provides preschool enrollment figures, last updated in October 2024. One concerning trend is that more than fifty percent of children across the country do not attend preschool, even after the pandemic. Between 2018 and 2022, over 4.3 million children did not participate in preschool, contributing to further academic disparities. The "pandemic erased a decade of progress in preschool enrollment in state-funded preschool programs, preschool special education, and Head Start." The limited access to state funded preschools creates a problematic situation for low-income families.

Providing early educational intervention has been proposed to help mitigate the impacts of poverty and inadequate learning environments on child development and school achievement (Barnett, 2011). Targeting highly effective programs is crucial, as positive outcomes on achievement tests were found through age twenty-seven. Ensuring equity in access to high quality preschool programs provides children with foundational experiences needed for future academic and social success. A study conducted by

Datnow et al. (2023) examined the efficacy of research practice partnerships within early education settings, focused on pedagogy and practice, supporting the need for equity in preschool practices. Limited access to quality early education poses a significant obstacle for socioeconomically and culturally diverse populations (Datnow et al., 2023).

Countries outside the United States are working through similar scenarios based on poorly regulated systems, lack of access to high quality programs, which creates inequitable options and fluctuating achievement results. Those with access to high quality preschools continue to make gains, while those who do not are outperformed. In England, a study conducted by Melhuish (2011) showed that by age eleven, children who attended high-quality preschools scored significantly higher on literacy and numeracy tests than those who did not. In sub-Saharan Africa, low-cost private schools are expanding and are perceived by parents to offer better quality (Pesando et al., 2020). Pesando et al. (2020) also studied the differences between children in public and private programs and found that children in private preschools outperformed peers in three of four domains. Many of these students fit into a higher readiness category, entering preschool based on a steady home life. This research across multiple countries highlights persistent inequities in access to high-quality preschool programs.

A study conducted by Gorey (2001), focused on a meta-analytic affirmation of the short-and long-term benefits of educational opportunity. The study used randomized experimental control groups and calculable sample sizes. Using a combination of thirty-five preschool experiments, three statistically significant findings were found. First, intelligence and academic achievement in preschool were statistically significant, positive, and large. Second, the cognitive effects of intense educational interventions

were significant even after five to ten years. Seven to eight of every ten preschool children did better than the average child in the control group. The third result found social and personal problems were substantially lower over a ten-to-twenty-five-year period for those who attended preschool (Gorey, 2001).

A study conducted by Bartik et al. (2012) focused on a universal preschool program in Tulsa, Oklahoma, in comparison to projected adult earnings. Recognizing the limitations of different job markets, the study used short term data. “For all children, irrespective of income, the earnings-related benefits alone of a high-quality preschool program outweigh the costs by three-to-one or four-to-one” (Bartik et al., 2012, p. 1156). Another study completed by Iruka et al. (2025) focused on the racial and ethnic differences among 192 students: 18.23% Black, 8.33% Latin speaking, 21.88% Latin Spanish speaking, and 51.56% White, examining the pattern between preschool and grade one achievement. The study found that achievement results connected to classroom quality were the only factor beyond the effect of a positive relationship with the teacher. Equitable access to high-quality preschool experiences, supported by positive family environments, is critical for high-risk students, leading to improved academic outcomes and long-term benefits such as increased adult earnings.

Geographic and Demographic Factors

Geographic and demographic factors play a critical role in shaping kindergarten readiness, influencing children’s access to early learning opportunities, quality preschool experiences, and the resources necessary to support foundational development. This section presents views from multiple studies including Magnuson et al. (2007), Yang (2024), Fuller et al. (2007), Cook and Coley (2017), Rimm-Kaufman and Pianta (2000),

Mollborn et al. (2018), Burchinal et al., (2010), Sabol and Pianta (2017), Keys et al. (2013), and Sheridan et al. (2019) showcasing a wide variation in the effects of where preschools are located and the feasibility of access in relation to kindergarten readiness.

Some studies provide strong evidence and correlations between geographic and demographic relationships. Based on an early childhood longitudinal study conducted by Magnuson et al. (2007), forty percent of public-school children attending preschool did so in the exact location as their kindergarten, with a sixty percent connection for economically disadvantaged students. Yang (2024) found that universal preschool programs funded by the state are generally free and available in public schools across various neighborhoods. This provides equitable access while also regulating the quality of programming. Accessibility is a key component for families, particularly in areas with a high percentage of walkers within a one-mile radius of schools and small towns. Every child deserves the opportunity to attend a quality preschool, regardless of where they live or their family's financial resources (Fuller et al., 2007). Families must feel connected to a school to support their child's transition in the most seamless way possible. According to Cook and Coley (2017), transition activities geared toward parents supports children's academic skills in kindergarten. Parents need to know how to help their child, and support from transition events can provide the necessary access to knowledge and activities. Geographic boundaries shape where children go to school and how they get there, affecting their friendships, parents' connections to the school and parents' involvement (Rimm-Kaufman & Pianta, 2000). However, the belief that a centrally regulated, large-scale institution can effectively meet the diverse needs of America's wide range of families is no longer sustainable (Fuller et al., 2007). Lack of sustainability

is a factor due to diverse family situations, differentiated needs of students, and rapid social changes effecting the planning and implementation of this model.

One study focused on residential mobility and whether shifts during early childhood impact academic performance. Mollborn et al. (2018) examined the consequences for social-emotional and cognitive kindergarten readiness, including the frequency and quality of moves. Mobility did not predict negative cognitive scores as reviewed in early reading and math scores, but only decreased behavior scores upon entering kindergarten (Mollborn et al., 2018). Moving is more common early in a child's life, and family disruptions have a more substantial impact on behavior than on cognitive functioning (Mollborn et al., 2018). The continuity in developmental support during this early stage of learning is an important focus. Data reflecting whether families have moved frequently is supportive during the transitional phase, as it helps build strong relationships and connections throughout the community and within the school system.

Determining how geographic and demographic factors directly influence the quality of preschool programming can have a significant impact on children's levels of preparedness for the academic and social demands of kindergarten. In a study focused on school readiness, children of economically disadvantaged backgrounds who participate in higher-quality early childhood education are associated with better school readiness results (Burchinal et al., 2010; Sabol & Pianta, 2017).

Two specific studies reported results indicating minimal impact on connection with school readiness and demographics including Keys et al. (2013) and Phillips et al. (2020). This relates back to barriers such as the need to adjust strategies to better support school readiness or reach diverse populations. The first study, conducted by Keys et al.

(2013), focused on the quality in preschool centers in relation to school readiness. Based on three demographic characteristics: ethnicity, gender, and socioeconomic status, the study found little effect on school readiness, with minimal effects on language and math outcomes (Keys et al., 2013). A second study conducted in North Carolina, focused on the quality of preschool education in programs rated three stars or higher. Phillips et al. (2020) found minimal attribution to neighborhood characteristics in relation to preschool programming quality ratings.

Certain studies have concentrated on rural versus urban settings focusing on parent engagement. Sheridan et al. (2019) conducted a comparison of family engagement in preschool transition in rural settings versus urban settings found urban settings learning environments to be more engaging than rural communities. Geographical factors influence involvement in communities with more difficult access to the school for events. Families need convenient access to schools to attend events and participate in transition activities that support student success.

Evidence-Based Approaches to Locating Preschool Programs

School choice creates more separation within preschool selection. The educational market in neighborhoods impacts preschool choice for families, and middle-class families spend a significant amount of time searching for the best program within their range. Families focus on finding and choosing programs based on their own preferences and how they perceive the risks associated with different locations (Bonal et al., 2024). A study completed in Barcelona, Spain showed “only 2.2% of students attend private preschools, while 53.8% are in compulsory programs, and 44% attend public programs”

(Bonal et al., 2024, p. 256). The desire to avoid socially disadvantaged schools leads families to focus their search on private schools nearby or those outside the area that offer higher social status (Bonal et al., 2024).

Recognizing that parents find it challenging to accurately assess preschool programs, a study by Bassok et al. (2018) focused on accountability systems, particularly for families in lower-income ranges who struggle to navigate quality options within the market. As of 2016, only 46% of children in the Cincinnati area attended preschool (Shields, 2016). Ohio has since worked to expand preschool access due to a lack of access in specific areas, as well as cost.

Rating systems are used to help families score programs to create a metric for quality control within the range of preschool options. The Quality Rating and Improvement System (QRIS) provides ratings for community, state, and regional programs based on quality. “Due to research showing quality early care and education produce favorable outcomes in young children, states have begun developing QRISs for their early care and education systems as a way to increase access to higher quality childcare” (Schmitt et al., 2023, p. 90).

Preschools rely on informational interventions to target parental guidance, which can drive program improvement and enhance learning outcomes. Informational interventions include supplemental items such as ways to practice skills at home, book recommendations, songs to support learning, and other example strategies to help families with transition within the home environment. Bassok (2018) studied a concept called Information Interventions and explained that providing information to families through multiple manners has been a key part of several federal efforts to

improve early childhood education. The more information families have access to, the more accurately they can shape decisions for preschool placement.

District Level Decision Making

Increasing preschool offerings in public schools can provide positive access to high-quality programs. Long term investment is a key driver in constructing preschools under the advisement of a school district. Datnow et al. (2023) explains that investing in early childhood education, (ECE), improves outcomes for children and families and yields greater economic returns than investments made at any other stage of schooling. This section also highlights studies by Bartiik (2014), Belfield et al. (2006), Melhuish, (2011), focused on earnings and employment in comparison to early learning opportunities.

Projections focused on adult earnings in correlation to preschool attendance is an area with positive findings. This topic is an essential focus as the goal of school districts is to prepare students for life and employment beyond graduation. “Early childhood education can increase a child’s future adult earnings by over twenty-five percent, and many programs have average future earnings effects of three percent or much greater” (Bartik, 2014, p. 9). Increased wages over the course of a lifetime can be impacted by whether a person attended preschool. As part of a cost-benefit analysis, the High/Scope Perry Preschool Program compared the impacts on education and earnings with those of a control group of forty-year-olds. This program focused on high quality, universal preschool in the state’s highest poverty districts. The Michigan-based analysis showed substantial positive impacts from participation in the half day program, specifically comparing the incomes of those who attended preschool with those who did not

participate. Beyond increases in wages, employment opportunities may also be positively affected. According to Belfield et al. (2006), preschool programs that build children's education and skills can improve their future economic well-being by increasing employment opportunities. Beyond the United States, European nations have also observed increased qualifications, employment, and earnings among individuals who attended preschool through age thirty-three (Melhuish, 2011).

Factoring in the age range to offer preschool programming is another avenue worth considering and reviewing at the district level. New Jersey's Abbot Preschool Program is a large-scale public program created to reform education in the state (Barnett & Jung, 2021). Students who attended preschool for two years had higher achievement and significantly lower retention rates through grade ten, while students with one year of preschool showed lower rates of achievement and a higher rate of retention (Barnett & Jung, 2021). These findings indicate that publicly funded programs can benefit school districts by reducing retention rates and increasing the likelihood of long-term earnings for students through the provision of preschool support.

Another concept districts can offer includes compensatory programming for those in need of additional support before kindergarten. Early Intervention services are available for those identified through eligible means, while programs such as Head Start and Pre-K Counts expanding further outside our district boundaries. This creates a deficit in districts, recognizing compensatory preschool programs can lead to long-term school success by strengthening cognitive skills that Intelligence Quotient (IQ) tests do not fully capture (Barnett, 1992). Our goal as educators is to provide as many opportunities as possible while preparing students for successful employment in their chosen career fields.

Providing a strong educational foundation lays the groundwork for future contributions to society, and the decisions made by school districts significantly impact early educational practices.

Summary

The substantial impact of preschool attendance on kindergarten readiness is supported by thousands of studies, with some including significant data to substantiate these claims. Numerous studies, including that of Schulting et al. (2005), indicate that school level transition practices are an important predictor of academic achievement at the end of kindergarten with individual achievement results showing as much as .051 standard deviations with each school level transition practice. Shaw (2022) investigated the correlations between early learning, student achievement, and later life success through a comparison of students who attended preschool versus those who did not. “The results of the study determined that preschool attendance at the age of four had a positive impact on a child's skills in kindergarten, specifically, thirty-one percent more growth in vocabulary scores, thirty-seven percent more growth in math scores, and an increase of almost twenty-three percentage points in print awareness (Hustedt, et al., 2007). Beyond the data points, theoretical frameworks introduced in the late 1900s, the ongoing development to support universal programming details positive effects for lifelong learning and earning. As equity and achievement continue to create disparities in outcomes, strategic considerations for preschool program placement and district-level decision making are crucial factors for ongoing planning and comprehensive support structures for success in kindergarten and beyond.

CHAPTER III

Methodology

A comprehensive literature review found a growing body of research demonstrating the powerful role preschool plays in preparing children for kindergarten. The impact of preschool exposure, shaping children's early learning experiences, often serves as a foundational predictor of success in kindergarten and school age student achievement. Within the Commonwealth of Pennsylvania, state-supported early childhood initiatives have been implemented to address disparities in school readiness and promote equitable access to high-quality preschool programming. A statewide evaluation of Pre-K Counts (PKC) examined outcomes for children who participated in the program prior to kindergarten entry and found statistically significant positive effects on language and mathematics achievement. Findings indicated that participating students demonstrated measurable learning gains, in some cases equating to several months of additional academic growth when compared to peers without preschool exposure (Peisner-Feinberg et al., 2020). These results reinforce the importance of structured early learning experiences in shaping developmental trajectories.

Kindergarten Readiness Outcomes

The study examines how early academic and social readiness beginning within preschool age children can influence long-term achievement. Evaluating the role of preschool exposure in shaping student performance upon kindergarten entry and beyond paints a picture of how current structures impact student success. Despite strong evidence supporting the benefits of preschool participation, gaps remain in understanding how early childhood experiences translate into sustained outcomes at the local district level,

particularly during the transition into kindergarten. This study seeks to address the gap by examining the relationship between preschool attendance and kindergarten readiness outcomes within a specific school district context.

Currently, no formal or standardized preschool education requirements exist in the United States. However, as of 2024, seventeen states, along with the District of Columbia require children to attend kindergarten (Barrientos, 2024). Forty-four states plus the District of Columbia, require districts to offer at least half day programs (Barrientos, 2024). Increasing academic pressure and formal requirements in the United States schools continue to shape the structure, balancing Froebel's emphasis on creativity and social development with the demands of standardized education. A 2020 study from Ansari et al. revealed that preschool graduates demonstrated greater academic and executive functioning abilities relative to peers who did not attend and confirmed the positive effects of preschool are sustained through the end of kindergarten.

By employing a quantitative methodological approach, this research aims to analyze existing data to determine whether preschool participation is associated with measurable differences in academic indicators at the school age level. The study examines the relationships between early childhood education experiences and subsequent student performance by analyzing both routinely collected district-wide data and archived data. Data collection and analysis address the following three research questions.

Research Questions:

1. How do Kindergarten performance metrics across our district primary schools correlate with the presence or absence of prior preschool experience among incoming students?
2. To what extent does preschool exposure/experience translate into student achievement advantages in literacy and numeracy skills over a two-year span?
3. What evidence supports the district in determining the most strategic location for a preschool program?

These research questions examine preschool experience in relation to kindergarten readiness and the longevity of student growth and achievement. The first research question will identify and track whether students who attend preschool show statistically significant differences in metrics related to early literacy and numeracy skill sets. Results from analysis of the second research question will be used to inform future district-level decision making to enhance understanding of the factors associated with sustained student development over time. Identifying whether students are making gains over a two-year period of grade level instruction will support targeted decisions in whether enhancing preschool opportunities within the district is a prudent investment and support. Results from the third research question will support data driven decisions in relation to increasing preschool offerings within district boundaries, in turn, increasing partnerships with families to support long-term student success. Determining a strategic location helps to prioritize resources, a crucial step within public education settings.

Setting and Participants

Located in a rural region of Western Pennsylvania, the school district examined in this study serves a population across several townships and boroughs. The district spans a wide geographic area relative to its student population of approximately 3400 students. The area reflects traditional rural and small-town industries, including manufacturing, agriculture, and service-based employment. A range of socioeconomic conditions among students and families result in a 42% economically disadvantaged data point. Special education rates are higher than the state average at approximately 19% across the district. The student population is predominantly White (88%), with smaller proportions of Black students (5.8%), Hispanic students (2.4%), and students identifying with two or more races (3.5%). Students attend neighborhood elementary schools before transitioning to a centralized secondary campus within the district's boundaries. These characteristics shape the educational environment, influencing access to early childhood programs and patterns of preschool participation. Understanding the rural context in which the district operates provides important background for interpreting the data and findings presented in this study, particularly as they relate to early learning opportunities and student readiness for kindergarten.

This research study focuses specifically on participants including kindergarten and first grade students within the district. Students are typically within the range of five years to seven years old. Current kindergarten enrollment for the 2025-2026 school year is approximately 240 students, while first grade enrollment includes approximately 250 students spanning across three primary centers. The district offers full day kindergarten

programming across all three sites with a total of twelve full time teachers in kindergarten and thirteen full time teachers in first grade.

No physical participant interactions are needed to complete the research, however a portion of the data collected is from assessments taken by students at the three primary school sites. Student data, compiled on an annual basis per district approved assessments, along with student data available through secondary analysis identifying those who attended preschool and those who did not through registration information is utilized for this study. There are no changes to environmental factors, or data sets outside regular operations within the district approved list of assessments. This data is part of archived district assessment records, and all data points are de-identified. Due to all data sources being part of normal district operations or publicly available records, and parents retain opt-out rights for assessments, individual consent forms are not required for this study. No personally identifiable information is utilized in the study or analysis as only the scaled scores are transferred to the data forms. The data sample within the study includes data points broken into two groups, fall and winter, including kindergarten and first grade results. Together, the characteristics of the district and the defined student participants, establish a clear context for this study. By examining kindergarten and first grade students within the district's rural educational framework, the research is positioned to explore patterns in early academic performance in relation to preschool participation.

Research Plan

The research plan for this action research study is grounded in a district-level concern regarding variations in kindergarten readiness among students entering the primary schools. Within the district, students arrive in kindergarten with differing early

childhood learning experiences, particularly related to preschool participation.

Understanding the correlation between students with preschool experience entering kindergarten and studying metrics across the district's primary schools strengthens the rationale for examining early childhood participation as a meaningful factor in kindergarten readiness. A deeper insight into how these early educational opportunities may influence readiness for kindergarten is an important consideration for district planning and resource allocation.

An expanding body of research highlights the significant impact of preschool experiences in supporting children's early academic development and school readiness. Examining the relationship between preschool participation and early academic performance within the district provides meaningful opportunity to better understand patterns present among students entering kindergarten. By analyzing district screening data and early achievement indicators, the study seeks to determine whether differences exist between students who attended preschool and those who did not. Identifying these patterns may provide insight into the role early childhood experiences play in shaping students' initial academic trajectories within the district's primary schools.

The theoretical foundation for this study is rooted in a sociocultural perspective on learning, primarily informed by the work of Lev Vygotsky. Vygotsky's theoretical framework emphasizes that learning is inherently social and that cognitive development occurs through interactions within meaningful social and cultural contexts. According to Vygotsky et al. (1978), learning experiences provided during early childhood serve as a critical foundation for later cognitive development. Preschool environments, which provide structured opportunities for guided interaction and scaffolded learning, align

closely with this theoretical perspective. This theoretical lens for understanding the role of preschool experiences in children's cognitive development also informs the work of other researchers whose studies build upon Vygotsky's framework.

Further research supports the importance of early childhood educational experiences. Studies consistently demonstrate that preschool participation contributes to improved early academic outcomes, particularly in literacy and mathematics. For example, research conducted by Gormley et al. (2005) found that students who participated in intensive preschool programs demonstrated long-term gains in cognitive development and achievement outcomes. Similarly, longitudinal research by Tucker-Drob (2012) suggests that preschool participation can help reduce achievement gaps associated with socioeconomic factors by providing early access to structured learning environments.

Additional studies highlight the predictive value of early academic skills developed prior to or during kindergarten entry. Research by Duncan et al. (2007) demonstrates that early proficiency in literacy and mathematics strongly predicts later academic success. Similarly, Johnson et al. (2023) found that preschool attendance contributed to sustained gains in literacy, language development, and mathematics through first grade. Vocabulary development has also emerged as a critical indicator of early school readiness. The designed study pulls data from scaled scores, which include vocabulary skills. Research conducted by McCormick and Mattera (2022) indicates that participation in early childhood programs such as Head Start supports long-term vocabulary development, with effects extending into the early elementary grades. Collectively, these findings establish a strong theoretical and empirical foundation

supporting the examination of preschool participation as a factor influencing early academic outcomes. The literature suggests that early childhood learning experiences may shape both immediate readiness for kindergarten and longer-term academic trajectories.

Guided by the foundations described above, the present study examines the relationship between preschool participation and early academic performance within the district's primary schools. Specifically, the investigation analyzes student performance data from the district administered STAR Early Literacy assessments collected during the kindergarten and first grade years. The study utilizes scaled score data drawn from district screening assessments administered during the fall and winter assessment windows. Student records are categorized into two groups, those who attended preschool versus those who did not attend, based on attendance information obtained through district registration records. By comparing these groups across multiple assessment periods, the study seeks to identify potential differences in early academic performance.

The investigation also incorporates longitudinal indicators to examine whether early academic patterns observed in kindergarten persist into first grade. Statistical analysis will be conducted to determine whether measurable differences exist between the two groups across literacy and numeracy related assessment measures. This approach allows the study to explore whether preschool participation is associated with differences in early academic development within the district's specific educational context.

The practical significance of this research lies in its potential to inform district-level decision making regarding early childhood education. If patterns emerge indicating that preschool participation is associated with differences in early academic performance,

the findings may provide valuable insight for district leaders when considering strategies to support kindergarten readiness. Results from the study will also help guide conversations about expanding access to early learning opportunities, strengthening partnerships with community preschool partners, and evaluate the potential development of district-supported preschool programming.

Beyond program planning, the research may also contribute to broader district efforts to strengthen family engagement during the early childhood years, a critical component of school readiness. Early connections between schools and families can support smoother transitions into kindergarten and foster long-term academic engagement (Rimm-Kaufman & Pianta, 2000). By examining patterns of preschool participation and early academic performance within the district, the study aims to provide actionable insights that can inform strategies for supporting students' early educational success and long-term achievement trajectories.

Research Methods and Data Collection

This study employs a quantitative research design utilizing existing district data collected through standard operational and assessment procedures. This action research project is approved by the Pennsylvania Western University Institution Review Board, effective September 23, 2025, and expires April 20, 2026 (Appendix A). All data sources are derived from routinely administered, board-approved processes and publicly available datasets. As such, the study relies exclusively on retrospective and secondary analysis, with no new data collection involving human subjects. Vernikoff and Reagan (2024), studied how quantitative research has historically shaped educational systems in ways that can perpetuate inequities, at times through explicitly biased assumptions, and at other

times through unintended methodological limitations. In this study, quantitative methods are essential not only for their capacity to generate measurable, generalizable evidence, but also to critically examine how data collection, variable selection, statistical modeling, and interpretation may highlight inequities within early education. By intentionally designing quantitative approaches that focus on equity, the study seeks to mitigate the historical limitations of traditional education research and produce findings that more accurately and responsibly inform practice and decision making. Meta-analytic results from a study completed by Duncan et al. (2007) indicated early math concepts such as knowledge of numbers and ordinality, were the most powerful predictors of later learning. This statistical technique supports the overall significance and magnitude quantitative results have on findings within a study.

The primary data sources include student registration records, district diagnostic assessment data, and publicly available demographic and geographic information. As part of normal district procedures, all parents and guardians' complete registration documentation for incoming kindergarten students. Beginning with the 2023-2024 registration cycle, the district initiated systematic tracking of preschool attendance. For this study, two consecutive years of preschool attendance data, 2023-2024 and 2024-2025 are available.

Diagnostic achievement data are drawn from the district's annual assessment protocol, which includes the Renaissance STAR Early Literacy assessment. Access to scaled scores available through Renaissance STAR Early Literacy assessment are part of our yearly assessment protocol approved by our school board. Parents and guardians have the right to opt-out of these digital computer-adaptive assessments at any time. This

computer-adaptive diagnostic assessment is administered districtwide beginning in kindergarten and first grade, with students initially completing the Early Literacy assessment and subsequently transitioning to the STAR Reading and STAR Math assessments as they progress through later grade levels. Scaled score data from the early fall kindergarten administration and the winter administration will be used, with first-grade data included to extend the analysis beyond a single academic year.

Additional contextual data necessary to address preschool access and availability include publicly released information from the Pennsylvania Future Ready Index, district boundary maps, building capacity information, and enrollment data published by the Pennsylvania Department of Education. These data sources provide information related to socioeconomic indicators, school catchment areas, facility capacity, and enrollment trends.

All student-level data used in this study are de-identified prior to analysis. Reports containing personally identifiable information are not retained. Only scaled scores and categorical variables are extracted and transferred to a password-protected Excel file for analysis. Each student record is assigned a numerical identifier for research purposes. No student names or identifying characteristics are visible or used in reporting. Stratified sampling is utilized as the process includes a random sampling technique to gain sample groups. This type of sampling supports a proportional representation. The process begins with the whole population, the creating of stratum one and stratum two, including those who attended preschool versus those who did not attend preschool. Random selection from each stratum occurs to form a sample. No active study participants are utilized within the study, no names are transferred to any data sheets, and all spreadsheets are

password protected through Microsoft Excel, creating a minimal level of confidentiality risk associated with personally identifiable information (PII).

The first research question addresses how Kindergarten performance metrics across our district primary schools correlate with the presence or absence of prior preschool experience among incoming students. To address research question one, registration data identifying preschool attendance versus non-attendance are analyzed across a two-year period. These data are accessed through existing district records and represent secondary analysis within an established dataset. A sample of twenty students per primary school is selected, sixty with preschool and sixty without preschool, totaling one-hundred twenty data points. Although all data points collected for this specific analysis stage have a kindergarten specific focus, this data includes both current kindergarten and first-grade students, combining two years of data points with equal representation of preschool and non-preschool attendees. This data collection took place in October of 2025. School-level Early Literacy diagnostic reports generated through Renaissance STAR are used to examine aggregate performance trends. No student-level identifiers are required for this portion of the study. A two-way Analysis of Variance, (ANOVA) is employed to compare school-level outcomes across two independent variables, preschool attendance status, preschool versus no preschool, and primary school building. The dependent variable is the aggregated school-level Early Literacy performance indicator. A total of one hundred twenty data points are connected to the ANOVA, twenty from each school within the two categories preschool and no preschool. Data are categorized and organized in Microsoft Excel, utilizing the Data Analysis

ToolPak for two-factor ANOVA with replication, as appropriate between January and February of 2026.

The second research question focuses on the extent in which preschool exposure and experience translate into student achievement advantages in literacy and numeracy skills over a two-year span. Research question two prioritizes whether statistically significant differences in early literacy achievement exist between students who attended preschool and those who did not. The data collection instrument for this analysis is the Renaissance STAR Early Literacy scaled score. This assessment was given as a baseline in late September 2025 and a mid-year December 2025 timeline. Using existing kindergarten screening reports and registration data, which falls under secondary analysis and retrospective analysis, students are categorized by preschool attendance status. Data is compiled using random sampling, specifically stratified sampling, from two distinct groups, those with preschool experience and those without. This type of sampling will support a proportional representation beginning with the whole population, shifting to stratum 1 and stratum 2 (preschool vs. no preschool experience), and then randomized selection from each stratus to form a sample. Data will be de-identified throughout this process.

Utilizing a stratified sampling technique, an initial one hundred and twenty data points move through the randomized selection process with a target of sixty samples selected for the two grade levels over two diagnostic windows. Each primary school is proportionately represented within the data sets, including both kindergarten and first-grade students, with equal representation of preschool and non-preschool attendees. This approach allows for an equitable comparison between the two populations while

maintaining the integrity of the findings. This step was completed between January 28 and February 10, 2026. Fall and winter diagnostic scores are analyzed to assess changes over time. An independent sample t-test is used to compare mean scaled scores between the preschool and non-preschool groups. Preschool attendance serves as the independent variable, and Early Literacy scaled scores, ranging from 200 to 1100, serve as the dependent variable. Scores are grouped and averaged by attendance category for each assessment window from February 11, through February 25, 2026. This analysis directly supports evaluation of potential achievement advantages associated with preschool exposure.

The third research question focuses on evidence that supports the district in determining the most strategic location for a preschool program. Research question three examines preschool availability in relation to primary school locations, enrollment trends, and socioeconomic indicators. Data include the geographic radius between preschools and primary schools, building level low-income eligibility rates, and enrollment growth patterns. All data for this question are obtained through secondary and public sources, including the Pennsylvania Future Ready Index and the Pennsylvania Department of Education enrollment and facility projection reports. No student-level data are required. Additional variables include building capacity, special education percentages, recent enrollment, and projected growth trends. A decision matrix is developed for each primary school site to synthesize factors including enrollment trends, facility capacity, socioeconomic status, number of preschools within a defined radius, and kindergarten growth rates as indicated by fall to winter STAR data between February 5 and April 15,

2026. This approach provides a comprehensive contextual analysis of preschool access and district capacity considerations.

Although this study utilizes quantitative research methods and does not generate direct costs, there are existing district expenses related to assessment and technology. Annual access to the Renaissance assessment for our kindergarten through eighth grade span costs approximately \$70,000.

When considering recommendations for a potential preschool program, it is essential to evaluate the fiscal impact of implementation. Research and district consultations indicate that startup costs for preschool programs in the region range widely, from \$150,000 to over \$1,000,000, depending on district size and number of classrooms. Personnel costs represent the largest portion of the budget. A certified early childhood teacher, paraprofessionals to meet classroom ratios, and a program coordinator would be required. Estimated costs for salaries and benefits include approximately \$105,665 for a teacher, \$50,000 for two paraprofessionals, and \$98,292 for a program coordinator if a new administrative role is established.

Facilities and maintenance costs are projected at \$20,000, covering classroom preparation, custodial support, minor restroom adjustments, and playground updates. Initial investments in age-appropriate furniture are estimated at \$30,000. Food services are budgeted at \$1,200 per classroom to provide breakfast, lunch and snacks in compliance with USDA standards. Curriculum materials aligned to early learning standards are projected at \$50,000, with an additional \$10,000 allocated for classroom technology. Another \$3,000 is projected for general classroom supplies. Marketing and family engagement costs are estimated at \$1,500 to support recruitment and outreach

efforts. Transportation would not be provided, and zoning or occupancy fees are not anticipated due to the program utilizing existing district facilities. State licensure through the Pennsylvania Department of Human Services will require a \$250 application fee. Professional development for preschool staff can be flexed, and cost anywhere from \$1,000 upward. This would be adjusted based on assessed needs or shared district-level training initiatives.

Overall, the fiscal analysis demonstrates that while preschool programming requires substantial initial and ongoing investment, careful use of existing district resources, including facilities, playgrounds, and shared professional development trainings, can help manage costs while supporting program sustainability and future growth.

Validity

Validity refers to the degree to which the instruments and procedures used in a study accurately measure the constructs they are intended to assess. According to Heale and Twycross (2015), validity reflects whether an instrument truly measures what it is intended to assess rather than an unrelated concept. In this research, validity is addressed using standardized, widely recognized assessment tools, ensuring that the data collected reliably reflect students' literacy and numeracy skills through scaled measures.

Reliability, which is an essential characteristic of quantitative data focuses on the consistency of data sets (Mertler, 2022). If a test is conducted repeatedly with different results each time, the test is unreliable. Mertler (2022) describes the routine use of standardized test scores as a quantitative data source in research studies while noting the study should be supplemented with other existing data forms. Careful selection of sources

is important to steer away from limiting the generalizability of the study to other settings and the population at large (Mertler, 2022). The critical focus when choosing sources is whether they are appropriate and accurate.

Content validity is supported through direct connections between the research questions and the tested data. The relationship is focused on the content addressed on the test along with the characteristic measured, also defined as construct validity. Evidence of content validity requires both item validity, extent to which items appear, and sampling validity, how well the items represent the total content area tested (Gay et al., 2009). In this study, a large, stratified sampling is utilized across primary schools. When a population includes meaningful subgroups, such as preschool versus non preschool participation, stratified sampling ensures each subgroup is included. This prevents important dimensions from being underrepresented, which would weaken content validity. Stratification controls some risk by ensuring balanced inclusion of groups essential to the study.

Construct validity is maintained by selecting measures that have been previously demonstrated to capture the theoretical concepts under investigation. Essentially, these are the characteristics the researcher is attempting to measure (Mertler, 2022).

Theoretical frameworks are addressed in depth within the literature review, including those of Jean Piaget, Lev Vygotsky, Urie Bronfenbrenner, Dr. Maria Montessori and Guiseppina Pizzigoni, each providing valuable perspectives. The STAR Early Literacy diagnostic connects early reading development through identifying data points in connection with emergent literacy skills, including both math and literacy components. The diagnostic assesses multiple, theoretically related domains such as phonemic

awareness, word knowledge, and comprehension. Relationships among these subskills provide evidence that the assessment measures coherent construct rather than isolated ability subsets. The use of scaled scores allows for meaningful interpretation of data, which supports construct validity by showing that score differences reflect true distinctions in early foundational aptitude.

The use of a stratified sample of sixty scores, equally representing preschool attendees and non-preschool attendees within each of the three primary schools, also contributes to the study's construct validity by ensuring that comparisons reflect balanced representation across groups. Independent samples t-tests are used to compare mean scaled scores at baseline and mid-year, allowing the analysis to capture patterns in achievement over time and supporting the validity of the constructs being measured through the observed academic trends.

The use of two-way Analysis of Variance, ANOVA, strengthens the study's validity by aligning the analytic method with the research questions. By examining preschool attendance status, preschool versus no preschool, and the primary school building simultaneously, the two-way ANOVA reduces the likelihood that observed differences in outcomes are incorrectly attributed to preschool participation alone. Including school building as a second independent variable helps account for differences across schools, strengthening internal validity. The analytic structure of the two-way ANOVA allows each construct to be examined independently and combined, supporting the validity with how this relates to student outcomes.

Criterion validity, an older term, relates to evidence which focuses on relationships to other variables (Mertler, 2022). The newer terminology fits into the

category of concurrent validity coefficients, as all data points are pulled and measured simultaneously. A decision matrix supports the evaluation of multiple potential preschool sites using consistent criteria applied across all locations. Each site is scored by predetermined factors such as building capacity, geographic accessibility, preschool proximity to existing elementary schools, and available classroom space. This structured comparison ensures that all sites are evaluated using the same standards, supporting methodological consistency. In connection with the third research question, preschool location decisions demonstrate concurrent validity coefficients as the comparison of locations are selected based on measurable external criteria such as enrollment trends, demographic and geographic information. Although these data points provide an array of statistics, the comparison across three consecutive buildings creates a comparable relationship amongst variables. Ensuring high validity strengthens confidence that the study's findings accurately represent the relationships among preschool experience, kindergarten readiness, and first-grade outcomes, rather than reflecting measurement error or external biases.

By collecting data from a variety of sources, the validity of a study is strengthened. Triangulation refers to “the process of relating multiple sources of data to verify their trustworthiness, accuracy, and consistency” (Mertler, 2022). In this study, three types of data, including school-level, student level, and contextual district level interrelate to support the research questions. According to Patton (2015), to enhance the rigor and validity of a study, triangulation integrates multiple sources of quantitative data to provide a comprehensive understanding.

In this specific study, preschool experiences, and their relationship to kindergarten performance, early achievement, and strategic district planning create the full picture. The first line of evidence comes from district registration records, which identify students with and without prior preschool experience across a two-year period. These data are combined with school-level Early Literacy diagnostic scaled scores from the Renaissance STAR assessment, administered at baseline in late September 2025 and mid-year in December 2025, to examine aggregate performance trends across primary school buildings. A two-way Analysis of Variance, ANOVA, is used to compare school level outcomes by preschool attendance status and school building, providing insight into correlations between early learning exposure and school performance.

Complementing this school-level analysis, individual student STAR Early Literacy scale scores are analyzed to determine whether preschool experience confers measurable advantages in literacy and numeracy skills over time. Using a stratified sample of twenty students per primary school, equally representing preschool and non-preschool attendees, independent sample t-tests compare mean scaled scores at baseline and mid-year, allowing for longitudinal assessment of achievement differences and supporting construct validity of the observed trends.

Finally, district-level contextual data, including preschool proximity between primary schools, building capacities, enrollment trends, and socioeconomic indicators are synthesized using a decision matrix to identify strategic locations for potential preschool locations. These variables, obtained from secondary and public sources provide a non-student level perspective that integrates academic outcomes with planning considerations. Appendix B provides a visual created by ChatGPT of the triangulation of data integrating

school level, student-level and district level sources to support this research (OpenAI, 2026). By combining school level data, individual achievement data, and contextual district metrics, the triangulated approach strengthens both content and construct validity, ensures findings across multiple dimensions, and provides a comprehensive framework for understanding the impact of preschool experiences on student achievement (Flick, 2018).

Summary

Chapter III provides an outline of the methodological framework used to examine the relationship between preschool participation and kindergarten readiness outcomes within a school district. Guided by quantitative, action research design, the study employs secondary and retrospective analyses of existing data, student level data, and contextual data sources to address three research questions focused on early academic performance, longitudinal achievement trends, and strategic preschool program placement. The methodology is grounded in a theoretical framework and informed by a robust body of literature from chapter two, demonstrating the sustained impact of preschool experiences on literacy, numeracy and long-term academic outcomes.

Data are drawn from district registration records, standardized diagnostic assessments, and publicly available demographic and geographic data sets. Stratified random sampling procedures ensure equitable representation of students with and without preschool experience while maintaining data integrity and confidentiality through de-identification protocols. Statistical analysis, including two-way analysis of variance and independent t-tests are selected to align with the research questions and to support validity by accounting for both preschool attendance status and school-level variation.

Contextual district-level data are synthesized using a decision matrix to inform evidence-based planning related to preschool access, enrollment trends, and facility capacity.

Validity is strengthened using standardized assessment instruments, alignment between research questions and analytic methods, and a triangulated data approach integrating school-level, student-level, and district-level evidence. Together, these methodological decisions provide a rigorous framework for examining how early childhood educational experiences influence kindergarten readiness, academic achievement, and district-level decision making. The comprehensive design of this study supports the reliability and applicability of findings while offering actionable insights to guide future early childhood programming and district considerations. Chapter I prepared the reader for the overall basis of this study through an introductory view of kindergarten focused objectives, Chapter II focused on a deep dive into the review of literature surrounding kindergarten readiness. Beyond the Chapter III methodology, Chapter IV will present the data analysis and results generated through this focused study.

CHAPTER IV

Data Analysis and Results

Chapter IV presents the data analysis and results for this capstone study, *Assessing Kindergarten Readiness: Evaluating the Impact of Preschool Exposure on School Age Student Achievement*. The chapter examines the relationship between preschool exposure and subsequent student achievement through the analysis of data aligned to the three guiding research questions. The chapter begins with a detailed explanation of the data analysis process, including the procedures used to organize each data set. Specific steps followed throughout the analysis are outlined in accordance with IRB approved data collection measures to provide transparency and ensure the reliability and validity of the findings. Each research question is addressed individually through multiple forms of data presentation, including tables and graphs. No changes to environmental factors exist or data sets outside regular operations within the district's approved list of assessments. Narrative explanations highlight the key process for each diagram provided. Additionally, triangulation of multiple data sources is utilized to strengthen the credibility of the findings by comparing and connecting patterns across quantitative evidence. The chapter concludes with an explanation of results categories as they relate to the purpose of the study and the overall investigation of preschool exposure and kindergarten readiness. The process utilized to analyze data for this capstone is presented in this chapter, along with a summary of results that will answer each of the research questions:

1. How do Kindergarten performance metrics across our district primary schools correlate with the presence or absence of prior preschool experience among incoming students?
2. To what extent does preschool exposure/experience translate into student achievement advantages in literacy and numeracy skills over a two-year span?
3. What evidence supports the district in determining the most strategic location for a preschool program?

Data Analysis

The first data source encompasses numerous data sets as part of Analysis of Variance, Two Way ANOVA with replication. As a first step, registration data, identifying preschool versus non preschool attendance was organized from available data sets. The data utilized to pull preschool identifiers included a two-year span from 2023-2024 and 2024-2025 school years. These specific years include the district's first requests from families to include preschool identifiers during the screening process. Each year, incoming Kindergarten students are screened during the month of April to identify needs and trends for the upcoming school year. Families are asked to note any identified preschools their child attended during their early childhood years, specifically the year leading up to kindergarten. It is important to note; these are the students who entered kindergarten during the 2024-2025 and 2025-2026 school years respectively. This data falls under the secondary analysis concept within existing data. To categorize student data into two sections, those who attended preschool and those who did not, the screening results were organized into categories by year, identified preschool versus non-preschool sections, as well as by home primary building which is identified by geographic location

within the three primary school boundaries. Essentially, this reorganization creates six identified columns of data. From this point, data was compiled utilizing stratified sampling, a random sampling technique to gain sample groups to support a proportional representation. Starting with the whole population, stratum 1, and shifting to stratum 2, focused on the two distinct groups, preschool versus no preschool, within each of the separated school samples random selection from each stratum formed the sample. This approach allows for an equitable comparison between the populations while maintaining the integrity of the findings. All personally identifiable information (PII) was removed prior to the stratified sampling process within the password protected system, using a number system. Once the sampling groups were set, the focus shifted to school level data compiled through the Renaissance STAR diagnostic tool, Early Literacy. No student specific identifiers were necessary for this portion of research due to STAR data already connected to student sets prior to the stratified sampling. Using Microsoft Excel, four columns were built, with the first labeled preschool and no preschool. The second, third and fourth columns were labeled by primary building. Under each of the columns school data was entered to allow enough data point for the next stage of analysis. Using the data analysis tool within Microsoft Excel, Analysis of Variance (ANOVA) Two-Way Factor with replication was utilized. Two factors affect the outcome, preschool versus no preschool, as well as the school level STAR data sets. Each of those combinations affects multiple data points creating the need for replication. The input range includes all data sets, with twenty rows per sample, per school. The alpha cutoff is .05 for the p-value where the p-value is considered significant. An output range is then identified in order to produce a summary of results.

Within the summary, the graphs provide a breakdown by the three schools including sum, average, and variance according to both preschool and no preschool, as well as the total from both categories. The two-way ANOVA is also calculated, which includes a different number of items that can change how these factors affect the outcome. The first category, samples, are distinguished by preschool versus no preschool in different schools. Essentially, how much the variation of attending different schools contributes to comparing preschool attendance. The second category is the condition, which in this sample includes the three school sites. The third category is the interaction between these items.

The next step in the process includes categorizing the averages, or means, from both the preschool and no preschool columns within each of the schools to create a bar graph representation for visual representation and comparison. The mean scores, also projected as the interaction through the ANOVA is shown in the graph. The full range of scores by building comparison, and the separation of preschool and no preschool ranges are noted. To support the visual reference, calculations were completed to find the standard errors, calculated from the standard deviation, completed from the square root of the variance. The standard error is a measure of how variables of all the different means standard deviation, divided by the square root of the sample size, which in this case was twenty per group. These ranges were then connected to the graph to show the standard error range for each bar on the graph comparing school data.

The second data source focuses on a two-sample independent t-test to compare the extent in which preschool exposure translates into student achievement advantages in literacy and numeracy skills over a two-year span. The t-test compares the mean scores

between a sample selection from two groups of students, those who attended preschool and those who did not attend preschool. Secondary analysis, using existing Renaissance STAR Early Literacy data and registration reports support this process. Similar to the first data analysis, registration data, identifying preschool versus non preschool attendance was organized from available data sets. Registration data from 2023-2024 and 2024-2025 identifies preschool experience during the transition phase. The STAR data utilized for this study includes the two-year span from 2024-2025 and 2025-2026 school years, matching the registration data identified in stage one. Diagnostic scores through STAR Early Literacy support this measure based on unified scaled score ranges from 200 to 1100. Student data was categorized into two sections, preschool and no preschool, however, the separation per building in this set is only completed to keep an equitable number of data points for each of the three primary buildings. The data was separated into two sets, kindergarten and first grade, in order to run the t-test twice, once with the kindergarten data points, and once with the first-grade data points to compare. Data was compiled utilizing stratified sampling, the random sampling technique to gain sample groups to support a proportional representation. Starting with the population by building, stratum 1, and shifting to stratum 2, which focused on the two distinct groups, preschool versus no preschool. Random selection from each stratum formed the samples. Again, this approach allows for an equitable comparison between the populations while maintaining the integrity of the findings. All PII was removed prior to the stratified sampling process within the password protected system, using a number system. A total of sixty data points from the three primary schools was entered in the spreadsheet, consisting of ten data points from each school. Five students with preschool, and five

students without preschool experience are shown within the first column for each of the three schools. In the first data set, the column consists of kindergarten fall 2024 Early Literacy scaled scores, while the other columns consist of first grade Winter 2025 Early Literacy scaled scores. The purpose of these groupings is to compare kindergarten fall data from 2024 to first grade winter data from 2025 to identify whether there are any significant achievement differences or closed gaps between the groups. The preschool versus non preschool identifier is the independent variable within the t-test. Mean, variance, degrees of freedom (df), the t-value, threshold cut off points, and probability (p-value), are addressed within the data sets for both kindergarten and first grade scopes. This focus supports the study of whether student achievement advantages exist based on preschool exposure.

The third data source is a Decision Matrix focused on three school sites. Evaluating and comparing specific criteria through an objective, data driven outcome supports the district in determining the most strategic location for a preschool program. Multiple categories are integrated for a broader scope. Building enrollment is tracked to plan accordingly for classroom needs each year, including a focus on bubble years, or years with higher enrollment. Kindergarten enrollment is tracked specifically through this matrix, along with building enrollment. Available classroom capacity within each facility is an important category as building space is essential for ongoing review of needs for foundational grade level additions and pre-planning for preschool space. Information related to the percentage of economically disadvantaged students as well as special education percentages was referenced through Future Ready PA Index (Pennsylvania Department of Education, n.d.). Identification of the number of preschools within a three-

mile radius is also tracked within the matrix. Another data point relates to growth rates within the kindergarten classes between STAR fall and spring data points. Student Growth Percentile (SGP) measures how much a student's academic skills have progressed over time compared to students nationwide who started with similar test scores. The range for this specific study is set at 15 SGP for comparison. No specific student reports are necessary for this portion of data collection. Visuals for each key component are provided, along with the compilation of key categories within the decision matrix. This mapping process paints a picture for future strategic planning purposes.

Results

The figures within this section provide a visual narrative of the data sets associated with the analysis process and results portion of this study. The combination of tables and figures support definitive data analysis associated with each of the three research questions. Table 1 and Figure 1 connect kindergarten performance metrics across district primary schools in correlation with the presence or absence of prior preschool experience through an ANOVA Two Factor with replication. Tables 2 and 3 correlate the extent of preschool exposure and how that experience translates into student achievement advantages in literacy and numeracy skills over a two-year span through t-test Two Sample Assuming Unequal Variances. Figure 2 provides evidence supporting a determination of the most strategic location for a preschool program using a decision matrix. These tools support each strategic measure of the data analysis process. The role of triangulation in strengthening and validating these measures is addressed in greater detail within this chapter.

Table 1 illustrates Anova Two-Factor with Replication. The upper data portion in the table includes a summary of schools A, B, and C, while providing a total from the data points based on those who attended preschool and those who did not. The summary sections provide sum, average, and variance for each specific school, as well as a total for preschool attendance and a total for those who did not attend.

The ANOVA in the bottom section of the table explains whether differences between groups are statistically significant. The two-way ANOVA examines the effect of two independent variables, factors, on one dependent variable to determine if they interact with one another. Numerous components of ANOVA are available within the table. The sources of variation in a two-way ANOVA identify where the variation in the data comes from. In this case there are five separate sources including condition, schools, interactions, within error, and the total. Condition represents the first independent variable. In this case, preschool versus no preschool. The ANOVA tests whether this condition significantly affects the dependent variable. The second row, schools, represents the second variable, which in this case represents the different schools being compared in the study. The ANOVA tests whether differences among schools significantly affect outcomes. The third row, interaction, examines whether the effect of one independent variable change depending on the level of the other variable. In this case, the interaction determines whether preschool attendance impacts student achievement differently across schools. The fourth row, within, focuses on error. This section represents variation that cannot be explained by the independent variables. It refers to natural variability among the individual scores within the groups. The total is final row within the ANOVA. This provides the total amount of variation in the entire

data set. It includes both explained and unexplained variations. Variation caused by condition, schools, and interactions are compared against variations occurring naturally, the within category.

These sources of variation are defined through multiple components listed in each column within the ANOVA. The sum of squares (SS) measures the total variance connected to a specific source. The degrees of freedom (df) represents the number of values that vary when estimating. The mean square (MS) is calculated by dividing the sum of squares by the degrees of freedom to find an average variation. The F-statistic (F) provides the ratio of variation between groups and within groups. A p-value indicates the probability that the observed results happen by chance. The critical F value (F crit) provides the cutoff value from the F-distribution table used to determine significance.

Table 1*Anova: Two Factor with Replication*

Anova: Two-Factor With Replication						
SUMMARY	School A	School B	School C	Total		
Preschool						
Count	20	20	20	60		
Sum	12837	11716	13140	37693		
Average	641.9	585.8	657	628.2		
Variance	7463.4	6880.69	4509.37	7025.19		
No Preschool						
Count	20	20	20	60		
Sum	7150	6979	7098	21227		
Average	357.5	348.9	354.9	353.8		
Variance	1640.05	751.73	612.94	980.65		
Total						
Count	40	40	40			
Sum	19987	18695	20238			
Average	499.7	467.4	505.9			
Variance	25167.05	18102.45	25896.61			
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Condition	2259409.63	1	2259409.63	620.2	0.001	3.92
Schools	34275.95	2	17137.98	4.7	0.011	3.08
Interaction	22762.92	2	11381.46	3.12	0.048	3.08
Within	415305.5	114	3643.03			
Total	2731754	119				

Note. Table 1 shows ANOVA: Two Factor with Replication including a summary of schools, broken into two categories, preschool and no preschool, along with the ANOVA section based on multiple sources of variation including condition, schools, interaction, and within.

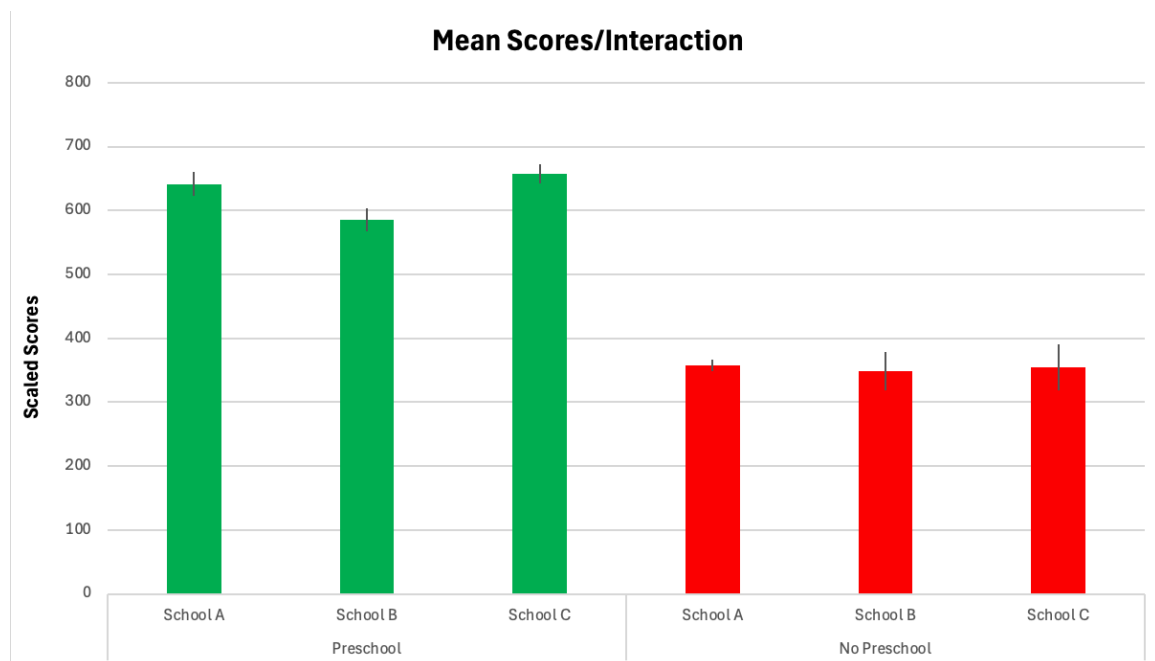
Figure 1 illustrates how averages are categorized by school as well as separation of preschool versus non preschool attendance through a vertical 2D bar graph. The vertical green bars show students' scaled scores based on those who attended preschools,

while the red vertical bars show students' scores based on those who did not attend preschool. The small black lines at the top of each bar project the standard of error for each data set.

This step in the process involves organizing and averaging the scores from the preschool and no preschool groups within each school to create a comparison. The figure displays the mean scores and the interaction identified through the ANOVA, along with the range of scores for each group and school. Additional computation was completed to determine the standard error, which was calculated using the standard deviation and sample size of twenty students per group. Standard error bars were then added to the graph to visually represent the variability within each group.

Figure 1

Mean Scores/Interaction: Preschool vs. No Preschool



The independent samples t-test in Table 2 compares the average scores of students who attended preschool with those who did not attend preschool based on kindergarten scaled scores from the fall of 2024. The visual representation shows differences in the mean scores between the two groups. The purpose of the comparison is to identify whether student achievement advantages exist based on preschool exposure.

Table 2

T-test: Two-Sample Assuming Unequal Variances Kindergarten Fall 2024

t-Test: Two-Sample Assuming Unequal Variances		
Gd. K Fall 2024		
	Preschool	No Preschool
Mean	605.2	360.3
Variance	3902.74	1582.49
Observations	15	15
Hypothesized Mean Difference	0	
df	24	
t Stat	12.81	
P(T<=t) one-tail	0	
t Critical one-tail	1.71	
P(T<=t) two-tail	0	
t Critical two-tail	2.06	

Note. Table 2 illustrates a t-test: Two-Sample Assuming Unequal Variances utilizing kindergarten data from the fall of 2024 based on providing the mean, variance, observations, hypothesized mean, df, t stat, p values, and t critical calculations.

The independent samples t-test in Table 3, similar to Table 2, compares the average scores of students who attended preschool with those who did not attend preschool. The difference in Table 3, is the data is based on first grade scaled scores from the winter of 2025. The visual representation shows differences in the mean scores between the two groups, variable 1 representing preschool, and variable 2, representing

no preschool. Similarly, the comparison supports the concept of whether achievement advantages exist based on preschool exposure.

Table 3

T-Test: Two-Sample Assuming Unequal Variances Grade 1 Winter 2025

t-Test: Two-Sample Assuming Unequal Variances		
Gd. 1 Winter 2025		
	Preschool	No Preschool
Mean	706	604.4
Variance	3085.29	7600.26
Observations	15	15
Hypothesized Mean Difference	0	
df	24	
t Stat	3.81	
P(T<=t) one-tail	0	
t Critical one-tail	1.71	
P(T<=t) two-tail	0	
t Critical two-tail	2.06	

Note. Table 3 illustrates a t-test: Two-Sample Assuming Unequal Variances utilizing grade one data from the winter of 2025 based on providing the mean, variance, observations, hypothesized mean, df, t stat, p values, and t critical calculations.

Figure 2, a decision matrix, focuses on identifying a strategic location for preschool programming, provides a full-scale visual display with the compilation of multiple criteria crucial for consideration throughout the evaluation process. A total of eight key criteria are categorized by school site based on high, median, and low need. Each criterion is explained at length within this section.

School enrollment data is valuable within a decision matrix because it provides a clear visual comparison of student populations across three potential preschool locations. By comparing kindergarten enrollment totals, the study identifies which school location may benefit most from expanded preschool programming. The enrollment information

helps identify which school has the greatest need for preschool services based on overall building capacity. The enrollment factors, one and two, listed in the matrix support the identification of kindergarten enrollment rates in each of the three settings. Figure C1 (Appendix C) provides 2025-2026 kindergarten enrollment per building, while Figure D1 (Appendix D) provides the 2025-2026 school enrollment for each of the three school sites by student population. This data supports the decision-making process by connecting quantitative enrollment to placement recommendations.

A second criteria reviewed through the Decision Matrix is economic disadvantage through percent enrollment by student group. This data point identifies which of the three potential preschool locations may have the greatest need for support services. Figure 2 allows for direct comparison of socioeconomic trends across schools and highlights populations that may benefit most from increased access to preschool programming. Equitable resource allocation is necessary to make informed preschool placement recommendations. Figure E1 (Appendix E) provides the 2025-2026 percentage of students who fit within this category in each of the three schools.

Figure 2 also displays the number of preschools within a three-mile radius to each of the three primary schools. In this specific measure, home daycares were not included in the findings. This data is valuable within the Decision Matrix because it illustrates the level of preschool access already available within the three-mile radius in each community. Figure 2 helps identify areas with limited preschool programming opportunities and highlights locations where an additional district preschool may address unmet needs. This supports community resource availability within the comparison of the

three potential preschool sites. As an extension, Figure F1 (Appendix F), provides this data in the form of a pie chart by calculated percentage per three-mile range.

Growth rate is also tracked in relation to the Decision Matrix. This data point represents the number of students who achieved a Student Growth Percentile, SGP, within a range of 15 or higher within each of the three school sites. This data point provides insight into academic growth trends across the three potential preschool locations. The representation identifies which schools are experiencing stronger or weaker student growth outcomes, allowing consideration of where a newly developed preschool location may have the greatest impact. Academic performance indicators contribute to evaluating and comparing potential sites. The SGP range of 15 or higher is also presented in Figure G1 (Appendix G) as an isolated data reference.

Figure 2 also illustrates the percent of available classroom capacity by calculating the total number of classrooms available in each of the three school sites, A, B, and C in comparison to current availability at each site. This data point supports review of classroom space and facility capacity within the three potential locations as represented in Figure H1 (Appendix H). The visual helps determine which school has the physical resources necessary to support additional preschool programming while minimizing disruptions to existing instructional spaces. This data supports the evaluation process by comparing building capacity and operational feasibility for consideration.

Accommodations and modifications are also considered within the Decision Matrix. Special education percent by enrollment by student group for each of the three school sites is included from the 2025-2026 school year in Figure I1 (Appendix I). These data ranges are provided as percentages to analyze the level of student support needs at

each of the three potential preschool locations. Comparison of the proportion of students requiring specialized services helps to identify schools where early intervention programming may have the greatest impact. Incorporating student need and service considerations into the evaluation process demonstrates how special education trends influence the comparison of sites for preschool placement.

Figure 2

Decision Matrix – Strategic Location for Preschool Programming



Decision Matrix

	Priority Tiers ----->	High Need	Median Need	Low Need
Criteria	School Sites	School A	School B	School C
Enrollment Factor #1	Kindergarten Enrollment 25-26	92	86	63
Enrollment Factor #2	School Enrollment 25-26	447	425	308
Kindergarten Enrollment Rate	Percent Enrollment specifically Kindergarten	20.6	20.2	20.5
Economics	Economic Disadvantage: Percent Enrollment by Student Group	42.5	90.8	41.7
Radius of Preschools	Preschools within 3 mile radius of school	3	3	5
Growth Rate	Student Growth Percentile (based on 15 SGP +)	92.3	81.7	91.2
Capacity	Percent of Available Classroom Capacity per Building	6.10	7.40	12.5
Accommodations and Modifications	Special Education percent enrollment by student group	17.7	20.0	14.6
Total	High Need Priority Tiers	2	4	1

Note. Figure 2 illustrates priority tiers through a Decision Matrix, within three color coded categories, high, median, and low need. Criteria include multiple data driven objectives for comparison of three school sites for a possible preschool target site. Each criteria addresses data points for each of the three sites, with red zones focused on high needs, yellow focused on median needs, and green focused on low needs.

By mapping priority tiers for each criterion, closely related to a story mapping structure, the data points support the decision-making process. While the Decision Matrix combines multiple criteria for data review, triangulation is also in effect on a broader scale throughout the study to map all analyzed components.

Triangulation

According to Mertler (2022), triangulation is the process of using multiple sources of data, methods, or analytical procedures to strengthen the credibility, validity and overall trustworthiness of research findings. In this study, guided by three research questions, triangulation allows a comparison to connect findings across several forms of analysis in order to develop a more comprehensive understanding of the condition being studied. Rather than relying on a single data source or statistical procedure, the use of multiple quantitative approaches provides stronger evidence and helps reduce the likelihood that findings are the result of chance or bias.

In this study, triangulation is achieved using three data analysis tools including a Two-Way ANOVA with replication, a decision matrix, and an independent two-sample t-test. The Two-Way ANOVA with replication was used to examine the interaction and differences between two groups, students attending preschool and students who did not attend, while also factoring in other variables such as multiple schools and scores

connected to the research question. The independent two-sample t-test provided a focused comparison of achievement between two groups, specifically examining whether statistically significant differences existed between students with preschool exposure and those without. The decision matrix offered a structured method for comparing findings across schools by organizing quantitative outcomes into a practical framework for interpretation and decision making.

Together, these methods support triangulation by allowing confirmation across multiple analyses and perspectives. When similar trends or conclusions emerged from the ANOVA, t-test results, and decision matrix comparisons, confidence in the findings increases. As stated by Mertler (2022), triangulation strengthens educational research because it integrates multiple forms of evidence to provide a richer and more reliable interpretation of data.

Summary

This chapter provides a detailed overview of the data analysis process used to analyze key data specific to assessing kindergarten readiness in correlation with preschool attendance. The step-by-step focus and process associated with ANOVA Two-Factor with Replication, a two-sample independent t-test, and the decision matrix create a narrative for the data analysis process through the presentation of multiple data sources. Each key step supports the three research questions with results presented in the form of tables and figures. The explanation of triangulation strengthens the validity of each step completed in this process. Specific review and interpretation of the collected data will take place in Chapter V.

CHAPTER V

Conclusions and Recommendations

Chapter V presents the conclusions, limitations, and recommendations drawn from the findings of this study, *Assessing Kindergarten Readiness: Evaluating the Impact of Preschool Exposure on School-Age Student Achievement*. This chapter continues to examine the relationship between preschool exposure and kindergarten readiness outcomes through the analysis of multiple data sources aligned to three research questions. The data sets, detailed in the previous chapter, serve as the foundation for determining whether the results support the research questions and underlying assumptions regarding the impact of preschool experiences on student achievement and readiness for kindergarten. Analysis and recommendations based on those data sets are provided in detail within this section.

This chapter begins with a review of each research question in connection with the conclusions drawn from the data analysis. The extent to which the findings support the conclusions is examined through the triangulation of quantitative data sources selected and approved through IRB for this study. The chapter also explores the practical application of the findings and how the results inform educational decision-making, program development, and resource allocation related to early childhood education and kindergarten readiness initiatives. Chapter V also considers external factors that may influence findings, including demographic characteristics, variations in preschool experiences and other contextual variables that can impact student readiness outcomes. Recognizing these factors provides important context for interpreting the results and understanding potential limitations of the study. Recommendations for future research

design expands the findings of this study. Collectively, the conclusions, limitations, and recommendations presented in this chapter contribute to a deeper understanding of kindergarten readiness and provide direction for future educational research and practice.

Conclusions

Numerous data points are evaluated throughout this section to determine the effectiveness of the intervention for each research question addressed through the research process. In addition to examining the effectiveness of the intervention, this section discusses how the findings can be applied to inform future decision-making, program development, and possible fiscal implications from the study. Attention is given to tangible improvements identified through the study, including impacts on student outcomes and organizational effectiveness. The goal is to gain practical information to support future planning and implementation efforts. Each conclusion is grounded in the evidence collected throughout the study to address kindergarten readiness.

Research Question One Results

How do Kindergarten performance metrics across our district primary schools correlate with the presence or absence of prior preschool experience among incoming students? To address research question one, a two-factor ANOVA with replication was conducted to examine the effects of condition, preschool or no preschool. The ANOVA also categorized school location to examine kindergarten readiness outcomes. The interaction between these two categories was conducted as part of the two-factor concept. This statistical analysis allows for the examination of whether differences in readiness scores are attributed to the intervention condition, the school location, or a combination of both factors. The analysis produced a total sum of squares, SS, of 2,731,754 across 119

degrees of freedom, indicating the overall variability present within the dataset. Larger sum of squares values indicates greater variability caused by that factor. The largest proportion of variance is attributed to the condition factor, which yields a sum of squares of 2,259,409.63. In comparison, the school factor accounts for 34,275.95 of the variance, while the interaction between the condition and school accounts for 22,762.92. The remaining unexplained variance is represented by the within-group sum of squares of 415,305.50.

Examination of the mean square (MS) values reveals that the condition factor, preschool versus no preschool, has a mean square of 2,259,409.63, substantially larger than the within group mean square of 3,643.03. This results in an F statistic of 620.20, which greatly exceeds the critical F value of 3.92. A larger F value from the ANOVA suggests the factor may significantly affect the outcome, and due to the F value calculated as greater than the F crit, the result is statistically significant. A p-value below the significant level, commonly $< .05$, suggests statistical significance. The associated p-value reported within the data set is .001, indicating a highly statistically significant effect. Therefore, the null hypothesis for the condition factor is rejected, demonstrating that the condition, preschool versus no preschool, has a significant impact on kindergarten readiness outcomes.

The school factor produced a mean square of 17,137.98 and an F statistic of 4.70. Due to this F value exceeding the critical value of 3.08 and the associated p-value .011, the effect of school is also statistically significant at the .05 level. This finding suggests that readiness outcomes differ across school locations, indicating that school location can influence kindergarten readiness performance.

The interaction between condition and school yielded a mean square of 11,381.46 and an F statistic of 3.12. This value slightly exceeds the critical F value of 3.08, and the associated p-value of .048 is below the established significance level of .05. As a result, the interaction effect is determined to be statistically significant. This finding indicates that the influence of the condition on kindergarten readiness varies somewhat across school locations, suggesting that the effectiveness of the condition is not entirely consistent among all schools.

Overall, the ANOVA results demonstrate statistically significant main effects for both condition and school, as well as a statistically significant interaction effect. The condition factor, preschool versus no preschool, accounts for the greatest proportion of variance in kindergarten readiness outcomes, indicating that it is the strongest contributor to differences observed among participants. While school location also contributes significantly to the outcomes, its effect is substantially smaller than that of the condition. The significant interaction effect further suggests that contextual factors associated with individual school locations may influence the degree to which the condition effect kindergarten readiness. These findings support the conclusion that both the intervention condition and school placement are important factors associated with kindergarten readiness outcomes and should be considered when making decisions regarding programming and service delivery for incoming kindergarten students.

Research Question Two Results

To what extent does preschool exposure/experience translate into student achievement advantages in literacy and numeracy skills over a two-year span? To address research question two, a two-sample independent t-test assuming unequal variances was

conducted using fall 2024 kindergarten assessment scores. This analysis compares the academic performance of students who attended preschool with those who did not attend preschool prior to entering kindergarten. These statistics reveal substantial differences between the two groups. Students who attended preschool demonstrated a mean score of 605.20, while students who did not attend preschool demonstrated a mean score of 360.30. This represents a mean difference of 244.90 points favoring students with preschool experience. The variance for the preschool group is 3,902.74, compared to 1,582.49 for the no preschool group, indicating somewhat greater variability among students who attend preschool. Both groups consist of fifteen students, providing balanced sample sizes for comparison. The two-sample t-test was conducted under the null hypothesis that no significant difference exists between the mean scores of students who attended preschool and those who did not attend preschool. The hypothesized mean difference was set at zero. The analysis produced a t-statistic of 12.81 with 24 degrees of freedom. This t-statistic substantially exceeds both the one-tailed critical value of 1.71 and the two-tailed critical value of 2.06. Further evidence of statistical significance is provided by the probability values. Both the one-tailed and two-tailed p-values are reported as 0, indicating that the probability of observing a difference of this magnitude by chance alone is extremely small and well below the established significance level of .05. Consequently, the null hypothesis is rejected.

These findings from fall 2024 data indicate a statistically significant difference in kindergarten achievement scores between students who attend preschool and those who do not. Specifically, in this study, students with preschool experience enter kindergarten with substantially higher assessment scores than their peers who lack preschool exposure.

The magnitude of the mean difference suggest that preschool participation is associated with a meaningful academic advantage at kindergarten entry. These results provide strong evidence that preschool exposure positively influences early academic readiness and achievement. Students who participated in preschool demonstrated significantly stronger performance on the fall 2024 kindergarten assessment, suggesting that early learning experiences contributed to enhanced foundational skills knowledge prior to school entry. These findings support existing research emphasizing the value of preschool programming as a means of promoting school readiness and early academic success. In relation to the broader research question examining achievement advantages over time, the fall 2024 kindergarten results establish a significant initial advantage for students with preschool experience. This finding serves as an important baseline for determining whether these advantages persist, diminish, or increase throughout the subsequent year's data within the study.

To further examine the extent to which preschool exposure translates into sustained student achievement advantages over time, a second two-sample independent t-test assuming unequal variances was conducted using grade one winter 2025 assessment scores. This analysis evaluated whether the achievement differences observed at kindergarten entry continue approximately one and a half years after students began their formal educational experiences.

These statistics indicate that students who attend preschool continue to outperform students who do not attend preschool. The preschool group achieved a mean score of 706.00, compared to a mean score of 604.40 for students without preschool experience. This represents a mean difference of 101.60 points in favor of students who

attended preschool. While the achievement gap is smaller than that observed at kindergarten entry, the difference remains substantial and educationally meaningful. Analysis of score variability reveals a variance of 3,085.29 for the preschool group and 7,600.26 for the non-preschool group. The larger variance among students without preschool suggests greater inconsistency in academic performance within that group. Both groups consist of fifteen students, providing equal sample sizes for comparison.

The t-test was conducted under the null hypothesis that no significant difference exists between the mean achievement scores of students who attend preschool and those who do not attend preschool. The hypothesized mean difference is set at zero. Results yield a t-statistic of 3.81 with 24 degrees of freedom. This value exceeds both the one-tailed critical value of 1.71 and the two-tailed critical value of 2.06, indicating that the observed difference between groups is statistically significant. The probability values further support this conclusion. Both the one-tailed and two-tailed p-values are reported as 0, indicating that the likelihood of obtaining such a difference by chance alone is extremely small and well below the established significance level of .05. Consequently, the null hypothesis is rejected.

These findings demonstrate that students who attend preschool continue to exhibit significantly higher academic achievement than their peers who do not attend preschool through grade one based on winter 2025 data. Although the achievement gap decreases from approximately 244.90 points at kindergarten entry to 101.60 points by the winter of first grade, the difference remains statistically significant. This suggests that while some narrowing of the achievement gap occurs over time, the academic advantages associated with preschool participation persist beyond kindergarten and into the primary grades.

When considered alongside the kindergarten fall 2024 findings, the results indicate that preschool exposure provides an early academic advantage that continues over the initial two-year span. The reduction in the size of the achievement gap may reflect the influence of subsequent educational experiences, targeted interventions, or natural development growth among students who do not attend preschool. Nevertheless, the continued statistical significance of the findings suggests that preschool participation contributes to lasting benefits in student achievement. Overall, the analysis of grade one data focused on score sets from a winter 2025 diagnostic supports the conclusion that preschool exposure is associated with sustained academic advantages. While the magnitude of the advantage decreased within the second data set, showing a smaller gap over time, students who attended preschool maintained significantly higher achievement levels than non-preschool peers, providing evidence that the benefits of early childhood education extend beyond initial school entry and continue into the elementary years.

Research Question Three Results

What evidence supports the district in determining the most strategic location for a preschool program? To support research question three, the Decision Matrix was developed to evaluate multiple factors that may influence the feasibility and potential impact of locating a district-operated preschool program at a specific elementary school site. Three priority tiers, high, median, and low were tracked within six categories to compare three school sites. Data point comparison for each of the three sites in each of the six categories is explained in detail throughout this section.

School A demonstrates the highest kindergarten enrollment among the district's elementary schools, with 20.6% of the school population in kindergarten. This finding

suggests a substantial population of young learners already entering the building and may indicate a strong demand for early childhood services within the attendance area. From a preschool planning perspective, higher kindergarten enrollment can support the placement of a preschool program by maximizing access for families and creating a larger pipeline of students transitioning into kindergarten. A high priority tier is listed in the Decision Matrix based on this data point. However, high enrollment may also place additional demands on existing facilities and resources. The school's 42.5% economically disadvantaged enrollment rate represents a median level of need when compared to the district other elementary schools. Students from economically disadvantaged backgrounds can benefit from access to high-quality early childhood educational opportunities. Therefore, this data point indicates a moderate level of need for preschool services and suggests that a district-operated program could provide additional educational support to families within the school community. School A is identified as having three existing preschool providers within a three-mile radius, representing minimal preschool access among the district's elementary boundaries. The presence of only a few preschools indicates families may struggle to find access to early childhood education services. This factor may increase the urgency for locating preschools as well as demonstrate high community demand for early childhood services and opportunities. Student achievement data further contributed to the analysis. School A demonstrates a 92.3% student growth percentile (SGP) rate, indicating that more than nine out of ten students achieved at least fifteen points of academic growth based on this specific data measure. This represents the strongest growth performance among the schools reviewed. Due to the student outcomes showing a strength, this measure indicates a lower level of

need within the priority tiers for additional intervention through a preschool placement in this setting. It is important to recognize that strong achievement outcomes do not necessarily eliminate the value of expanding early childhood opportunities for students. Facility capacity emerged as one of the most significant considerations for School A. The building reports only 6.1% classroom capacity available, equivalent to two available classrooms out of thirty-three full size instructional spaces. This represents the lowest available capacity among the schools under consideration and may create substantial challenges for implementing a preschool program without repurposing existing instructional spaces or pursuing facility modifications. Based on this available data point, School A is listed as a low priority tier in this category due to the limited space available. The availability of adequate classroom space is critical to the successful operation and long-term sustainability of a preschool program. School A also reported a 17.7% special education enrollment rate, representing a median level of need relative to other district elementary schools. The presence of a substantial population of students receiving special education services may support the value of early intervention programming and opportunities for identifying and addressing developmental needs before kindergarten entry. It is important to note the percentage does not significantly distinguish School A from the district's other elementary sites and therefore should be considered alongside the broader collection of indicators.

Collectively, the data suggests that School A offers several advantages for preschool placement, including its large kindergarten population and moderate levels of economic and special education needs. However, the school's strong academic growth outcomes, even with access to only three preschools within the three-mile range, and

limited facility capacity reduce its overall suitability as a location for a district operated preschool program. With the Decision Matrix incorporating multiple criteria rather than a single indicator, these findings must be evaluated in comparison to the results from the remaining school sites.

For School B, the Decision Matrix revealed a profile that differs notably from School A, particularly in the areas of economic disadvantage and special education enrollment. While no single criterion is sufficient to determine the optimal preschool location, the combination of indicators provides important insight into both the potential need for and feasibility of implementing a district-operated preschool program at this site. School B has 20.2% of the school's population in kindergarten, representing the lowest kindergarten enrollment among the three elementary schools. The difference between School B and the other school sites is relatively small, suggesting that kindergarten enrollment is generally balanced across the district. The matrix shows a low priority tier based on this site having the lowest kindergarten population in comparison to school enrollment, all sites are with a tight range within tenths of a percentage. Although a smaller kindergarten population in comparison to the overall school population may indicate a slightly reduced immediate demand for preschool services compared to other locations, the enrollment percentage remains substantial enough to support a viable preschool program and should not be viewed as a limiting factor in isolation. One of the most significant findings for School B is its 90.8% economically disadvantaged enrollment rate, the highest among the schools included in the Decision Matrix. This exceptionally high concentration of economically disadvantaged students suggests a substantial need for early childhood educational opportunities. As a result, this measure

strongly supports consideration of School B as a potential preschool location due to the potential impact on an at-risk student population. Similar to School A, three preschool providers are identified within a three-mile radius of School B. With only three preschool options within close proximity to the primary school, the high concentration of economically disadvantaged students can raise questions regarding affordability, accessibility and participation rates within those programs. The existence of only three preschool providers within this radius creates a high need priority. Student performance data indicates that 81.7% of students achieved an SGP of fifteen points or higher, representing a high level of need compared to the other school sites. This result suggests that a majority of students are demonstrating meaningful academic growth, however the percentage is lower than the other two school sites under comparison. This criterion shows greater room for improvement in comparison to the other school sites. Facility capacity presents a similar outlook for preschool implementation. School B reports 7.41% classroom capacity available, equivalent to two available classrooms out of twenty-seven full size instructional spaces. Essentially, the number of available spaces is the same as School A, however school B has five less classrooms overall, increasing the overall percentage of space available. The available amount of dedicated classroom space is crucial for preschool planning to reduce a need for facility renovation. This measure supports the feasibility of locating a preschool program at School B. School B also reported a 20.0% special education enrollment rate, the highest among the schools evaluated. This finding may indicate a greater need for early identification and intervention services within the area. The elevated special education enrollment percentage strengthens the case for locating a preschool program at School B, as early

intervention services can help address developmental and academic needs before they become more significant challenges. Collectively, School B presents a strong case for preschool placement. While the school serves a slightly smaller kindergarten population, the minimal local preschool providers, its exceptionally high rate of economic disadvantaged students, highest special education rate, moderate student growth outcomes, and available classroom space indicates a substantial need for a district operated preschool program. These results, along with those of School A and School C can determine which location best aligns with the district's educational priorities.

School C represents the final site evaluation through the Decision Matrix. Similar to School A and School B, multiple indicators are examined to assess both the potential need for a district-operated preschool and practical feasibility of implementation. School C demonstrates several strengths, while also presenting criteria that can reduce the overall urgency for preschool placements. School C has 20.5% of the school's overall population in kindergarten, representing the median tier among the three elementary schools. However, the difference between School C and School A is only 0.1 percentage points, indicating that kindergarten enrollment is nearly identical between the two sites. This finding suggests that School C serves a substantial number of incoming students and would be capable of supporting a preschool program from an enrollment perspective. As with the other schools, kindergarten enrollment reflects the potential number of students who could benefit from a strong transition between a district operated preschool and kindergarten programming. School C data shows an economic disadvantage enrollment rate of 41.7%, the lowest among the schools included in the Decision Matrix. Although a significant portion of students are identified as economically disadvantaged, the

percentage suggests comparatively less socioeconomic need than Schools A and B. This finding indicates a lower level of urgency for preschool placement compared to the other sites. The analysis identified five preschool providers within a three-mile radius of School C, the highest number among the three school attendance areas. This finding suggests that families residing within these boundaries have greater access to existing preschool opportunities. The availability of multiple nearby providers reduces the need for the district to establish an additional preschool location in this area, as well as an indication that students have opportunities to participate in preschool prior to kindergarten entry. From a decision-making standpoint, this factor lessens the priority of School C as a preschool location relative to the other sites. Student achievement data reveals 91.2% of students achieved an SGP of fifteen points or higher, identified as the median priority tier in comparison to other student performance among the schools included in the matrix. This growth data indicates the lowest indicator of need. School C demonstrates the greatest level of available facility capacity, reporting 12.5% classroom space available, equivalent to three classrooms out of twenty-four full size instructional spaces. Although School C is the smallest school in terms of total classrooms, it possesses the largest percentage of unused instructional space. Available classroom space can be utilized without displacing existing educational programs or requiring extensive facility modifications, which places this criterion at School C as the most favorable facility conditions for preschool implementation. School C reported a 14.6% special education enrollment rate, the lowest among the schools reviewed. While the percentage does not eliminate the value of early intervention services, it suggests comparatively lower levels of identified student need than data points from School A and B.

The data profile for School C indicates a lower level of need for a district operated preschool program when compared to School B, and, to a lesser extent, School A. Although School C offers more available classroom space, making it a more feasible site from a facilities perspective, the Decision Matrix highlights an important comparison of multiple criteria including educational and operational feasibility. The demographic and achievement indicators suggest that potential impact on student need is greater at the other school sites. The final recommendation balances the practical advantages of available space with the district's broader goal of maximizing access and support for students who stand to benefit most from a district operated preschool program.

The identification of a strategic location for a preschool program is crucial for responsible fiscal impact and for longevity of a support system in a high need area within the district. While each school demonstrated strengths and limitations across the six evaluation criteria, findings suggest School B as the highest priority location based on the factors addressed through the Decision Matrix. The recommendation is grounded primarily in the indicators of student need including the high percentage of economically disadvantaged students, 90.8% and the highest special education enrollment, 20.0%. Although School B serves the smallest percentage of kindergarten students, 20.2%, the difference between the three schools is negligible, with less than one percentage point separating all sites. Therefore, kindergarten enrollment was not considered a significant differentiating factor in the final recommendation. School B is categorized with four of the six high priority categories, one median, and one low priority criteria. School A identifies two high need areas, based on an overlapping tie with School B in the preschool radius category. School A has two median and two low need categories

identified. School C has three categories in low need status, two within a median tier, and one identified as a high priority tier. All determined ratings follow the tiered scale in connection with the Decision Matrix.

The conclusions presented are supported by the quantitative evidence obtained through multiple statistical analyses. Findings demonstrate consistent patterns that address each of the three research questions and inform recommendations for increasing preschool support through the development of district led preschool programming. The findings suggest meaningful implications for district planning and preschool placement. The quantitative results consistently demonstrate that students who attend preschool enter kindergarten with stronger readiness skills and continue to exhibit higher levels of academic achievement in grade one when compared to their peers who do not attend preschool. These findings indicate that increased access to high-quality early learning opportunities contribute to improved educational outcomes for students across the district.

A tangible application of these findings is the establishment of a district operated preschool program. The district can expand access, which has severely declined in the past couple of years, to better align preschool experiences with district instructional practices, as well as provide early identification and support for students requiring additional academic, behavioral, or developmental interventions. The addition of preschool programming can also strengthen transitions to kindergarten by fostering familiarity with faculty and administration. District led preschool programming also has the potential to generate long-term organizational improvements such as reducing the number of intensive interventions in the primary grades, as well as improved student

achievement outcomes over time. The findings provide evidence to support the consideration of a district based preschool program as a strategic investment in student success, with the potential to yield both immediate and sustained benefits for students, families, and the district.

Fiscal implications explain how the results inform efficient use of district funds and long-term investment within the district. Potential costs and resource allocation decisions are faced annually. Fiscal implications reflected through the ANOVA results, which show that statistically significant differences are found between students attending different elementary schools with varying preschool experiences, support decisions surrounding where resources are most effectively administered to effectively support kindergarten outcomes. Replicating successful strategies across other schools while targeting allocation of funds toward evidence-based practices supports ongoing development. This avoids distribution of resources uniformly without consideration of effectiveness.

The second data analysis, which includes independent sample t-tests, provides evidence regarding the extent to which preschool participation influences student achievement and readiness outcomes. The results, which show those who attend preschool demonstrate significantly higher achievement scores, support the economic value of investing in preschool programming. Establishing preschool programming requires initial costs related to staffing, facilities, and curriculum. Improved readiness outcomes may reduce future costs associated with academic intervention services, remediation programs, retention, and intensive support services. The t-test results provide

quantitative evidence that justifies an investment in preschool programming as a cost-effective strategy for improving student outcomes.

The Decision Matrix incorporates multiple criteria to evaluate potential fiscal implications through the factors within the matrix. In this study, the matrix identifies a specific school with the highest-ranking potential for a district operated preschool program. Comparing anticipated costs and projected benefits through the matrix findings, supports the review of fiscal implications. The results suggest that the investment in preschool programming will require upfront financial commitments, however the potential for improved kindergarten readiness and increased academic achievement yields significant educational and economic benefit over time. The evidence from the study allows district leaders to build fiscally responsible decisions that align financial resources to improve student success.

Limitations

Several limitations need to be considered when interpreting the findings from this study. Although a specific research design and methodology were selected to address the three identified research questions and provide meaningful insight into kindergarten readiness and student achievement categories, certain factors can influence the results and their interpretation.

First, the study relies on existing district assessment data and historical student records, limiting the ability to control variables that may influence student outcomes. For example, one limitation is the number of students that attend the district screenings. The district has students who register after the initial screening dates, and preschool records at times have a delay with updates over the summer with including data sets, closer to the

start of the new year. These late registrations create a smaller set of screening data to pull from. Although statistical analyses were conducted to identify relationships between preschool and non-preschool attendance, other factors such as parental involvement, home literacy experiences, access to educational resources, and prior learning opportunities may have contributed to student performance. These variables were not directly measured and therefore may have influenced findings.

A second limitation centers around the study utilizing a non-experimental design. While significant differences were identified between the groups through ANOVA and independent t-tests, the results demonstrate associations rather than definitive evidence that preschool participation alone causes differences in readiness or achievement outcomes. Students who attend preschool may have different experiences from non-attending students in ways that are not captured within the available data sets.

A third limitation involves the sample population and setting. The study was conducted within a single school district, with characteristics and community factors unique to the area. This limits the generalization of findings to other districts or geographic regions. Consequently, caution should be exercised when applying the result beyond the district itself.

Despite these limitations, the study provides valuable evidence regarding the relationship between preschool participation, kindergarten readiness, and subsequent academic achievement. The use of multiple quantitative analyses and decision-making tools strengthened the overall investigation. The findings should be interpreted within the context of the study's design and sample.

Recommendations for Future Research

The findings of this study contribute to the body of research examining the relationship between preschool participation, kindergarten readiness, and subsequent academic achievement. While the results provide evidence supporting the value of preschool programming and experiences, they also identify areas requiring further investigation. Future research can build upon the conclusions of this study to deepen understanding of the factors that influence kindergarten readiness and long-term student success.

One recommendation is to conduct a longitudinal study that follows students beyond first grade to determine whether the academic advantages associated with preschool participation persist throughout elementary school. While the present study identified significant differences in readiness and achievement during kindergarten and first grade, additional research is needed to determine the duration and magnitude of these effects over time. Examining student performance across multiple grade levels provides a more comprehensive understanding of the long-term impact of preschool.

Future research can also investigate the specific characteristics of preschool programs that contribute most significantly to kindergarten readiness. Preschool experiences vary widely in curriculum, instructional quality, duration, and frequency. Identifying which program components are most strongly associated with positive student outcomes can support districts in making informed decisions regarding program design and resource allocation. The current study does not delineate between these factors to identify what constitutes a preschool and what constitutes a daycare system. Only home-based daycares were rejected within the study.

Given the fiscal implications identified, future research should include cost-benefit analysis of a district operated preschool program. Understanding the financial return on investment associated with preschool programming can provide valuable information for district leaders. This allows the district to assess whether a future program achieves its intended goals to make data-informed adjustments.

The conclusion of this study generates a new research question that warrants further examination. A strong future study can investigate, what instructional practices within preschool settings contribute most effectively to kindergarten readiness? This question provides a deeper look into understanding the relationship between early childhood experiences and student achievement. Overall, the results can provide a foundation for continued inquiry into kindergarten readiness and early childhood education. By extending the scope of investigation, essentially examining additional variables, educational leaders can refine practices that support student success and inform strategic decision making. These recommendations offer a logical progression from the study's conclusions and establish a framework for generating future research.

Summary

This study examines the relationship between preschool participation and kindergarten readiness, as well as the extent to which preschool exposure contributes to sustained academic achievement. Through the analysis of multiple quantitative data sources, including a two-factor ANOVA, independent t-tests, and a decision matrix, the findings consistently demonstrated that preschool participation is associated with stronger educational outcomes. Based on the data sets, students who were identified as attending preschool entered kindergarten with significantly higher readiness scores and maintained

higher levels of academic achievement through the winter of first grade compared to students without preschool experience. While the achievement gap narrowed over time, the advantages associated with preschool participation remained statistically significant, indicating lasting benefits beyond kindergarten entry.

The findings also reveal that school location contributes to differences in kindergarten readiness outcomes while recognizing preschool participation is identified as the strongest factor influencing student performance. Additionally, the Decision Matrix identified School B as the most strategic location for a district run preschool program based on multiple priority tiers and criteria. These results provide evidence to support targeted expansion of early childhood programming within the district.

The study further highlights practical and fiscal implications associated with preschool investment. Results suggest that expanding access to preschool opportunities may improve kindergarten readiness, strengthen early academic achievement, potentially reducing future expenditures related to remediation, retention, and intensive support services. Collectively, the findings support preschool programming as both an educationally effective and fiscally responsible strategy for promoting long-term student success.

Although limitations related to the use of historical data, a non-experimental research design, and the single district sample restrict the ability generalize findings broadly, the study provides valuable evidence regarding the positive relationships between preschool participation and student outcomes. Future research should build upon the conclusions of this study to deepen understanding of the factors that influence kindergarten readiness and long-term student success as well as to determine the duration

and magnitude of effects over time. As part of the district's reflective planning process, the findings of this study suggest an opportunity to explore the feasibility and effectiveness of expanding preschool opportunities. If implementation should occur, the district can assess whether the program achieves its intended goals to make data informed adjustments as needed. By extending the scope of investigation through examining additional variables, and evaluating future program implementation, educational leaders can continue to refine practices and support student success. The recommendations presented offer a logical progression from the study's conclusions and establish a framework for generating future research that advances educational practice.

The results of this study provide compelling evidence that preschool participation is strongly associated with improved kindergarten readiness and sustained academic achievement during the early elementary years. Through multiple measures and statistical analyses, the findings support the conclusion that access to preschool experiences offer meaningful educational advantages that extend beyond school entry. As districts continue to seek effective strategies for improving student outcomes, investing in early childhood education represents a proactive approach to strengthening readiness, achievement, and long-term success. Ultimately, this study reinforces the critical role of preschool programming in building a strong foundation for learning and provides a data-informed framework to guide future educational planning, resource allocation, and research initiatives.

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APPENDICES

APPENDIX A**IRB Approval**

Pennsylvania Western University
Institutional Review Board
250 University Ave, California, PA 15419
IRB@pennwest.edu

September 23, 2025

Emily Mather
Pennsylvania Western University
mat88579@pennwest.edu

Protocol Title: *Assessing Kindergarten Readiness: Evaluating the Impact of Preschool Exposure on School Age Student Achievement*
Revised Protocol Tracking #: PWIRB25018EM-EP
Approval Date: September 23, 2025
Approved Study Period: September 23, 2025 to April 20, 2026

Dear Ms. Mather,

On behalf of the Institutional Review Board (IRB) at Pennsylvania Western University, I am pleased to inform you that the above-referenced research study has been approved. Your protocol qualifies for Expedited Review under 45 CFR 46.110, Category 6 (secondary use of data, documents, or records collected for non-research purposes, e.g., educational records).

The IRB acknowledges your clarifications submitted in response to reviewer feedback. This includes specifying the use of stratified random sampling, clarifying the “plan for action research” as meetings with principals to review the study plan and confidentiality safeguards, updating language to reflect that students are a protected population under federal regulations, and revising references to “return on investment” to describe examination of relationships, trends, and outcomes. These revisions are now part of the official study record.

This study falls under the oversight of Pennsylvania Western University’s Institutional Review Board (IRB00003711), operating under a Federal-wide Assurance (FWA00032724) filed with the U.S. Department of Health & Human Services (IORG0003094).

Please retain this letter for your records and for use in grant, publication, or program/institutional documentation. You are expected to continue conducting this study in accordance with the ethical principles of the Belmont Report and all applicable institutional and federal guidelines.

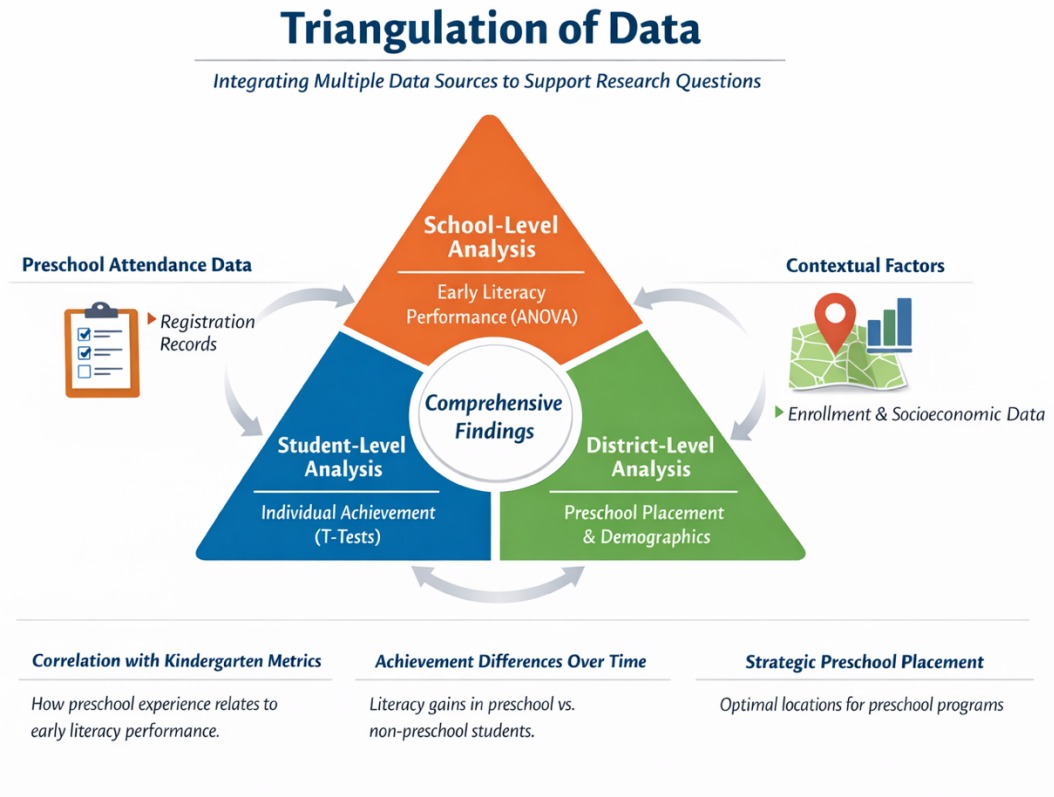
Please notify the IRB of any proposed modifications, unanticipated problems, or adverse events. If you have any questions, please contact us at IRB@pennwest.edu.

Best,

Nikolas C. Roberts, Ph.D.
Director, Institutional Review Board
Pennsylvania Western University
roberts_n@pennwest.edu

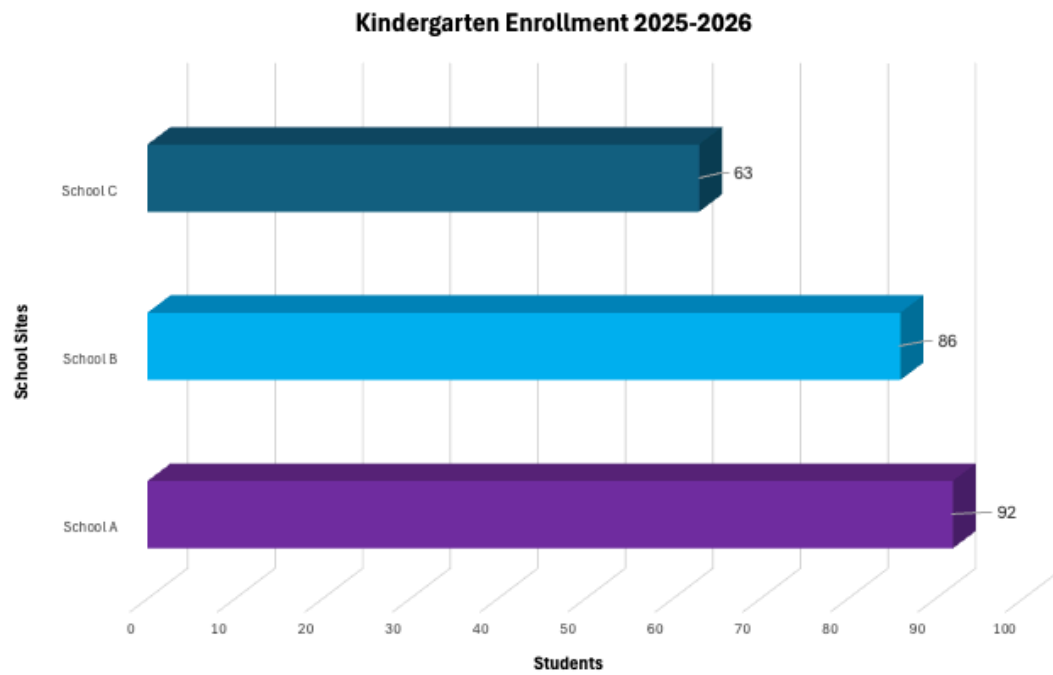
APPENDIX B

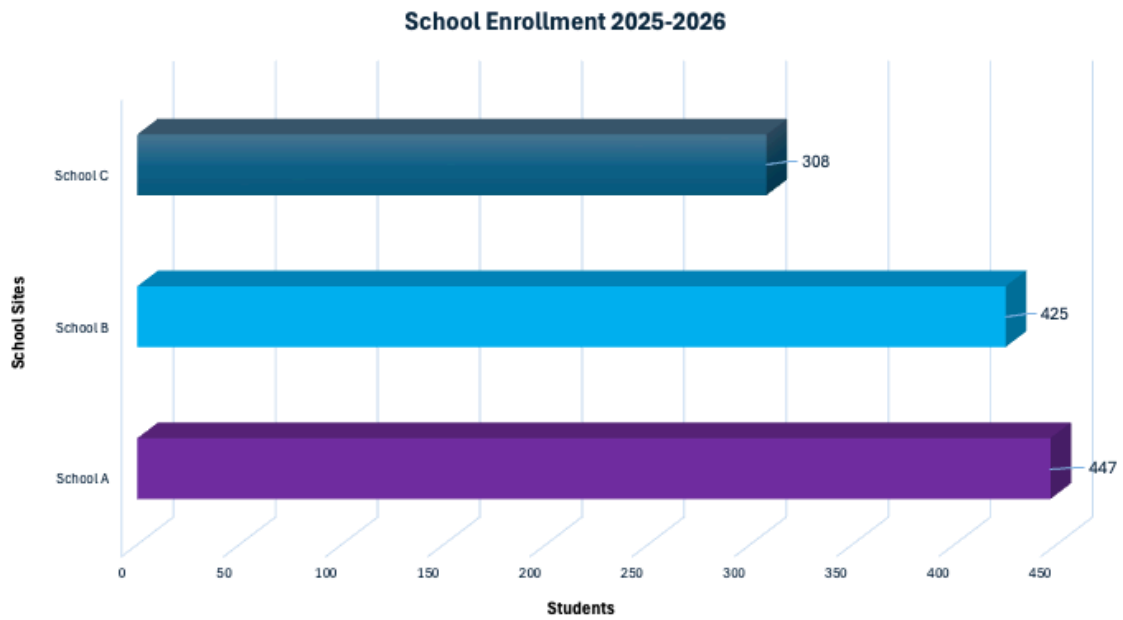
Triangulation of Data Image



Appendix C

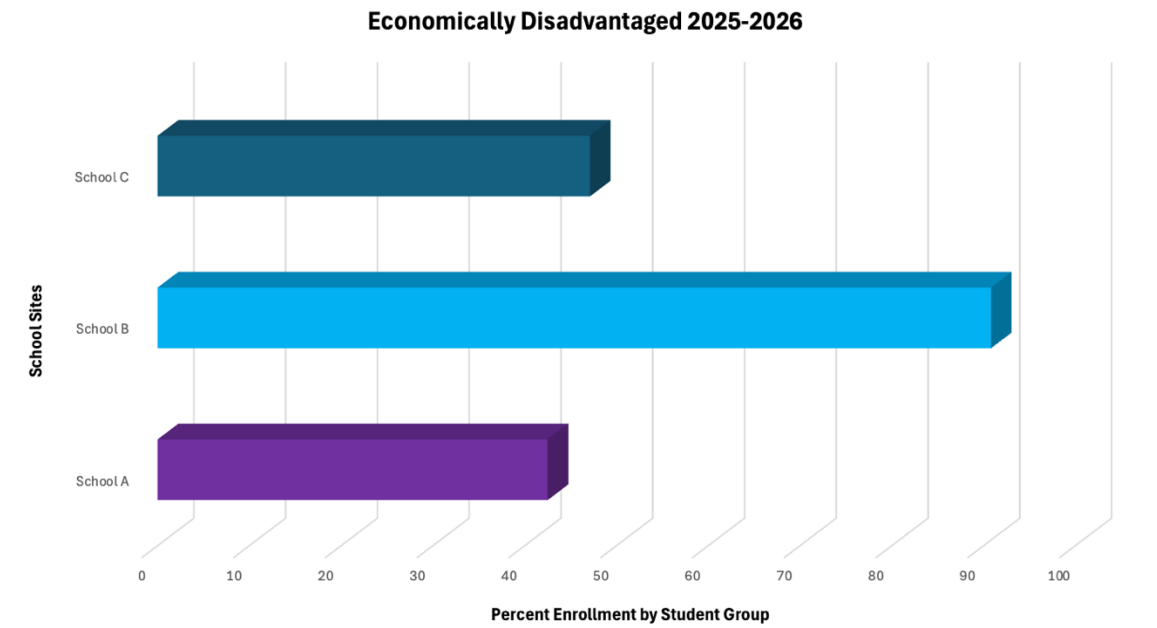
Figure C1

Kindergarten Enrollment 2025-2026

Appendix D**Figure D1***School Enrollment 2025-2026*

Appendix E**Figure E1**

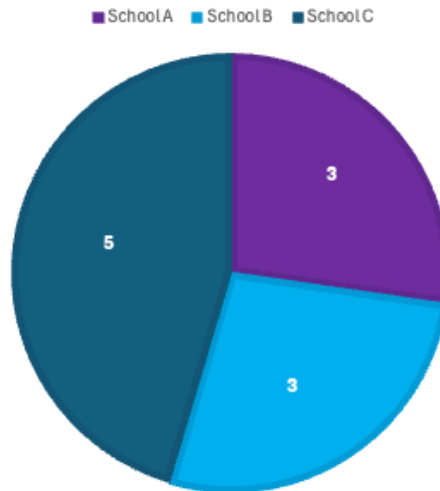
Economically Disadvantaged Percent Enrollment by Student Group 2025-2026



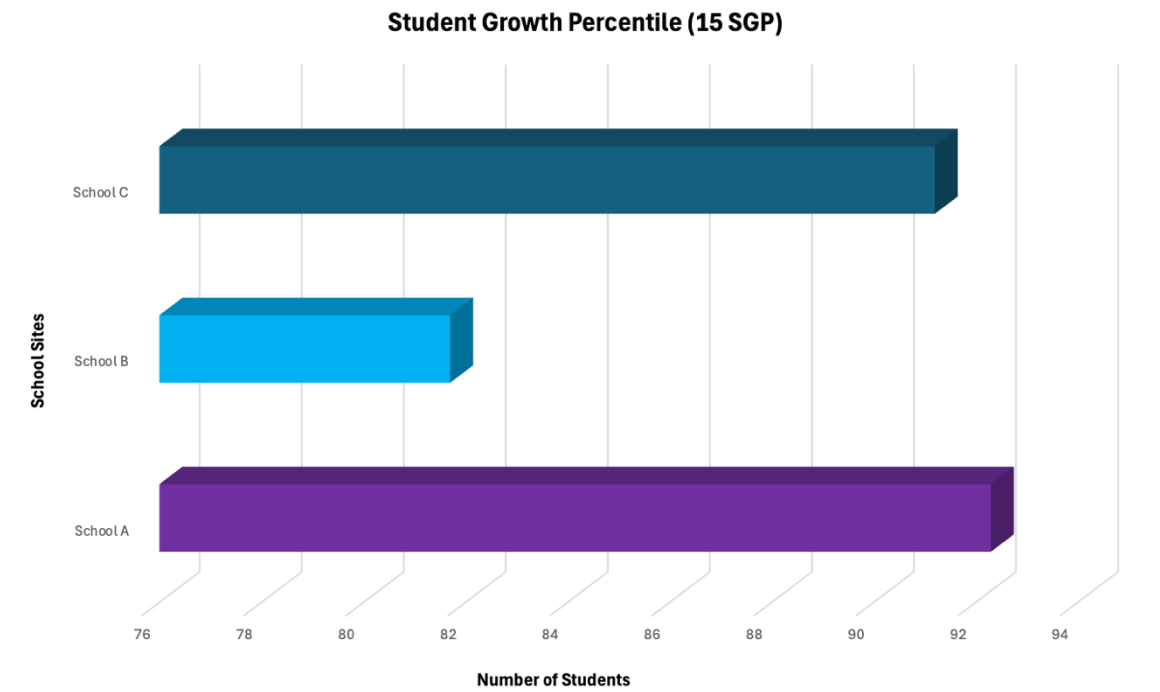
Note. Figure E1 illustrates a K-4 data set focused on the economically disadvantaged percent enrollment by student group from the 2025-2026 school year.

Appendix F**Figure F1**

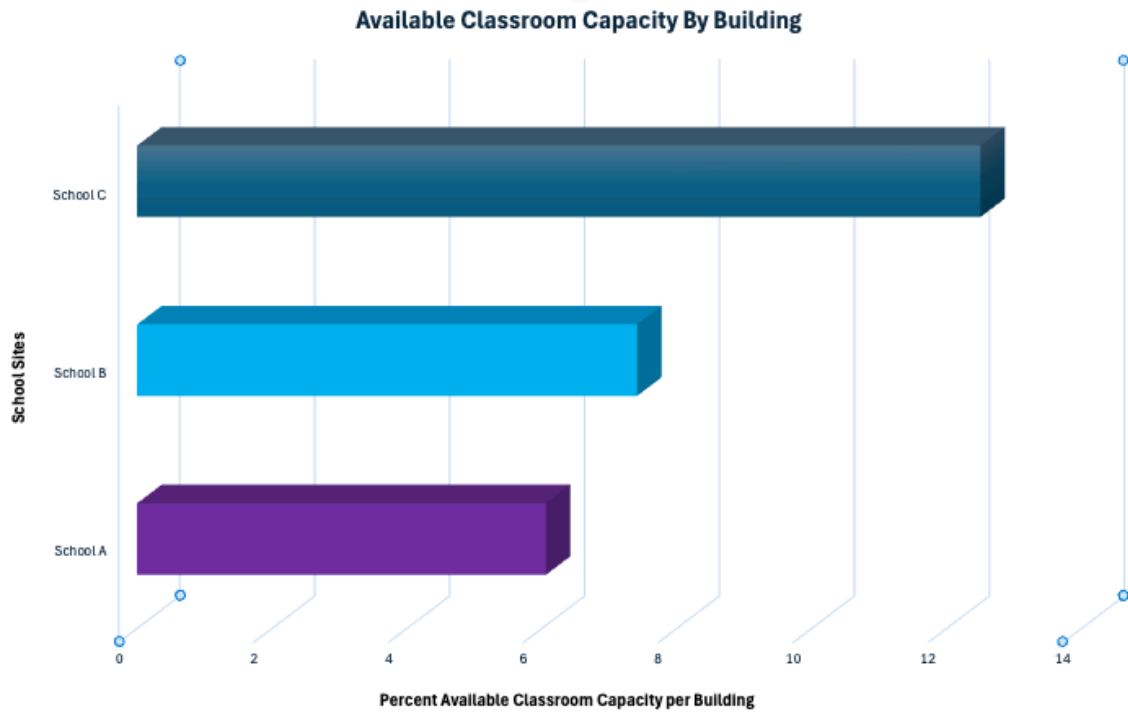
Number of Preschools within a Three-Mile Radius to Primary Center

NUMBER OF PRESCHOOLS - 3 MILE RADIUS TO PRIMARY CENTER

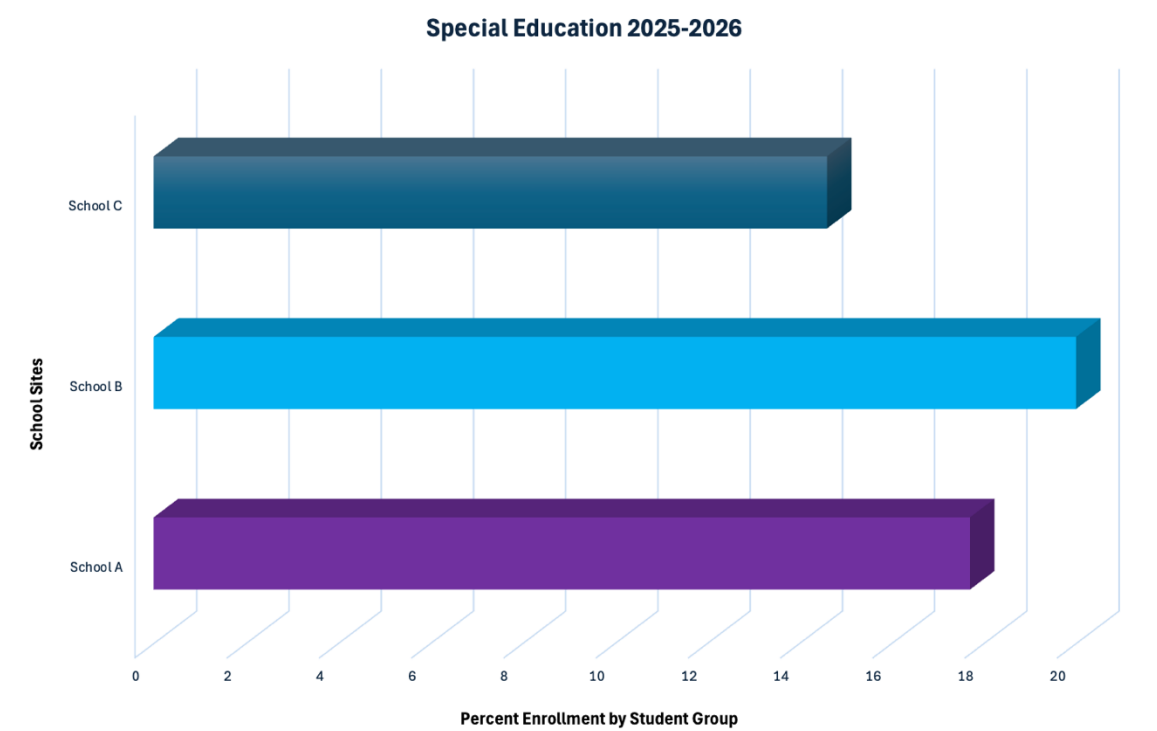
Note. The pie chart in Figure F1 illustrates the number of preschools within a three-mile radius to each of the three school sites. In-home preschools are not included in this data set.

Appendix G**Figure G1***2025-2026 Kindergarten Student Growth Percentile (15 SGP)*

Note. Student Growth Percentile (SGP) is associated with the Renaissance STAR Early Literacy Assessment. It measures the rate of growth in relation to peers according to grade level norms within a scaled range of 1 to 99. The bar graph shows the number of kindergarten students who met a 15 SGP or higher over the course of the 2025-2026 school year.

Appendix H**Figure H1***K-4 Percent of Available Classroom Capacity by Building*

Note. This bar graph illustrates the percentage of full-size available classrooms available in each of the K-4 school sites. The number of available full-size classrooms compared to the total building capacity determines the percentage at each school site.

Appendix I**Figure I1***Special Education Percent Enrollment by Student Group*

Note. This bar graph illustrates K-4 special education percent by enrollment per student group across three school sites. The percentage of students in each building with special education services highlights how resource distribution varies across the school district.