

West Virginia's Universal Preschool Program: The Relationship between Child
Characteristics and Early Learning Scale (ELS) Growth

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This dissertation titled
West Virginia's Universal Preschool Program: The Relationship between Child
Characteristics and Early Learning Scale (ELS) Growth

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Abstract

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West Virginia's Universal Preschool Program: The Relationship between Child Characteristics and Early Learning Scale (ELS) Growth

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West Virginia provides universal access to publicly funded preschool for all 4-year olds in the state. This approach contrasts with the approach many states and the federal government take to offering preschool, which is to provide targeted programs, focused on traditionally at-risk populations. Support for moving toward universal access has grown to include the White House, where it has been touted as a priority in recent State of the Union Addresses. This research explores West Virginia's existing program to understand the experience of the students enrolled in the 2012-2013 school year using extant data.

West Virginia's Universal Preschool program uses Early Learning Scale (ELS) to assess student growth during the preschool year, the results of which are collected in a statewide database. The West Virginia State Department of Education also collects data on student and classroom demographics. This study uses hierarchical linear modeling to analyze the relationship of student characteristics and baseline and growth scores on ELS. Additional descriptive analysis of site characteristics is also provided to provide a profile of the classrooms of the 2012-2013 preschool class.

This study documents a gap in ELS scores at baseline between low SES and non-low SES students and between boys and girls. No gap was apparent between white and non-white students in the analysis. Students in West Virginia's Universal Preschool

program show growth through the preschool year on ELS; however, growth rates of low-SES and male children are not great enough to close the gaps that exist when the students are initially assessed. This dissertation recommends that more research needs to be done to understand how classroom, student, and socio-geographic characteristics interact to influence student baseline and growth scores on ELS in West Virginia.

Dedication

This dissertation is dedicated to my mom, Dr. Polly Collins.

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Chapter 1: Introduction and Background of the Study

“I propose working with states to make high quality preschool available to every child in America.” With these words in the 2013 State of the Union Address President Obama introduced expansion of publicly funded preschool as a national budgetary priority, prompting a renewed national discussion of the efficacy of universal access in relation to the program’s cost (The White House, United States Government, 2013). In 2014, President Obama reiterated his comment to quality preschool (The White House, United States Government, 2014). The current dominant model for publicly funded preschool (targeted preschool programs such as Head Start) primarily serve children identified as being at-risk for later difficulty in school, such as children from low-income families and children with special needs. Supporters of universal access cite research indicating that high quality preschool offers benefits for all children, including increased participation and academic benefits for at-risk children over targeted programs (Cavalluzzo, Clinton, Holian, Marr, & Taylor, 2009; Geraghty, Holian, Gyekye, 2012).

As one of a handful of states already providing all 4-year olds with access to publicly funded preschool, West Virginia’s Universal Preschool Program provides a unique context for exploration of the issues surrounding universal access to preschool. The state’s largely rural population and its other low-income populations represent two underserved groups of students traditionally targeted by preschool programs because they have the most to gain from high quality preschool education.

Nationally, more than 70% of children who are 4 years old are in preschool (OECD, 2006), but the cost and the quality of these programs varies widely (Pianta, Barnett, Burchinal, & Thornburg, 2009). Improved quality of early childhood experiences

improves outcomes for children, with those in the highest quality settings receiving the greatest benefit (Peisner-Feinberg et al., 1999).

Unfortunately, high quality early care and education is less affordable and less accessible to families of low and middle socio-economic status (SES) than to their higher SES peers. Perhaps surprisingly, middle class children tend to attend the lowest quality programs (Karoly, Ghosh-Dastidar, Zellman, Perlman, & Fernyhough, 2008), since high SES children's parents can afford high quality and low SES children qualify for targeted programs. Middle class families struggle to afford early care and education experiences that meet high standards for program quality. While all children gain from high quality preschool, children of low SES gain the most from high quality early experiences (Peisner-Feinberg et al., 1999).

West Virginia is one of a small number of states experimenting with providing its 4-year olds universal access to publicly funded preschool (WVDE, 2012). Universal access means that there is a seat available in a publicly funded preschool for all 4-year olds in the state, should the child's parent or guardian choose to enroll him or her (WVDE, 2012). West Virginia's Universal Preschool Program employs a combination of site types: public schools, Head Starts, and childcare centers, which are called collaborative sites. In part because of these site types, there is variation in characteristics linked to program quality. The Early Learning Scale (ELS), an authentic, longitudinal measure of children's progress in three domains--Math/Science, Social-Emotional/Social Studies, and Language/Literacy-- assesses preschoolers in West Virginia Universal Preschool (WVDE, 2012). Authentic assessments are observational assessments that track children's growth and development through observation of their achievements in

real world settings (Worthham, 2012). Authentic assessments can be used to inform teachers during the instructional process, and to identify children in need of additional supports. Authentic assessment is particularly appropriate for young children because young children are not reliable test takers (Kostelnik, Soderman, Whiren, & Rupiper, 2015).

The aim of this study is to explore the relationship between preschool growth on the Early Learning Scale (ELS) and the interplay of child and site characteristics in West Virginia's universal preschool program. The study has four main objectives:

- to explore the relationship between student characteristics and preschool growth on the ELS. Student characteristics include rural/ non-rural, socio-economic status, attendance rates, gender, minority status, special needs, and native language;
- to explore the relationship between site type and preschool growth on the ELS. Site types are Head Start, collaborative, or public; and
- to explore the relationship between site characteristics and preschool growth on the ELS. Site characteristics include rural/ non-rural, teacher credential, assistant teacher credential, teacher employer, level of collaboration, hours of instruction, mean SES, licensed/ non-licensed.
- Additionally, the study will look at the interplay of the student and site characteristics identified in objectives 1-3 in relation to preschool growth on ELS.

Background of the Study

In a monograph on the state of preschool policy in the United States, Pianta, et al. (2009) described the current national situation as “stunningly” varied and unequally delivered, stating:

Current public policies for childcare, Head Start, and state Pre-K fail to ensure that most American children attend highly effective preschool education programs. Some attend no program at all. Others attend educationally weak programs. Children in families from the middle of the income distribution have

the least access, but coverage is far from universal even for children in poverty.... Increased public investment in effective preschool education programs for all children can produce substantial educational, social, and economic benefits, but only if the investments are in programs in which teaching is highly effective. (2009, p. 50)

Most states provide limited publicly funded preschool; children attend a patchwork of publicly and privately funded childcare and Head Start settings. The type of care a child receives is related to both SES and geographic location (Forry & Walker, 2011). There is discussion, both in the field of early childhood and in the political arena, on the necessity and appropriateness of publicly funded universal access to preschool. High quality early childhood education can enhance long-term educational outcomes for children, narrow the achievement gap upon school entry, and provide lasting social and economic benefits (Campbell and Ramey, 1994, 1995; Ramey & Campbell, 1984, 2004; Heckman, Moon, Pinto, Savelyev, & Yavitz, 2010; Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005; Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Schweinhart, Barnes, & Weikart, 1993; Reynolds, & Temple, 1998; Reynolds, 1994; Reynolds, Temple, Robertson, & Mann, 2002; Reynolds & Robertson, 2003; Temple, Reynolds, & Miedel, 1998). Concerns remain over further institutionalizing childhood, limited assurance of quality, and high cost (Elkind, 1987; Shankler, 1987; Zigler, 1987; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2005). The institutionalization of childhood refers to the concern that children play less, have less independence, and are more protected and observed by adults relative to prior generations of children.

West Virginia Department of Education Policy 2525 (WVDE, 2012) the policy that provides universal access to all 4-year olds in the state through a combination of childcare, Head Start, and public school services under the coordination of public schools, was approved in January 2003. The policy addresses all aspects of the preschool education program including personnel qualifications and salary, curriculum, collaboration, funding, program delivery, and minute aspects of teaching including banning the use of specific instructional material. It has created a unified and complex system of care and education that serves 80 percent of 4-year olds in the state (WVDE, 2012). This study will explore West Virginia as a case of one state's approach to providing publicly funded universal preschool from a critical policy analysis perspective. In critical policy analysis, policy is not only reported but also evaluated in terms of the values it reflects with a social justice perspective (Eppley, 2009). Through this lens, the following section examines how the state's Universal Pre-K policy works for or against the children, families, and schools in the state.

WV Policy 2525 (WVDE, 2012)

WV Policy 2525 (WVDE, 2012) requires that "every eligible child... has access to a high quality WV Pre-K classroom that meets or exceeds all of the requirements of this policy" (WVDE, 2012, p.5). This policy does not define high quality and includes wide variation in some indicators of quality. For example, programs must be available at least 12 hours a week and no more than 30 hours a week during the school year for a total of 108 school days per year, including six days for home visits. Total hours of preschool for the year could range from 1296 hours to 3270 hours. There is research indicating that full-day participation in Head Start and kindergarten results in greater academic success

for children as compared to half-day (Administration for Children and Families, 2003; Gullo, 2000; Robin, Frede & Barnett, 2006). There is a need for further study on the impact of hours in preschool per week on preschool outcomes (Riley-Ayers, Jung & Frede, 2010).

Since the development of a universal system required the union of existing agencies, seats are provided through collaboration between three types of sites: public, Head Start, and collaborative sites. Counties must provide a minimum of 50 percent of the seats in community sites (Head Start and collaborative sites). Site type is a source of great variability in traditional indicators of quality. Each site historically has unique personnel requirements, pay, and quality assurances, some of which have continued to remain unique in the WV Universal Pre-K model. For example, West Virginia Department of Health and Human Resources licenses childcare centers and off site Head Start facilities, requiring them to meet a set of criteria for health and safety, nutrition, and curriculum while public sites are not held accountable to this set of regulations. Public school preschool teachers must hold a bachelor's degree and certification in Pre-K/K while teachers in community collaborative sites and Head Starts do not. Public school preschool teachers are paid according to the state salary scale while collaborative and Head Start teachers are paid according to their own program scales. Head Start is monitored locally and federally according to its own standards, including standards that guide pedagogy, which stand apart from those required by public and collaborative sites.

Rurality

The State of West Virginia offers a unique context for examination of policy that might inform policy in other states, particularly rural ones. Families across the United

States struggle to find and afford high quality early care and education. Compounding issues of access for families in West Virginia is the state's geography. Although West Virginia has a few populous places, it is predominantly rural; more than half of West Virginia's population lives in a rural area (US Census, 2010). Additionally, more than half of the schools in West Virginia are in rural areas and 37.6 % of West Virginia's children attend a rural school (Rural School and Community Trust, 2011). West Virginia's geographic landscape may be the reason for its largely rural nature. West Virginia is the only state situated completely in the Appalachian region; it is nearly entirely mountainous and the region is extremely rugged. Simply establishing an infrastructure to allow easy movement across the state presents a challenge.

Poverty

West Virginia is not only marked by its rurality, it is also unique in its high poverty rate. West Virginia is the second poorest state in the nation as measured by both per capita income and median income with 20% (over 36,000) of its children living in poverty (Kids Count, 2011). According to Kids Count ratings, West Virginia ranks 44th out of 50 states based on 10 key measures of child well-being (2011). Poor children have traditionally been the focus of targeted programs. West Virginia's Universal PreK program may increase participation for underserved children or may offer benefits that a targeted program cannot; further research is needed.

Inequity

In a review of the literature on inequity in early childhood education nationally, Kagan (2009) finds multi-dimensional inequity in the current national structure- a "non-system" (2009, p.13) she deems more a marketplace than system:

Inequity pervades early childhood education, seriously restricting who has access to services, the quality of the services themselves, the quality and competency of those who teach young children, the nature and application of regulations, the quality and thoroughness of the expectations and standards that guide pedagogy and instruction, and the amount and distribution of resources.

While confirming socioeconomic status and race as predictors of inequity... state, regional, and programmatic inequities are also serious and ubiquitous. (2009, p.6)

The current study examines factors related to possible inequity in West Virginia's Universal Preschool program, including socio-economic status and geographic location.

In the quote above, Kagan (2009) identifies six dimensions of inequity in the national picture:

- Access
- Quality of Programs,
- Quality and Competency of Teachers and Caregivers,
- Nature and Application of Regulations,
- Quality and Thoroughness of Expectations and Standards, and
- Amount and Distribution of Resources.

In the following section, I will describe how WV Policy 2525 (WVDE, 2012) promotes or mitigates inequity in the state's preschool program in relation to these dimensions. I will identify strengths, weaknesses, and gaps in the literature on West Virginia's Universal Preschool in relation to inequity within the policy.

Access. The first dimension of inequity in Kagan's model is Access (2009). Historically, access to early care and education is linked to social class because higher quality childcare programs cost the most. Currently, wealthy families and poor families qualifying for targeting programs tend to have the best access, while middle class

families have difficulty affording high quality early care and education for their children (Barnett, Husted, Robin, & Schulman, 2004). In addition, targeted programs for low SES children often fall short of meeting their target populations (Gilliam & Ripple, 2004). West Virginia's existing universal program increases access to preschool (Cavalluzzo, Clinton, Holian, Marr, & Taylor, 2009; Geraghty, Holian, & Gyekye, 2012)

Quality of Programs. Program Quality is a second dimension to Kagan's (2009) model for examining inequity in early childhood. Preschool program quality is a concept that is difficult to define, quantify, and measure. It includes both structural dimensions and process dimensions (Pianta, 2003). The literature suggests West Virginia is faring well on measures of structural quality. Eighteen states' public preschool programs meet more than eight of ten National Institute for Early Education Research quality checklist criteria for preschool. These ten indicators are: early learning standards, teacher degree, teacher specialized training, assistant teacher degree, teacher in-service, maximum class size of fewer than twenty, staff child ratio of 10:1 or better, screening referral and support service, meals, and monitoring. West Virginia meets eight of the ten indicators and ranks fifth nationally in access for 4-year olds (NIEER, 2012).

West Virginia's program characteristics in relation to other definitions of quality remain unexplored in the literature. Other definitions of program quality, such as the foundation of the assessment scale called Classroom Assessment Scoring System (CLASS, 2014) focus less on structural dimensions like those measured by NIEER (2012), and more on process criteria including responsive teaching (Pianta, 2003). WV Policy 2525 (WVDE 2012) includes explicit direction on specific classroom practices such as managing difficult behaviors, including a class pet, working with families, using

passive media, and the use of learning centers. It does not include specific guidance concerning child-teacher interactions, relationships, and other process criteria as recommended by Pianta (2003). Process quality is comprised of social, emotional, and physical elements of interactions between teacher and child, both individually and on the classroom level, which are related to program quality and child outcomes. The best way to assess process quality is through classroom observation (Pianta, 2003).

Still other definitions of quality exist. For example, the National Association for the Education of Young Children (NAEYC, n.d.) accredits programs for young children based on a different set of ten criteria spanning structural and process dimensions: relationships, curriculum, teaching, health, assessment of child progress, teaching staff, families, community partnerships, leadership and management, and the physical environment. Another source of program quality criteria is the ECERS-R (The Early Childhood Environmental Rating Scale), a well-established assessment of preschool quality (Harms, Clifford, & Cryer, 1998). WV Policy 2525 (WVDE, 2012) has previously required that classrooms be assessed using the ECERS-R yearly by a team of three observers including at least one WV Experienced ECERS-R Evaluator (with training and experience). Use of the ECERS-R has allowed assessment of process quality, specifically using the criteria included in the Teaching and Interactions and Provisions for Learning subscales. County plans for professional development were based on the county mean results of these scores in a system. Byard (2009) referred to the county plan as “fragmented” with “arbitrary” topics after an exploration of statewide professional development for preschool teachers. A 2012 revision to WV Policy 2525 (WVDE, 2012) requires the ECERS-R be completed only once every three years by a

team of two observers and that counties should assess classrooms as they choose in alternate years, basing their local professional development plans on these individually designed assessments. Examination of program quality including scores on CLASS, ECERS, and NAEYC criteria is needed to improve understanding of West Virginia Universal Pre-K.

Quality and competency of teachers and caregivers. Kagan's (2009) next dimension of inequity, Quality and Competency of Teachers and Caregivers, is another area in which there is a gap in the literature related to West Virginia's Universal Preschool program. Early childhood educators' professional development is related to the quality of the programs in which they teach (Bowman, Donovan & Burns, 2000; Saracho & Spodek, 2007). Children enrolled in programs employing better-educated teachers have better social, language, and cognitive skills than those enrolled in programs employing less-well educated teachers (Saracho & Spodek, 2007). Higher educational attainment of early childhood teachers is linked to use of activities that motivate children and providing easy-to-follow instructions (de Kruif, McWilliam, Ridley, & Wakely, 2000). Better-educated teachers are able to help children build on their current abilities and prior knowledge (Howes, 1997). Teachers with a bachelor's degree are more sensitive and provide more language related experiences than teachers with lower educational attainment (Howes, James, & Ritchie, 2003). Teachers who attended an early childhood teacher preparation program have stronger knowledge of teaching practices and child development (Bowman, et al., 2001). A bachelor's degree with focus on early childhood education is the recommended minimum for all teachers of young children (Bowman, et al., 2001). Despite this research, many children have preschool

teachers with an associate degree or less. Nationally, children from higher SES homes are more likely than middle and low SES children to attend classrooms with better educated, better compensated, more sensitive, and more stable teachers (Phillips, Voran, Kisker, Howes, & Whitebrook, 2004). In West Virginia, the quality and competency of teachers and caregivers is linked to site type. West Virginia's Policy includes multiple exceptions to the state requirement of a minimum of a bachelor degree as outlined in the following section on the Nature and Application of Regulations (Kagan, 2009). An exploration of the actual distribution credentials of West Virginia's universal preschool teachers will be possible in this study.

Currently, West Virginia's preschool teachers' educational attainment is more likely linked to the site type's traditional requirements. Head Start's requirements for lead and assistant teachers have increased incrementally in recent years. A mandated 50% of lead teachers nationally must hold a bachelor degree or higher in early childhood education or a related field with experience in early childhood, a goal that was met in 2011, when 57 % of lead teachers nationally held a bachelor degree. Childcare centers in West Virginia require one of the following as a minimum educational attainment for teachers:

- West Virginia Training Certificate in Early Care and Education (WVTCECE) which is comprised of 120 hours of training across several field specific content areas,
- The Child Development Associate plus 300 hours of experience or 12 college credits, or
- Two years of experience (WVDE, 2012).

Those centers affiliated with WV universal preschool program must meet the criteria outlined in the following section on the Nature and Application of Regulations

(Kagan, 2009). Public school teachers must hold a minimum of a bachelor degree and certification in birth to five, preschool, preschool special education, or elementary education with Pre-K specialization. To meet certification standards, these teachers must pass a standardized test related to their knowledge and competencies in the field and complete supervised student teaching according to state regulations (WVDE, 2014). An exploration of the actual distribution credentials of West Virginia's universal preschool teachers will be possible in this study.

Nature and application of regulation. Kagan's (2009) next dimension of quality, the nature and application of regulation, is illustrated well by the educational attainment alluded to above. As indicated by a footnote in NIEER's report, "Beginning August 1, 2013, all newly hired teachers in nonpublic school settings will be required to have a minimum of a B.A. (NIEER, 2013 p. 143)". While policy may be in place to ensure this indicator will eventually be met in the future, in practice, it is not yet met. The personnel section of WV Policy 2525 (WVDE, 2012) is four and a half pages long because of the numerous exceptions it makes to its Bachelor's Degree requirement. Many collaborative and Head Start teachers have been granted Permanent Authorization for Community Programs based on teacher's employment in a center or Head Start and their completion of the equivalent of six courses in early childhood education designated by the state. Further provisions are in place for a Temporary Authorization for Community Programs granting three years to complete the required coursework for those who have not enrolled. An additional extension is available to teachers who do not meet this deadline but have completed two courses. Further, WV Policy 2525 (WVDE, 2012) states that those granted temporary or permanent authorization continue to be

credentialed after August 31, 2013; under-qualified teachers have been grandfathered into the current system. It will be many years before West Virginia has a workforce that has either a bachelor's degree in Early Childhood Education or six courses of specialized training (due to the many exceptions to the rule allowed by the policy). Even the revised policy that began August 31, 2013, to guarantee that all teachers have a bachelor's degree, is weakened by exceptions allowing similar authorization for under-qualified teachers.

These exceptions were likely necessary compromises for policymakers considering two issues: workforce and salary. First, consider West Virginia's workforce. Like other rural places, there are fewer adults with higher education than in non-rural places. In fact, West Virginia has fewer adults with a bachelor's degree or higher than any other state and the highest percentage of adults with only a high school level education (Education Sector, 2012). Byard (2009) noted that programs of higher education in West Virginia graduated approximately 75 early childhood teachers in 2008-2009 to fill an anticipated 2000 new early childhood educator jobs created by 2012-2013. This study will provide insight into the distribution of teachers with varying educational credentials.

Quality and thoroughness of expectations and standards for pedagogy and instruction. (Kagan, 2009) The next dimension in Kagan's model for describing inequity is an area of strength in WV Policy 2525 (WVDE, 2012) where there is no apparent inequity in the policy. All sites in WV Public Preschool are accountable to state regulations for preschool. Curriculum is uniform to a degree—programs may select from High/ Scope, Creative Curriculum, and High Reach curricula. All sites use a

developmentally appropriate uniform assessment, the Early Learning Scale (ELS). All programs are evaluated regularly with site visits every 3 years and professional development is designed to target specific areas of need (WVDE, 2014). Still, variation between sites exists. Childcare centers and Head Start sites housed outside of public school grounds are accountable to child care licensing regulations while public sites are not. Licensing includes health and safety regulations. Likewise, Head Start sites are accountable to the federal and local guidelines for their programs.

Amount and distribution of resources. This dimension of Kagan's framework (2009) is another area where inequity may be present in West Virginia's Universal Program. Concern for declining enrollment was a factor in the expansion of the public schools into the pre-primary years in West Virginia. WV Code 18-5-44 (2013) includes the following explicit wording regarding the use of preschool as a means to support counties with declining enrollments:

(6) Excluding projected increases due to increases in enrollment in the early childhood education program, projections indicate that total student enrollment in West Virginia will decline by one percent, or by approximately 2704 students, by the school year 2012-2013;

(7) In part, because of the dynamics of the state aid formula, county boards will continue to enroll four-year old students to offset the declining enrollments;

(Early childhood education programs, §18-5-44, 2013)

Increasing headcount by enrolling preschoolers in public school brings funding to West Virginia's public schools as the state's declining population presents schools with serious budget challenges. A complexity of the funding picture is the ways counties

distribute funds between the agencies delivering preschool. The participating agencies create a county specific plan, and the public schools oversee the county implementation of the plan. School funding is an admittedly complex system and understanding how WV Policy 2525 (WVDE, 2012) fits into West Virginia's overall funding system is beyond the scope of this project.

WV Policy 2525 (WVDE, 2012) currently has a provision that:

...when the county school system includes the eligible children attending in an approved contracted community program in the count for the school aid funding formula, a portion of the money generated by the formula must be used through the contractual agreement to insure that the requirements of this policy are met and adhered to for the length of the contract. (WVDE, 2012, p.8)

The policy includes additional wording referring counties to the directive provided by the State Superintendent on the use of this money (WVDE, 2013). This document indicates that FTE is determined by hours of instruction in Pre-K. The updated policy currently available for public comment shifts the wording of this section slightly:

Each LEA shall enroll Pre-K children in community classrooms and generate funding through the school aid funding formula according to the process and criteria established in the May 28, 2008 WV State Superintendent's Guidance document. Funding generated through community classrooms should be invested in providing quality early education services and local infrastructure to support WV Pre-K classrooms. (WVDE, 2013, p.28).

Further research to gain a deep understanding of how funding is equitably distributed for preschool children in West Virginia's Universal Pre-K is needed.

Statement of the Problem

There is potential for inequity in the delivery of public preschool in West Virginia. Because of programmatic and district based discrepancies in the delivery of the preschool by site, there may be unintended variation in program quality that could impede the opportunity for a fair and equitable education. Examples of characteristics of sites related to quality that may vary include teacher educational attainment and hours of instruction. Additionally, site type and the degree of collaboration between sites provide additional elements of variation that may affect child outcomes. A second dimension of particular concern in this research are two related subgroups of children, rural children and poor children, who tend to be less ready for school than peers and thus stand to gain the most from a high quality early care and education experience.

This study seeks to understand:

- Is there a relationship between preschool growth and subgroups of students (i.e., rural/non-rural, minority/non-minority, low-SES/high SES, low attendance/high attendance, male/female, native English speaker/non-native English speaker)?
- Is there a relationship between preschool growth and types of sites (i.e. Head Start/public/collaborative)?
- Is there a relationship between preschool growth and site characteristics (i.e. rural/non-rural site, teacher credential, assistant teacher credential, teacher employer, level of collaboration, hours of instruction, mean SES, licensed/non-licensed)?
- Are there site characteristics that better predict preschool growth for subgroups of children? For example, are sites with greater hours of instruction associated with greater preschool growth for rural children?

Significance of the Study

Early childhood education is touted as a potential solution to society's ills ranging from the achievement gap to poverty and crime to high school graduation rates (Heckman, Moon, Pinto, Savelyex, and Yavitz, 2010). Historically, publicly-funded

preschool programs have targeted at-risk populations with mixed results documented in the literature (Resnick, 2010; Head Start, 2014). Because they are relatively new, programs offering universal access provide largely unexamined territory in the literature. This examination of universal preschool in West Virginia may provide insight into how the interaction of child and program characteristics are related to variation in ELS growth, especially for rural and poor subgroups of children; therefore more effective and appropriate matches between program characteristics and these subgroups of children can be made. Additionally the study will focus on program characteristics related to quality, which may contribute to the field's definition and quantification of this concept. An overarching interest in equity frames the study, allowing results to inform a broader discussion of universal access and equity in preschool education.

There is a movement toward providing universal access in other states and the topic is in the forefront of the national discussion on early childhood public policy (Resmovits, 2013). Still, few studies have been done, so little is known about the effects of these policies. This study could inform policy makers, families of preschoolers, and early childhood professionals about the potential benefits and pitfalls of the approach to universal access being taken in West Virginia. The study may inspire further research related to child outcomes, long-term societal impacts, school funding, and public policy. Most importantly, this study could impact the early education and care experiences of West Virginia's young children, especially those who are rural and/or poor.

Delimitations

Subjects will be included in the study if they are enrolled in the 2012-13 school year in WV public preschool, because attendance in universal preschool is not

compulsory and four years old between September 1, 2012 and September 1, 2013.

The second designation is necessary because WV public preschool also serves 3-year olds with IEPs and, occasionally children who repeat preschool when they are 5-years old. These preschool children will not be included in the study. The inclusion of these students would be problematic because it would introduce greater differences in growth that are age related.

The population being studied limits the generalizability of the study. Although the results will generalize perfectly to the population of 4-year olds in West Virginia's universal preschool for 2012-2013 due to the use of population data, the results could generalize less well to a broader population of preschoolers because random sampling was not employed. The population could be considered a large convenience sample of West Virginia preschoolers over time but even this is problematic because their context of their experiences, such as state policy, changes from one year to the next. In addition, since participation in WV Universal Preschool is voluntary, the group does not represent all 4 year olds in the state. There may be commonalities between those who do not choose to participate. For example, parents who live near Washington DC and commute via train may select preschool providers near their place of employment.

The study will employ ELS baseline and growth sum scores as a measure of student baseline and growth in the preschool year. Domain scores are also calculated but will not be included in the current results.

Limitations

A limitation is the measurement of the dependent and independent variables. Because ELS (Early Learning Scale) is an observational assessment completed by the

child's teacher, there may be issues with assessor bias. Assessing young children is inherently problematic as young children are not reliable test takers and a relationship with the assessor is ethically necessary. ELS may prove a much-needed tool for comprehensive appropriate observation and assessment of young children using a scale with favorable reliability and validity (Snow & Van Hemel, 2008). In West Virginia, training for reliability on use of the tool is required and a minimum reliability score is required for independence with the assessment (Harless, 2011). ELS known reliability and validity reveals comparable reliability and validity to other tools used to assess early school readiness (Riley-Ayers, Jung, and Frede, 2010).

Further, the study relies on data entered into state databases for independent variables, which may be flawed due to human error, inconsistency among those entering the data, or problems with technology. Onsite visits are required to confirm data reported in the ELS database, which provides increased confidence in this data. Additionally, efforts will be made to test these results against outside data to increase accuracy in addition to a careful and systematic examination and cleaning of this data. It is my expectation that the data will be available and usable based on communication with WVDE prior to the beginning of this study.

Definition of Terms

Collaborative Site: A publicly funded preschool site in a traditional childcare center. Licensed by West Virginia Department of Health and Human Resources and subject to WV Policy 2525 (WVDE, 2012) guidelines for universal preschool during hours designated for West Virginia Universal Preschool by the county. Physically in childcare center, church, or other childcare site.

Head Start: A publicly funded preschool site receiving Head Start funding, subject to Head Start regulations and WV Policy 2525 guidelines for universal preschool during hours designated for West Virginia Universal Preschool by the county; a targeted preschool program designed to serve children in poverty. Head Start sites in West Virginia were traditionally housed in independent buildings but are increasingly housed inside public schools in collaboration with public schools.

Poverty: This study uses free and reduced lunch qualification as criteria for assessing low SES. Students are grouped into low SES and non-low SES based on their enrollment in free and reduced lunch.

Preschool Growth: ELS is administered multiple times over the school year. Multiple measures on a single scale can be used to examine growth. The change over time is the focus of the measure.

Public Site: A publicly funded preschool site housed in a public school building, subject to WV Policy 2525 guidelines for universal preschool and staffed by a teacher meeting NCLB highly qualified guidelines.

Program Quality: A set of criteria and traits associated with positive outcomes for young children. Licensing regulations, curriculum, and Head Start guidelines are based on program quality. WV Policy 2525 includes elements of program quality. Common measures of program quality include ECERS-R, CLASS, NAEYC Program Accreditation criteria.

School Readiness: West Virginia's Office of School Readiness defines school readiness as an expectation that schools are ready for the diverse knowledge, skills, and abilities of children entering kindergarten by the defined entry date. The term also more traditionally

refers to a complex conception of the social-emotional, physical, and cognitive qualities that children who transition to school with ease possess. School readiness is associated with academic and social skills needed to be able to participate in academic work in kindergarten.

Targeted Preschool: Publicly funded preschool that is targeted to subgroups of preschoolers identified as at-risk for later difficulty in school.

Universal Preschool: Publicly funded preschool that serves all children meeting an age criteria.

Chapter 2: Review of the Literature

The purpose of this review of the literature is to describe both the current and historical context of publicly funded early childhood education and to situate the study in the existing literature on the effects of preschool, especially on children from at-risk rural and low-SES subgroups. This review will begin with the problems associated with inequity in early childhood experiences in the United States. The subsequent section will provide a background of the history of public support for early childhood care and education as a means to address poverty and meet the needs of at-risk children. Next, the chapter will outline both sides of the related debate over universal preschool versus targeted preschool as a means to address these issues. A discussion of the body of literature regarding existing universal preschool programs will be followed by a discussion of inequity in program quality, a critical component to effective early intervention for at risk children.

Children in the United States have unequal and inequitable experiences, opportunity, and outcomes that are linked to their socio-economic status, race, home language, and geography (Kagan, 2009). This section will explore the dimensions of inequity in early childhood most relevant to the current study that have driven movements throughout the nation's history to address inequity through publicly funded early childhood education. This section will also discuss gender, race, ethnicity, and home language, because they are major sources of inequity in the lives of children in the United States, although West Virginia's relatively homogeneous population make these areas less of a focus for the current study.

Socio-economic Status

Despite disagreement about solutions, there is little debate over the effect of poverty on academic, social, and economic outcomes. Poor children face a host of challenges including emotional and social challenges, acute and chronic stress, cognitive lags, and health and safety issues that are less frequent, overlapping, and pervasive for their higher SES peers (Jensen, 2009). These challenges are interrelated and multifaceted with one factor often compounding and exacerbating another. The correlation between social class and academic success in early childhood is well documented in the literature (van Ijzendoorn, Vereijken, Bakermans-Kranenburg & Riksen- Walraven, 2004) and is a central issue facing the field of education broadly. Low-SES is associated with long-term problems such as high dropout rates, increased crime, and lower achievement on standardized tests. This phenomenon is called the achievement gap. SES accounts for more of the achievement gap between white middle and upper class children and their minority and low SES peers than any other factor (Engle & Black, 2008).

There are clear indications that the ongoing problems associated with poverty begin well before the kindergarten year, as evidenced in disparities in vocabulary which are detectable as early as age 18 months and which grew greater as children aged (Hart & Risley, 1995). Children from highest-SES homes score significantly higher than lower-SES peers on measures of academic ability before kindergarten. In the Early Childhood Longitudinal Study- Kindergarten Cohort (ECLS-K), the highest SES children scored 60 percent higher than the lower SES group (Lee & Burkam, 2002). The lasting achievement gap apparent between higher- and lower-SES students might be attributed to early childhood experiences, including inconsistent or poor attachment with caregivers,

lack of safe and predictable environments, lack of reciprocal interactions in infancy, lack of rich and stimulating activities, high stress, and lack of protective factors which support resiliency, such as strong relationships with adults and peers (Jensen, 2009).

Equity issues affect both poor and middle class families. Enrollment in preschool is closely linked to family income. Children growing up poor were less likely to go to preschool than highest SES children, although poor children are most likely to benefit from it (Bainbridge, Meyers, Tanaka, and Waldfogel, 2005). However, because of the availability of high quality targeted programs such as Head Start, families with incomes from \$20,000- \$50,000 a year were least likely of the three income levels to enroll their children in preschool since they do not qualify for targeted preschool programs and cannot afford highest quality private programs (Barnett and Yarisz, 2007).

Rurality

Rural poverty is consistently rising (Joliffe, 2004). Rurality and poverty are closely related and the factors that place rural children at risk are inseparable from poverty, although rurality complicates the issues associated with poverty, with some effects being compounded and others mitigated by rurality. Rural areas have more single parent households and families often have less access to programs that support poor families, due in part to issues with transportation (Whitener, Gibbs, and Kusmin, 2003). Rural children were less likely than non-rural children to have a parent who holds a bachelor's degree and half as likely to have a household income above \$75,000. Rural children, then, were more likely to come from a low socio-economic status (SES) background and thus face the challenges described above.

Grace, Zaslow, Brown, Aufseeser, and Bell (2011) found differences in the early childhood experiences of rural children compared with non-rural children in an analysis of data from the ELCS-B database. Their research indicates that children from rural areas were less prepared for school than their urban and suburban counterparts. Rural children were 15 percent less likely to begin school with early literacy skills fundamental to learning reading and 50 percent less likely to possess beginning sound recognition-- a strong predictor of later literacy-- than urban and suburban children. They are also 60 percent more likely to require special education than non-rural children (Grace et al., 2011). In light of research relating positive parent discipline styles to higher vocabulary (Hart & Risley, 1995), family characteristics may shed light on the disparities in school readiness for rural children. In the ELCS-B analysis, rural children's parents were less likely to use positive parenting than non-rural children's parents do, and were more likely to be spanked frequently. Spanking was more likely even in higher income households in rural areas than non-rural (Grace, Zaslow, Brown, Aufseeser, & Bell, 2006).

Race, Ethnicity, and Home Language

Because of the racial and ethnic homogeneity of the population of West Virginia, race, ethnicity, and home language are less central to the study, although these factors will be included in the data analysis. Race and ethnicity, like rurality, are inextricably linked to poverty in the United States. Lee and Burkam (2002) found that black and Hispanic students scored much lower than their white peers did on academic preparedness tests at kindergarten. Black students scored 21 percent lower on math achievement than whites while Hispanic students did not fare much better, scoring 19

percent lower than white students. Children who speak English as a second language face lower academic proficiency than English proficient peers and the gap widens over time (Pew Research Hispanic Center, 2008). Children with limited English proficiency are less likely to attend preschool than their peers despite indications of the benefits for these students (Rumberger & Tran, 2006)

Gender

An achievement gap between boys and girls has been documented since the 1970s (Levy, 2014). Although interpretation of it has varied, with some researchers focusing on grades, which favor girls across all grades and other researchers examining standardized tests, which favor girls in reading and boys in math and science, with variation between grades. The effects of being male on school success appear to be moderated by other factors, such as socio-economic status (Alexander, Entwisle, & Olsen, 2007). Although some have discounted this achievement gap based on adult male's advantage in income and employment in high-income-earning fields, the lifetime effects of the divide are evident in many areas. The effects are seen in incarceration rates (Bureau of Justice Statistics, 2014), unemployment rates (Bureau of Labor Statistics, 2014), life expectancy (Population Reference Bureau, 2013), and educational attainment (Snyder & Dillow, 2012). These characteristics are related to the achievement gap (Langham, 2009). Kraemer (2000) revealed that boys are worthy of special attention from conception throughout their lives, documenting their vulnerability from their higher incidence of birth defects and disabilities to behavioral and developmental disorders. This gap between men and women has grown so wide that writer Hanna Rosin (2010) posited that

the compounded effects of the gender gap may lead to what she refers to as the “end of men,” with women increasingly becoming the dominant gender.

Young boys are more likely to be identified as having special needs, more likely to be expelled, more likely to be retained and to delay entry into kindergarten (Buchmann, DiPrete, & McDaniel, 2008). Boys are increasingly excluded from preschool programs due to behavior problems, at a rate five times more frequently than girls (Gilliam, 2005).

Gilliam (2005) analyzed data nationally indicating that 97% of preschool teachers are women, reflecting the dominance of women in the profession. Materials are often selected that are of less interest to boys than girls. Teaching strategies are often geared toward girls’ approaches to learning (Alexander, Entwisle, & Olson, 2007). Assessments are primarily language oriented, favoring the linguistic strength of girls. Teachers may overestimate girls’ abilities based in part on their behavior, not their understanding (Robinson & Lubienski, 2010).

Children in the United States growing up in at-risk subgroups including low-SES, boys, rural, racial or ethnic minority, or those who speak English as a second language, face challenges that impact their academic, social-emotional, and economic outcomes. The outcomes are linked to poverty and intensified by other factors. The effects of poverty are persistent and have life-long impacts (National Center for Education Statistics, 2009) but have been improved through intensive intervention in highly controlled randomized trials on the effects of preschool education (Ramy & Campbell, 1984; Schweinhart, et al, 2005; Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Schweinhart, Barnes, & Wikart, 1993; Reynolds, 1994; Reynolds &

Robertson, 2003; Reynolds & Temple, 1998; Reynolds, Temple, Robertson, & Mann, 2002 ; Reynolds & Robertson, 2003). Long before the potential for preschool to mitigate the impact was documented, programs have been introduced to address inequity in early childhood in the United States. The following section will explore this history to provide a backdrop for the subsequent discussion of the current debate over universal access.

History of Public Funding of Early Care and Education

Although politicians may promote publicly funded early care and education as new ideas, the history of advocacy for public programs for young children in this country began far before the current movement. As the following section will outline, the historical push for publicly funded early care and education has come in several distinct waves of support, each wave responding to the need for working parents to have care for their children and each using the potential of the policy for addressing poverty and its associated problems as a motivating force for promoting the policy. A discussion of current trends in public policy related to universal access to early care and education is incomplete without first developing a backdrop for the discussion based on the long history of the education and care of young children in the United States including historic movements toward publicly funded programs, and the successes and pitfalls of those efforts. The following section will present this history and examine the research that has informed policy and practice in the field.

Although as early as the mid-1600's, parents often sent young children with siblings to school if their children's teacher allowed it (Vinovskis, 2005), public early care and education policy's first real wave of support came in the early 1800's, beginning with the introduction of Robert Owen's infant schools, which originated in Great Britain

as a childcare option for parents working in cotton mills. The schools were intended to develop children's character through teaching and the environment and ultimately were designed to move society toward a utopian ideal (Morrison, 2011). Owen's first infant school provided night school for parents to address problems for the children associated with their parents' limited education. The schools enrolled children as young as eighteen months for active instruction. In 1830, Boston public schools were petitioned by a group of advocates to incorporate infant schools into the public system. Primary teachers were opposed citing difficulty with management of children who had attended the programs and expert advice against excessive stimulation of young children. The proposal was ultimately defeated (Vinovskis, 1995).

This defeat came at a time when the perception of women in society was changing. Because of the Victorian Fireside Education Movement-- , which placed Victorian women in the center of, home and family by virtue of "God-given" traits including nurturing, intuition, empathy, and morality-- by the mid-1800's, women in the home began to be seen as the primary source of education. Although many women needed to work outside the home, this image dominated cultural expectations of mothers; so, the infant schools' popularity waned and public schools did not serve children younger than 6 years of age (Spodek, 1988). The need for children to be cared for outside of the home remained unfulfilled by a public program.

The next wave of support for public education of young children in the United States was the kindergarten movement, which led the way for 5-year olds to enter publicly funded schooling. Kindergarten, meaning "garden of children" in German, was conceived by Friedrich Wilhelm Froebel as a means through which young children could

learn about the world through facilitated play. Froebel's ideas were brought to the World's Fair in Pennsylvania in 1876 in the form of a demonstration classroom populated by orphans and taught by Ruth Burnt of Boston (Morrison, 2011). The kindergarten curriculum was radically different from traditional education. In kindergarten, play and exploration were at the center of the classroom, in the place of lecture, reading, and memorization.

Kindergarten's widespread adoption in the United States was the result of the work of several women. In 1856, Margaret Shurz, who emigrated from Europe to the United States, opened the first kindergarten in the United States in Wisconsin based on Froebel's kindergartens in Germany. Shurz had taught in a kindergarten in England before immigrating. Her kindergarten was conducted in German (Gordon, 2014). Shurz introduced Froebel's writings to Elizabeth Peabody who opened the first English-language kindergarten in 1860 in Boston and published a book on kindergartens with her sister, Mary Mann. Peabody travelled to Germany, then brought what she learned back to the United States, and began promoting the program widely. Public support for the kindergarten became great enough that in 1873, Susan Blow established the first public kindergarten in St. Louis, Missouri. The St. Louis public schools' superintendent, William T. Harris, later became US Commissioner of Education and further spread support for the curriculum (Morrison, 2011). A shift away from absolute adherence to Froebel's teachings toward mixing ideas from Dewey's progressive education and G. Stanley Hall's scientific approach to education became the standard in the United States. Kindergarten began to blend teacher-directed activity and academic focus with play-based and child-centered ideas. Patty Smith Hill advocated for a movement toward

innovation and experimentation. Her leadership led to kindergarten reform, resulting in the curriculum of kindergarten as we know it today (Gordon, 2014).

Kindergartens became widespread as states adopted legislation to include the curriculum in the public schools. Kindergarten was, and continues to be, promoted as a solution to poverty (WestEd, 2005). This argument was largely successful in gaining the buy-in of state legislatures and the public. By 2010, only seven states did not have legislation requiring that kindergarten be provided by the public school (NCES, 2010). Still, a range of offerings exists with some states requiring compulsory kindergarten where others only offer the program. State policies also vary in hours of instruction with some states offering half-day programs while others provide full day.

Kindergarten's success in addressing the needs of at-risk children is difficult to quantify. One overarching challenge the curriculum has had since its adoption in the United States is developing an appropriate balance between child-centered play-based practice and teacher-directed and academically focused experiences. Currently the metaphorical pendulum has shifted toward the latter approach, due in part to the accountability movement that has dominated the field of education since the 1990's (Lawler and Bauch, 1988). The National Association for the Education of Young Children (NAEYC, 2001) published a position statement expressing concern over kindergarten practices that are potentially damaging to children including grade level retention, the use of screening tools and readiness tests for denial of admission, and the use of transitional classes designed to keep children out of kindergarten. Despite a basis in research indicating potential for harm from these practices, they continue commonly

and could serve as a warning to advocates of preschool in public schools of potential difficulties in marrying the two programs.

A few federally funded programs were offered in the first half of the twentieth century more in response to national crises than as a solution to poverty's effects on children but these were short-lived. The Works Project Administration (WPA) Depression Era Nurseries (1933- 1943) were established to provide work for unemployed teachers and support workers while providing parents the childcare they needed to be able to seek employment. The program was part of the New Deal, which created jobs that served the public good to put workers back to work during the Great Depression. The centers were the subject of strong public and academic support but they were closed as unemployment dwindled and the WPA ended (Cohen, 1996).

The Lanham Act (1942- 1946) provided another brief publicly funded program. This program followed WPA nursery schools immediately, providing childcare centers to allow mothers to work to support the war effort. The centers were limited to "war impact areas" and were designed to be impermanent. Their impact reached only 13 percent of children needing care; however, the program was the most comprehensive federal program for young children to date (Cohen, 1996). The Lanham supported centers closed shortly after the war ended amidst national outcry against the termination of the program but the need for childcare decreased only minimally (Lascardides and Hinitiz, 2000). Still, it would be decades before a federally funded program became available in response to the Civil Rights Movement and subsequent War on Poverty—this program, discussed in the following section—was called Head Start.

The first large-scale publicly funded preschool in the United States, Head Start, began in 1965 as part of Lyndon Johnson's war on poverty and continues to serve children and families today. The program started as a part-day summer program before kindergarten. In 1996, Head Start was expanded to offer additional full-day programs to support families faced with welfare reforms requiring full days of commitment in job search or training to receive aid. Based on the social-constructivism of Vygotsky and Bronfenbrenner's ecological systems theory, the program offers comprehensive services including education, social-emotional support, and physical and cognitive experiences. The program is built on a foundation of connection between home and family and children's early education. In recent years, emphasis has been on improving program quality through education of teachers and alignment of curriculum to state standards for early learning (Head Start, 2012). Although it is a large program, Head Start serves only 11 percent of preschool children nationally (OECD, 2006). Watson (2011) estimated that the program is serving about half of eligible children.

Efforts to provide publicly funded preschool care and education like Head Start on a national level have been proposed before. In 1971, the US House and Senate passed the Comprehensive Child Development Act of 1971 which would have made early care available to all families nationally based on the belief that child development programs are a right of all children (Cohen, 1996), but President Nixon vetoed the bill based on his conviction that the government should have limited input into the lives of young children (Hustedt, Friedman, and Barnett, 2012).

A few additional milestones in the history of the field deserve mentioning. In 1975 federal legislation, the Education for All Handicapped Children Act began a shift in

the public education of children with disabilities. Its successor, the Individuals with Disabilities Education Act (IDEA, 2004), assured a free and appropriate public education for all children with disabilities. Special education since has moved closer to inclusion with each new iteration of the law. Many targeted programs have been established to serve young children with special needs in public preschools, but they may struggle to meet the requirement for the least restrictive environment when programs do not include typically developing peers.

Early Head Start began in 1994 with the goal of extending Head Start's interventions to young children- birth to age 3-years (Head Start, 2013). The program extends the family centered practices upon which Head Start was founded to young children, providing home visits, parent education, health services, nutrition, and case management support for parents. Funding for the program has been unsteady since the beginning.

The Childcare Development Block Grant (CCDBG) program is a federal program intended to help low-income families access childcare while the adults in the family work or look for work. Families qualify based on Temporary Assistance for Needy Families (TANF) criteria and some states add TANF funds to their childcare subsidies to increase the available funds. The fund is designed to serve children up to age 13 and age 19 for children with disabilities. These funds are also used to improve quality for infant and toddler care. A major criticism of this funding plan is that it does not provide adequate program quality standards and regulations since it is designed to meet parents' need for childcare, not to meet the care and educational needs of their children. Additionally, there is evidence that the grant may not reach the population for which it is intended, as

many more children qualify for the funds than receive them (Mezey, Greenberg, & Shumacher, 2002).

The Early Learning Childhood Challenge fund was established in 2009 to provide a competitive grant fund for the development of early learning systems within states. Modeled after the competitive Race to the Top Fund, the program pushes states to meet federally determined criteria including in creating enrollment in high quality programs, development of an integrated system of early learning programs, and assurance that assessments are developmentally appropriate.

In conclusion, this section has described the waves of support for public funding of early childhood care and education, beginning with Owen's infant schools and touching on milestones including the widespread adoption of kindergarten, the WPA nursery program, and Head Start. The next section will examine literature on the effects of preschool, beginning with two highly controlled random assignment trials, the Abecedarian study and the High Scope/ Perry Preschool project and an additional study, the Chicago Parent Child Centers Study, which used more realistic conditions than the other two studies. After a thorough review of the literature on the effects of preschool, I will examine the current wave of support for universal funding of preschool.

Effects of Preschool

The potential of preschool to address the needs of children growing up in poverty is best illustrated through three landmark studies-- Abecedarian Study, the Perry Preschool Project, and the Chicago Parent Child Centers Study--all of which revealed significant and lasting benefits for at-risk children that extended into adulthood. Further cost-benefit analysis of their results showed economic benefits to investing public money

in young children as opposed to remediation of adults. This discussion of the effects of preschool will begin with a description of these landmark studies, followed by an examination of additional literature on the effects of preschool.

Beginning in 1972, the Abecedarian study randomly assigned four cohorts of predominately African American infants (totaling 111) to intervention and control groups. The intervention group received full time, high quality educational experiences from infancy through age 5-years. Quality was assured through adult-child ratios, professional development, salaries for teachers, and individualized, play-based instruction for children. Activities included all domains of learning but particularly focused on language. The study is longitudinal with progress thus far being reported at ages 5, 12, 15, 21, and 30, although results must be interpreted with the understanding that other factors are likely contributing to differences as time passes.

The initial effect was a significant impact on cognitive development during the treatment (Ramy & Campbell, 1984). Academic and cognitive benefits continued to show a positive effect based on the intervention through early schooling (Ramy & Campbell, 1991). At age 15, these benefits were still apparent (Campbell & Ramy, 1994, 1995). Other benefits were noted in young adulthood ranging from education to occupation and social-emotional development (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002). At age 21, treatment participants were more likely to be in college (Campbell et al., 2002). The most recent data on participants revealed that the preschool group was 4.6 times more likely to complete college than the control group, were more likely to have been employed consistently, less likely to use public assistance, and had delayed parenthood longer than the control group.

The High Scope Perry Preschool Project, began in 1962 in Ypsilanti, Michigan, is another carefully controlled randomized experimental study of the impacts of preschool on at-risk children. The sample included 3 and 4-year-old children with low intellectual ability scores. The treatment group received high quality preschool for either one (the first cohort only) or two years. Results of the study have been reported incrementally over 40 years. Initially, the treatment-improved children's IQ- nearly a whole standard deviation- but this effect faded. Other benefits persisted into adulthood including improved literacy and math scores, behavior ratings by teachers, lower placement in special education, higher income, and improved graduation rates (Schweinhart, 2005; Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Schweinhart, Barnes, & Wikart, 1993). Of particular note in this study is the small class sizes- only 6 children to one adult, a ratio unlikely to be replicated in a larger scale program.

So far, this discussion has described the most widely cited studies that provide evidence of the potential of preschool to improve outcomes for at risk children. Although these results are impressive, there are justified questions about the possibilities of replicating such results on a large scale, especially considering the elements of quality assured in each of these studies. Barnett (2007) suggested that another study replicated these effects in a more realistic context with a larger number of children- the Chicago Longitudinal Study.

The Chicago Longitudinal Study was a quasi-experimental study- examined outcomes of the Chicago Child Parent Centers (CPC) programs housed within or near public schools in low-income neighborhoods. The study followed a group of low

income, mostly African American children from the CPC half-day preschool longitudinally to understand the effects of the program on academic and social indicators. The group was matched to a similar age and socioeconomic status control group of individuals of the same age who attended other early childhood programs in randomly selected schools. Reports have been provided each year while participants were in school and periodically after they entered adulthood. A feature that sets this study apart from other longitudinal studies is that the program included family and school factors as contributors to child outcomes (Reynolds, 1999).

The study showed long-term effects including higher academic performance into middle school, higher graduation rates, and lower special education placement and arrests with benefits of attendance traced into adulthood (Reynolds, 1994; Reynolds & Robertson, 2003; Reynolds & Temple, 1998; Reynolds, Temple, Robertson, & Mann, 2001). Participants had a 9 percent higher high school completion rate. Twenty percent more lived in middle or high SES neighborhoods. Twenty-eight percent fewer abused drugs and alcohol. Twenty-two percent fewer overall were arrested and 45 percent fewer high school dropouts were arrested. Twenty-eight percent fewer had been jailed. The amount of the intervention seemed to be of importance to child outcomes, as two years of treatment was associated with longer lasting benefits than one year. The CPC program followed many of the participants into the school years, providing small class sizes, comprehensive family services, and curriculum focused on language arts.

Additional studies provide further understanding of potential benefits of preschool. Lazar and Darlington (1982) completed a follow up study of participants in 11 early education studies in the late 1970s and found that early education had impact on

school competence, ability, children's attitudes, and family. The Cost Quality and Child Outcomes study (Peisner-Feinberg et al., 1999) was a longitudinal study started in 1993 to examine the influence of childcare on children's later schooling. The study took into account multiple dimensions of childcare experiences and found that high quality is associated with higher cognitive skills and social interaction from the preschool years into later schooling. The study notes an impact of childcare through second grade. The effects of poor quality were most harmful to poor children and the benefits were greatest to this group. Degree of closeness of the relationship of the child to the teacher was linked to social outcomes.

Further research that must be weighed in the discussion comes from large-scale databases. The Early Childhood Longitudinal Study (ECLS) has been the source of additional research on the effects of preschool education. Nelson (2005) compared achievement of at-risk children who attended preschool with those who did not. The study found a link between preschool attendance and higher scores in reading and math, regardless of program type. National Institute of Child Health and Human Development's (NICHD) large scale examination of childcare (Loeb, Bridges, Bassol, Fuller, & Rumberger, 2005) found that between the ages of 3 and 4.5, half of all participants were in non-maternal care for more than 30 hours a week. An analysis of the data found a link between childcare attendance and increased reading and math scores, especially for poor and middle level income children who attended more than 30 hours per week. The study also found increased behavioral problems for children who attended childcare which were greater when children began attending center based childcare prior to the age of 2 (Loeb, et al, 2005).

Studies examining the effects of preschool show potential for significant benefits for at risk children, middle class children, and society as a whole. There exists a body of research that may more closely mirror a large-scale preschool program- that regarding Head Start. The following section will explore the literature related to the effects of Head Start then will conclude with lessons for the current debate over universal access.

Research on Head Start is important since the program represents a large-scale attempt to replicate the results of the landmark studies. The body of literature related to the program's effects has been employed by both proponents and detractors to highlight its strengths or weaknesses depending on the research. Commonly cited by those opposed to Head Start is research indicating that the benefits of the program are intense in preschool but fade over time (Resnick, 2010; Currie & Thomas, 1995; Garces, Thomas & Currie, 2002; Ludwig & Phillips, 2008; Deming, 2009). For example, the Family and Child Experiences Survey, a longitudinal study of Head Start, reported significant gains in writing, social skills, and vocabulary for Head Start participants over a year of enrollment (2004). The Head Start Impact Study, a federally mandated randomized longitudinal study of comprehensive outcomes of Head Start from a representative sample of children, compared the randomly assigned experimental group (those in Head Start) to a control group who had the option to choose any arrangement other than Head Start. The study found significant cognitive and social emotional advantages linked to Head Start during the preschool experience that mostly equaled out with the control group by the end of first grade (Head Start Impact Study, 2010). By third grade, there were no consistently favorable or unfavorable impacts found (Head Start Impact Study,

2013). A limitation to the study is the limited control the researchers could ethically have over the control group of children. The experiences of the control and experimental group may have been very similar depending on the childcare arrangements made by parents of the control group children. The landmark studies on which much discussion about the effects of preschool is based – Abcedarian and Perry Preschool-- compared no-preschool group to a preschool group while this study is designed to compare Head Start to other preschool options. Similar methodological issues have been pointed out as the reason for limited evidence of Head Start’s success (Barnett, 1995).

Research on Head Start indicates that results may be differentiated by race. A study using data from NLS-CM (National Longitudinal Study Child Mother) files used siblings who were split by attendance or non-attendance in Head Start as groups. This study found fade out for African Americans but persistent benefits for whites through adolescence, which could be explained by differences in experiences beyond preschool (Currie & Thomas, 1995). Positive results were found from an analysis of the Panel Study of Income Dynamics including increased earning and educational attainment for white Head Start completers and decreased crime for African Americans. The results reveal benefits for younger siblings of Head Start completers (Garces, Thomas, & Currie, 2002). Ludwig and Miller (2006) found that Head Start is likely preventing deaths due to causes that are addressed by the program’s comprehensive services. Other studies have found that effects are not apparent in grade school but become apparent in adulthood (Garces, Thomas, & Currie, 2002; Ludwig & Miller, 2007). Although these results are promising, the preponderance of evidence related to Head Start does not support the notion that preschool can pull people out of poverty or change their IQ as was initially

promised. The disappointing results may be attributed to lower quality than is needed to produce the impacts shown the Perry and Abecedarian. It is possible that the effects of living and going to school in poor neighborhoods negate the benefits of the program (Lamy, 2012).

Universal Preschool

In the United States, families' use of early care and educational settings outside the home for their young children has shifted from an uncommon practice to the norm in a matter of decades. In 1960, just 10 percent of three- and four-year-olds attended preschool, but by 2006, 70 percent of four-year olds and 40 percent of three-year olds were enrolled nationally (OECD, 2006). Today most children begin kindergarten with prior experience in an early care and education setting (Barnett & Yarosz, 2007). Reasons for this growth in the use of childcare and education outside the home can be attributed to three main causes: increasing dual-earner households, increased single-parent homes, and increased recognition of early childhood as an important stage of human development. In 1970, 56% of married couples had a male sole provider and most males in families with two working adults earned far more than their female counterparts did (Raley, Mattingly, & Bianchi, 2006). By 2011, 57 percent of mothers and fathers were both in the workforce (US Census, 2011), presenting these families with new challenges in providing care for their young children. Single-parent homes have grown from 10 % in 1960 (Elwood & Jencks, 2004) to 35 percent in 2011 (Kids Count, 2013). Over the same decades, the ability to research the workings of the human brain have grown exponentially, resulting in increased research on the effects of early childhood experiences. This literature reveals the importance of the early years of life in

building lifelong structures and patterns for learning and interaction (Harvard National Center Developing Brain, 2013) pushing parents to seek high quality settings for the care of their young children. Both the need for childcare to support families and the need for high quality experiences to provide a strong foundation for children are often cited in current arguments for providing a publicly funded system of early care and education. Additional research revealing the impressive potential for high quality early care and education to provide economic and social benefits (Heckman, 2013) provides additional support for the movement. The following section will further outline the case in favor of adopting a policy supporting publicly funded universal preschool.

Proponents of universal access have described additional potential benefits of the policy for various subgroups of children including:

- Quality,
- Participation,
- Peer Group,
- Political Support,
- Middle Class Benefits
- Benefit to Society (Watson, 2011; Fuller, 2011; Barnett, 2011; Lawrence, 2011; Kagan & Friedlander, 2011).

The following section examines these arguments and reviews the literature related to each. One possible benefit is improved quality of the care being provided to all children. Although currently those children attending targeted programs may be assured some levels of quality based on program standards and assurances, programs outside of systems of early care and education vary widely in terms of quality. QRIS (Quality Rating and Improvement Systems) provide structure within childcare licensing to improve quality but it is up to parents to choose the quality of their child's program with many low cost programs failing to move to these higher levels on QRIS. With a central

system of preschool, measures can be put into place to continuously evaluate and improve via targeted professional development and direction of resources toward areas of weakness within programs. There are significant differences between the outcomes of Head Start participants in Oklahoma's Universal Preschool program and those achieved nationally, which could be attributed to the higher quality of the universal preschool program (Zigler, 2011).

Increased participation for children born into disadvantaged families may be another compelling argument for universal access. In an analysis of data from the National Household Education Survey, Barnett (2010) found that targeted public programs do not reach most children they intend to reach. Preschool participation among wealthy (non-targeted) families at age 3 is 80%, while participation among low-SES families who qualify for publicly funded preschool is about 40 %. A shift from targeted programs toward universal access appears to improve participation for low-SES children (Cavalluzzo et al., 2009; Geraghty et al., 2012).

Another benefit of universal access may be a shift in peer group, which could improve child outcomes based on research indicating that disadvantaged children benefit more from learning with higher-SES peers (Mashburn, Justice, Downer, & Pianta, 2009; Neidell & Waldfogel, 2008; Schechter & Bye, 2007; Sylvia, Melhuish, Sammons, Siraj Blachford, & Taggart, 2004).

Another benefit of universal access is for middle-income families. Because of the cost of high quality care, middle-income families often place their children in low-quality settings (Karoly, Ghosh-Dastidar, Zellman, Perlman, & Fernyhough, 2008) resulting in this group of children receiving the lowest quality care. Children from middle-income

families are at higher risk of dropping out of school and being retained than high SES students (Barnett, 2007). The opportunity to attend high quality publicly funded preschool may improve the quality of care for middle-income children, which may improve their later success.

Universal access seems to be more politically viable than increasing support for targeted options (Kagan & Friedlander, 2011). The policy appeals to a broader base, many of which will personally experience the benefits of the program. Rather than sway voters to support a program to benefit the poor, politicians can garner support for universal preschool by demonstrating benefits for all constituents.

Perhaps one of the most interesting additions to the discussion of universal preschool in recent years are the voices of economists who find impressive return on investment results when they apply cost benefit analysis to existing research on the affects of preschool education. James Heckman is one of the most vocal of these economists, based on research suggesting that society's money is more wisely spent on young rather than remediating troubled adults. This view is based in part on a cost-benefit analysis of the Perry Preschool project indicating a seven to ten percent rate of return (Heckman, Moon, Pinto, Savelyex, & Yavitz, 2010). A cost benefit analysis of the Chicago Longitudinal Study program outcomes reveals potential benefits to society of over \$7.00 per dollar invested through the increase of economic well-being of the participants and by reducing the expense of remedial education and interventions related to crime (Reynolds, Temple, Robertson, & Mann, 2002). The results of the Chicago Childcare Centers have remained consistent in the latest outcomes (Reynolds, et al., 2011). In a meta-analysis of similar studies comparing cost benefit analysis results across

age groups and programs, Reynolds, Temple & White (2011) concluded that preschool programs for 3 to 4-year olds show the most return on investment.

Those favoring targeted approaches rather than universal access to preschool cite three main reasons for their position:

- the disparities are too great to be resolved by universal access,
- prohibitive cost,
- the implementation of the policy poses potential harm to children.

Although studies indicate that for some children and families, early childhood programs have mitigated some of the effects of poverty, poverty remains a critical issue in the United States. The challenges adequately addressing poverty's impacts have been used to explain Head Start's fade out as described previously in this chapter. Edward Zigler (2011), longtime Head Start affiliate and advocate, cautioned against overstating the potential benefits of preschool based on years of observation of Head Start.

Historically, to garner support, lofty goals for the program were promised only to ultimately disappoint by its inability to work "magic" and eliminate disparities.

Wilkinson and Pickett (2009) suggested that greater disparity between rich and poor within a society is associated with a host of significantly worse outcomes on measures of wellbeing compared to societies that are more equitable. If this holds true, a year or two of high quality early care and education cannot mitigate the damage of growing up poor in one of the most disparate societies on earth.

The strongest argument in favor of targeted over universal preschool is the cost to taxpayers. Preschool is expensive and the funding of the current approach is complex. Sources of revenue for preschool currently include: Head Start, CCDF, Tax Credits, Department of Defense Childcare, Title 1, Preschool Special Education, State initiatives.

Additionally families pay tuition for childcare. Targeted programs are less expensive and can produce similar returns to universal, although there is evidence that universal approaches are more effective (Ronick & Grunewald, 2011).

Mindful of the history of kindergarten education, others argue that there is the potential for a universal preschool system to place children in potentially inappropriate situations that could be harmful to them. Some suggest that a public preschool system would further institutionalize childhood and, despite any good intentions, deny children the very experiences needed for a healthy, happy life (Elkind, 1987). Elkind warned against an educational experience for 4-year olds modeled after traditional elementary education because it would stress children and ultimately take from them their intrinsic motivation to learn (Elkind, 1987). Research indicates that some negative outcomes, specifically poor behavioral outcomes, are associated with early childhood care and education (Loeb, et al, 2005). Others have suggested that although the results from studies such as the Perry Preschool project have been impressive, the conditions are difficult to replicate on a larger scale and might not generalize to the broader population (Zigler, 1987; 2011).

Since universal programs are relatively rare, there is limited research on their impacts, however some studies have been done. Oklahoma is among the oldest universal programs in the United States and is among the best researched. The program has a participation rate above 90 percent. Like West Virginia, the Oklahoma program uses public schools for delivery with public schools administering the services from public sites, Head Start, and collaborative childcare centers. Differences in the Oklahoma approach as compared to West Virginia include the salary and benefits of the teachers—

Oklahoma teachers all earn the same salary. Also dissimilar to the West Virginia program, all Oklahoma preschool teachers hold a bachelor degree with a teaching certificate in early childhood. These quality indicators may be in part responsible for the higher gains associated with Oklahoma's program over other universal preschool programs. Classrooms have a maximum 10:1 adult to child ratio. There is no state mandated curriculum (Gormley, Gayer, Phillips, & Dawsom, 2005).

A 2005 study focused on the city of Tulsa's preschools using a regression discontinuity design to examine the effects of the program. The design matched similar-birthdate (different birth year), similar-parent children in kindergarten and preschool in the system and compared the gains of the kindergarteners to the preschoolers' predicted gains. The assumption of similarity of parents is based on the idea that parents who select a particular preschool experience for their child are likely similar. This design is favorable because it provides the researchers with controls for selection bias, a consistent issue in much of the literature on the effects of various preschool programs. Controls were established for demographic characteristics of the students. The study showed that the program provided a total 16 percent improvement on test scores, 17.2 percent improvement on cognitive items, 8.4 percent on motor items, and 16.5 percent on language items over the predicted scores based on the preschool year test. When disaggregated by race, Hispanics showed greatest impact with 53.6 percent gain on the assessment overall. Hispanics attending a full day program showed an even greater 73.4 percent gain. Black students benefitted from full day programs as well, gaining 18.5 percent in full day compared to a statistically insignificant result for the half-day programs. White students did not show statistically significant improvement in either

setting. When scores were examined by socio-economic status, those students of lowest SES scored a 25.7 percent gain overall. No significant gains were indicated for students qualifying for full price or reduced price lunch with the exception of the reduced price lunch group gaining 34.7 percent in language (Gormley, Gayer, Phillips, & Dawsom, 2005).

Another regression discontinuity study (Lamy, Barnett, & Jung, 2005) compared two groups of children who attended the preschool program in Oklahoma. The study found statistically significant impacts on literacy and math development in the kindergarten group over the predicted gains of the preschool group. The study indicated that the program improved vocabulary growth by 28 % (effect size .18), math growth by 44 % (effect size .43), and print concept growth by 88 % (effect size .74). This study was replicated across four additional states—Michigan, New Jersey, South Carolina, and West Virginia in public preschool programs.

The results of the five state group showed improved gains in vocabulary, math, and print awareness across the state funded programs. The programs varied in the length of the school day, adult/child ratio, class size, and percent of students enrolled. Only Oklahoma and West Virginia were universal preschool programs while Michigan, New Jersey, and South Carolina were targeted programs. The study found effect sizes two to three times greater than those found in the Head Start National Impact study. There were consistent improvements across settings, but there was significant variation between states; however, the design did not allow a causal relationship to be determined to explain this variation (Barnett, Lamy, & Jung, 2005).

Georgia, like Oklahoma, has a long-stranding universal program. Unlike Oklahoma, however, the program is not centrally administered by the public schools. It has fifty-seven percent of the spaces being provided by private childcare centers. The state has lower requirements for the educational attainment of teachers- a minimum of an associate degree in early childhood. It also has prescribed guidelines regarding the curriculum. A study of Georgia's universal pre-K explored the effects of the program from multiple dimensions using a design comparing probability samples of three groups of children: 1) children enrolled in the pre-K program, 2) children enrolled in Head Start, and 3) children attending other private preschools who were eligible for the universal program (Henry, Rickman, Ponder, Henderson, Mashburn, & Gordon, 2004). The study employed assessments at the beginning and end of preschool, the beginning of kindergarten, the end of first grade; ratings by teachers; surveys of teachers and parents; and observations of classrooms. Children in the Georgia program across sites made significant gains compared to the national means, beginning below their peers on average but exceeding national norms by the end of first grade. A similar design was used to compare Head Start-enrolled preschoolers to Georgia's low SES public preschoolers. The public preschool enrollees achieved higher scores on assessments and teacher ratings, indicating that the program is as effective as the targeted approach (Henry, Gordon, & Rickman, 2006).

Research suggests that West Virginia's universal access policy has already impacted the state's preschools. The program increases access to preschool, especially for children with special needs and those in rural areas (Cavalluzzo, Clinton, Holian, Marr, & Taylor, 2009; Geraghty, Holian, & Gyekye, 2012) compared to the targeted

model previously employed. This greater access is significant in light of research by Lamy, Barnett, & Jung (2005) that connects attendance in West Virginia's universal preschool to increased vocabulary, math, and print awareness in kindergarten and similar findings in studies in other states employing universal access. The study in West Virginia was not able to report data by socio-economic status; however, in similar studies in states with complete data on free and reduced lunch, the increase in scores across domains was greatest in children who qualify for free and reduced lunch, a finding that supports literature on providing access to preschool for children who come from disadvantaged backgrounds (Barnett, Lamy, & Jung, 2005).

Chapter Summary

Based on the history of early care and education in the United States and a review of the literature, the current push toward universal access has both positives and negatives for both children and society. Potential benefits include academic and social benefits for children, although because of sample mismatch to the broader population and infidelity of implementation of these high quality intensive programs, it seems unreasonable to expect the lasting significant gains found in the landmark Perry and Abecedarian studies. Other benefits include meeting the childcare needs of families and consolidating efforts to promote quality. Because of difficulty ensuring quality experiences on a large scale, there remains reason for concern considering the potential harm that poor quality experiences could cause. Some of the concerns about the policy include a fear that allowing public education to control preschool will expose young children to potential harm from inappropriate practices such as those experienced in kindergartens, the high

cost of the program, and indications that time spent in non-maternal care may be associated with negative behaviors.

Despite any musings regarding the potential pros and cons of a publicly funded preschool system, most children in the United States are already in childcare. The quality of this care and presumably its outcomes for children and society varies significantly and this variation in quality is related to class. Childcare is costly. Currently the burden of this cost is borne by parents, children, and teachers. Parents pay high fees for the best quality their income can afford. Children bear the burden of the lifelong effects of whatever care they are given. Teachers often bear the burden with low wages, long hours, and lack of benefits. If economists like Heckman are right, society as a whole has much to gain from spreading the financial burden of high quality childcare and education beyond children, families, and teachers.

Conclusion

This review of the literature has explored inequity in the early childhood experiences of children in the United States. It has outlined the history of public funding for early care and education to address inequity. The review then examined the research on the effects of preschool education, with special attention to at risk children, and discussed the research on universal access to preschool.

Chapter 3: Methodology

This chapter describes the population, research design, data, and methods to be used in the study. First, I will describe the population. This will be followed by an outline of the research design. Next, the research questions are described. The chapter will outline how a model will be built to answer the questions. Finally, it will identify the limitations of the study.

Data

This study centers on children who were 4 years old and enrolled in West Virginia's universal preschool system in the 2012-2013 school year. The entire population within 1,071 classrooms of approximately 16,489 children is used in this study. The use of population data reduces the threat to statistical conclusion validity because there is no sampling error. However, because a large sample (or in this case population) inflates power, results will not be interpreted or evaluated based on statistical significance. For this reason, a power analysis is not necessary. Data analysis includes effect size as a fundamental element in understanding the results.

Research Questions

This correlational study focuses on the interaction of student and site characteristics with ELS growth in West Virginia's Universal Preschool during the 2012-2013 school year. It seeks to understand:

- Is there a relationship between ELS growth and subgroups of students (i.e., rural/non-rural, minority/non-minority, low-SES/high-SES, low hours of instruction/ high hours of instruction, male/female, native English speaker/non-native English speaker)?

- Is there a relationship between ELS growth and types of sites (i.e. Head Start/public/collaborative)?
- Is there a relationship between ELS growth and site characteristics (i.e. rural/non-rural, teacher credential, assistant teacher credential, teacher employer, level of collaboration, hours of instruction, means SES, licensed/non-licensed)?
- Are there site characteristics that better predict ELS growth for subgroups of children? For example, are sites with greater hours of instruction associated with greater ELS growth for rural children?

Research Design

To determine the relationship between student characteristics and site characteristics to ELS growth, a comprehensive collection of information was needed. The West Virginia Department of Education collects an array of data on students, preschool sites, and ELS growth. Through discussion with WVDE representatives, a selection of this data was identified to address variables of interest in the study, which will be accessed through three West Virginia Department of Education databases. First, this section will describe the ELS database, which collects the assessment data for preschoolers in the program. Next, student data will be pulled from West Virginia Education Information System (WVEIS). The final source of data is the Site Database, in which site information is recorded. The following section will describe the three databases from which data will be extracted for this research and the variables that will be pulled from each.

Data Collection

Data was collected upon the final deadline for state reporting of ELS scores in May through a request to WVDE. ELS data was matched by WVDE to student data prior to being sent using a common identified, student id. Data was received from WVDE according to the data use agreement. Site data was sent in a separate file.

ELS database. The ELS Database includes teacher assessments of student growth as measured by ELS at three checkpoints throughout the school year-- October, February, and May. Although these dates appear to be spread over unequal periods of time, they account for time away from school in November and December, making the time in preschool similar between each assessment. The teachers enter data according to training and guidelines provided by the Department of Education.

West Virginia Education Information System (WVEIS). One data system, WVEIS, contains student information. Teachers, school secretaries, and principals may enter this information depending on county policy and the level of data being recorded. Training on the use of WVEIS is completed through a train-the-trainer approach through Regional Educational Service Areas (RESA) or WVEIS county contacts. Variables that may be pulled from WVEIS for this study include child SES, gender, race, ethnicity, home language, special needs, school attendance, and geographical location.

Site database. This dataset contains site information. Variables from this database include teacher and assistant teacher employer and credentials; type of setting; collaboration between types of settings; and hours of instruction. Although these data are self-reported, on-site audits are scheduled on a rotating basis throughout the state to allow outside confirmation of reported information. More detailed descriptions of the variables included in the study are provided in the following section.

Variables

This section will describe the variables included in the study and provide operational definitions of each. This discussion will begin with operational definitions of

each covariate. Following the operationalization of the variables, issues related to reliability and validity will be discussed.

ELS. Individual ELS scores on three checkpoints throughout the school year will determine the outcome variable, ELS growth. A growth score will be calculated based on the mean growth between each administration of the assessment. The ELS will be used as an assessment of growth across three domains- Math/Science, Social-Emotional/Social Studies, and Language/Literacy- which can be broken down further into 10 items- Number and Numerical Operations, Classification and Algebraic Thinking, Geometry and Measurement, Scientific Inquiry, Self-regulation, Play, Oral Language, Phonological Awareness, Print Awareness, and Writing.

Scores are recorded in the database as individual student scores over the 10 scale items. Item scores are determined according to scoring procedures are outlined in the ELS Guidebook (2011). Each item is comprised of strands. A strand score is determined based on teacher observations. Evidence for teacher observations is recorded in a portfolio for each child. Using the strand scores from each item within, teachers determine an item score. When strand scores are equal or there is a single strand, the item score is the same score. When the scores for strands differ, the middle score, not the average, is the overall item score. Assessors are cautioned to reexamine observations when a single strand score is very different from the rest of the strand scores in the item. For the purpose of this study, a sum score for each administration of the assessment will be calculated. Each item, rated by the teacher on a scale of 1-5, will be equally weighted, allowing a range of 0-50 possible points at each administration.

Since ELS is the outcome variable, consideration was given to the type of variable it is. An interval variable is necessary. An interval variable means that the points on the scale are equidistant. The researcher considered the assumption of interval data carefully in designing the study. The ELS is a scale that provides a form of ordinal data, however, it is common to use scale data, as that generated by Likert scales, in statistical computations that assume interval data, with limited impact on Type 1 and Type 2 errors (Jaccard & Wan, 1996).

Reliability and validity Early Learning Scale (ELS). West Virginia's Department of Education piloted the ELS in 2011-2012 in the state's universal preschool. The state transitioned away from Creative Curriculum's Teaching Strategies Gold seeking a comprehensive assessment system that would provide data to support the program (Burch, 2013). The National Institute for Early Education Research (NIEER) published the instrument in 2011 to meet the need for a comprehensive, standards-based observational assessment that can inform teaching decisions. As a relatively new tool, there is no published literature using the tool but a technical report has been developed (Riley-Ayers, personal communication, 2013).

ELS is an informal, performance-based assessment of child progress in relation to state standards for early learning. It can be viewed in contrast to standardized tests, a formal measure of child progress. Standardized tests are inappropriate for young children because they are not reliable test takers and because their test results may be misused (McAfee, Leong, & Bodrova, 2004). In addition to being formative and performance-based, ELS differs from standardized tests as it compares children to themselves, not to the group mean (Riley-Ayers, Jung, & Frede, 2010).

The ELS is used as an assessment of growth across three domains- Math/Science, Social-Emotional/Social Studies, and Language/Literacy- and 10 items- Number and Numerical Operations, Classification and Algebraic Thinking, Geometry and Measurement, Scientific Inquiry, Self-regulation, Play, Oral Language, Phonological Awareness, Print Awareness, and Writing. Teachers who are trained to a predetermined inter-rater reliability score enter this data three times a year during the windows for ELS reporting-- in October, February, and May. In three separate inter-rater reliability studies, most newly trained users scored folios with 70% or higher agreement with previously determined expert true scores (Riley- Ayers, et al., 2010). In contrast, experienced trainers had higher levels of agreement ranging from .91- .98 suggesting that inter-rater reliability improves with experience and training. These scores compare favorably to other accepted instruments in the field. For example, COR (High Scope Child Observation Record) reports .69-.73 inter-rater reliability while Developmental Continuum (Creative Curriculum) does not report inter-rater reliability. In West Virginia's implementation of the tool, use of training modules and tests of inter-rater reliability is planned.

Validity of ELS is described in the technical report in terms of both internal consistency and concurrent validity. Cronbach's alpha, which was calculated at .91, is used as a measure of internal consistency for the instrument. Concurrent validity was explored through correlation of measures of student performance using ELS and two other instruments; Early Literacy Skills Assessment (ELSA; DeBuin- Parecki, 2005) and Child Math Assessment (CMA; Klein & Starkey, 2006). Trained teachers assessed children using ELS while NIEER assessors used ELSA and CMA on the same group of

children. Correlations between ELS to ELSA and ELS to CMA were significant and low to moderate ranging from .39-.46 on comparisons of the whole instruments. Between ELSA and ELS, low to moderate measures of correlation were found on both phonological awareness and comprehension. The authors of the technical report attributed these moderate correlations to observer lack of understanding in the case of phonological awareness and, in the case of comprehension, difficulty in measuring in general as evidenced by a lack of instruments available in the literature. The Math-Science ELS domain correlates significantly with CMA. Variation in the strength of correlation is due to the fact that the measures do not assess the same specific mathematical concepts. For example, correlations between CMA Equivalent Sets and Division and ELS are low because ELS does not measure these skills. Correlations between ELS to ELSA and ELS to CMA were similar to those reported for other instruments in the field. ELS is a relatively new instrument, published in 2010. An exhaustive search of educational and psychology databases found no published studies using the instrument. A study validating ELS and its relationship with quality in a New Jersey Head Start was to be presented at the 2013 Society for Research in Child Development meeting (Riley-Ayers, personal communication, 2013). An advantage of the proposed study is that it will provide further estimates of reliability and validity of the tool on a large state-wide population.

In addition to the outcome variable, the study has an additional set of variables that can be used as predictors or controls. For example, the study can answer: What is the relationship between ELS growth and site type when controlling for SES? In this

instance, site type is the predictor while SES is a lens for understanding the relationship between site type and ELS growth.

Student variables. The following are operational definitions of the variables.

Student gender: Coded in WEVIS as male or female.

Student race/ ethnicity: Coded in WVEIS as Hispanic/ Non-Hispanic, Asian, Black, American Indian, Pacific Islander, and White. Multiple Races is an additional code generated when more than one race is selected and the Hispanic box is not selected.

Home language: Coded according to a list of languages- categorical.

Special needs: Coded as Y/ N.

Student free/ reduced lunch: Coded Y/N. Used to determine low SES.

Site variables. The next section describes site variables.

Site name: This is the specific site in a county. This variable will help differentiate type of site.

Teacher credential: This variable will help determine the educational background of the teacher.

Assistant teacher credential: This variable will help determine the educational background of the assistant teacher.

Collaborative partners for classroom: This information will provide insight to the degree of collaboration within the classroom, i.e., is the site a Head Start only or is it Head Start and public combined.

Location in/out LEA: Some Head Starts are inside public schools.

Lead teacher employer: Teachers may be employed by the childcare center, the public school, or the Head Start. This variable will help determine site type and degree of collaboration.

Assistant teacher employer: Assistant teachers may be employed by the childcare center, the public school, or the Head Start. This variable will help determine site type and degree of collaboration.

Classroom hours of operation: In WV Preschool programs, children can be considered fulltime for funding purposes when they attend for 25 hours a week. Actual hours of instruction vary from 12 hours to more than 24 hours.

Classroom days of operation: This variable will help determine the schedule of the classroom.

Selection of Statistical Model

The purpose of the study is to understand the relationship between the interaction of three levels of variables- growth on ELS, student variables, and site variables. Because the intent of the study is to understand the relationships between these levels of data, it was necessary to select a statistical model that could account for multiple levels of data. It was important to consider the nested structure of the data, or the relationship that exists between the levels of variables, to avoid violations of the assumption of independence, associated with ordinary least squares (OLS) regression. A type of multilevel modeling- hierarchical linear modeling (HLM)- was selected because it allows for the possibility of individual level effects and contextual level effects in a single analysis. OLS multiple regression can be used to examine data in this way but with less accuracy, ease, and precision than HLM (Bickel, 2007). Cross-level interactions can be

detected using HLM without violating the assumption of independence of data. For example, it is possible that the relationship of child SES (level 2) to ELS growth (level 1) is different between types of preschool sites (level 3). HLM's advantage over OLS multiple regression is that it allows for exploration of this relationship by using sites as a control.

There are several additional advantages of HLM specific to this study. A common problem with HLM is that with nesting, sample size is quickly reduced. Thus, the large population available in the study is a factor that makes HLM a good fit. The study relies on extant data that is entered by various people with various level of training in the databases. It is likely that there will be missing data, which causes problems for other statistical tests. HLM is robust to missing data because it can use available data to determine a best estimate of the data (Bickel, 2007) however, SPSS uses listwise deletion. Finally, in this study, a growth model was selected in which the level one data-- a repeated measure on ELS-- is nested in students (level two) who are nested in sites (level three). Growth has traditionally been measured using analysis of covariance (ANCOVA), which allows for a pre-test post-test design. This approach is limited because ANCOVA assumes that the relationships between the covariate and outcome are the same across groups. HLM models variability between groups (Fields, 2009), which is preferable for this study since group comparisons are part of the research question.

Data Analysis

This section will outline the steps to be taken in data analysis beginning with checking the data for errors and running descriptive statistics. The process for model

selection will be outlined and sample research questions and their possible corresponding model will be provided.

Descriptive statistics. Tests for normality will be run. Descriptive statistics will be run including measures of central tendency, measures of variability, measures of shape, frequency distributions, and histograms. SPSS gives two statistics to test for normality of distribution, the Shapiro-Wilk test, and the Kolmogorov-Smirnov test. If the result of either test is significant then normality has been violated. However, with large sample sizes, the test can yield significant results that do not actually deviate from normality enough to bias statistical procedures so all tests of normality will be used to understand the distribution of scores.

Correction of problems in the data. Problems with the data will be examined and corrected. Missing data will be identified and coded as missing. Other common errors that will be identified and addressed include typing errors, column shift, coding errors, and measurement errors. Other troubled data may only be apparent in relation to other data. In this case, outliers and influential cases are identified and considered.

Selecting the model. Once the data is cleaned, it will be analyzed using HLM analysis with SPSS software. A covariance structure of AR (1) will initially be assumed because it is appropriate for repeated measures data, such as the ELS scores in this study (Fields, 2009) but the models will be run with other covariance structures and tested for model fit to see if changing the model covariance structure improves model fit. The model will be built beginning with a basic model with fixed parameters and then adding predictors and controls. As changes are made to the model, comparisons between tests of

model fit will be used to determine which model best explains the relationship between variables.

Restructuring the data. Because the outcome variable is a growth curve, the data will need to be restructured from the format provided by the WVDE. A new variable will need to be created using SPSS by using the three data points to create a new variable GROWTH. This information will be used to create the level 1 outcome variable.

Possible HLM models. The analysis will be structured around the 3-level models for studying individual change described by Bryk and Raudenbush (2002). Table 3.1 outlines the Level 1, Level 2, and Level 3 variables. The following questions and their matching analysis describe the types of questions to be addressed and their analysis.

Table 3.1

Levels and Variables Included in Data

Level 1	Level 2	Level 3
ELS Baseline	SES	Site Type
ELS Growth	Student Gender	Teacher Cred
	Student Race/ Ethnicity	Assistant Teacher Cred
	Home Language	Location In/ Out LEA
	Special Needs	Lead Teacher Employer
		Assistant Teacher Employer
		Hours of Operation
		Days of Operation

Unconditional. The unconditional model allows for determination of variation in baseline and outcomes at each level. If no significant variation is detected, no additional analysis will be necessary. If the variation is significant, additional parameters can be added to the model to account for portions of the variation.

The Level 1 unconditional model uses Level 1 data- ELS Growth.

$$Y_{tij} = \pi_{0ij} + \pi_{1ij} (TIME)_{tij}$$

Y_{tij} = Outcome at a point for a child in a school

π_{0ij} = baseline of child i in school j

π_{1ij} = growth rate between time points for a child i in school j

$(TIME)_{tij}$ = is 1 in October, 2 in February, or 3 in May

The above equation can answer the question, “do children’s baseline and growth rates vary?” because a child’s outcome at a given point is a function of the child’s baseline score, his or her growth rate, and time. Building the model is an iterative process and the answer of this question determines the worth of exploring the data further and expanding the model.

Level 2 unconditional equations can determine variation in baseline and growth among children.

$$\pi_{0ij} = \beta_{00j} + r_{0ij} \quad (\pi_{0ij} = \text{baseline of child } i \text{ in school } j)$$

This equation can determine, “is the baseline different across children?” because a child’s baseline varies by the school baseline and the error.

$$\pi_{1ij} = \beta_{10j} + r_{1ij} \quad (\pi_{1ij} = \text{growth rate between time points for a child } i \text{ in school } j)$$

The preceding equation can determine “is the growth rate different across children?”

because a child’s growth is a function of school growth rate and error.

Level 3 equations can be used to examine variation in baseline and growth among schools.

$$\beta_{00j} = Y_{000} + u_{00j} \quad (\beta_{00j} = \text{the school baseline})$$

This equation can determine “is the baseline different across schools?” because school baseline is a function of overall grand mean baseline and error.

$$\beta_{10j} = Y_{100} + u_{10j} \quad (\beta_{10j} = \text{the school growth rate})$$

This equation can determine, “is the growth rate different across schools?” because school growth rate is a function of overall grand mean growth rate and error.

Conditional. In the conditional model, level 2 and level 3 variables are added to the model to explore how well they explain the variance in baseline and growth.

Level 2 variables can be inserted into the following models to determine how well the level 2 variable predicts either the baseline or the growth. Level 2 conditional models can be used to determine, “What child characteristics are predicting the baseline or growth rate?”

$$\pi_{0ij} = \beta_{00j} + \beta_{01j}(\text{LEVEL 2 PREDICTOR})_{ij} + r_{0ij}$$

This equation can answer the question, “How well does the level 2 predictor predict the child's baseline?” because a child’s baseline is a function of the school’s baseline and the relationship between the level 2 predictor and baseline along with error.

$$\pi_{1ij} = \beta_{10j} + \beta_{11j}(\text{LEVEL 2 PREDICTOR})_{ij} + r_{1ij}$$

This equation can answer the question, “how well does the level 2 predictor predict the child’s growth rate?” because a child’s growth rate is the function of the school growth rate and the relationship between the level 2 predictor and growth rate, along with error.

The following models include Level 3 variables to determine how well site characteristics predict site baseline and growth rate when accounting for child variables. Level 3 models can answer, “What site level variables are predicting site baseline and growth rate when accounting for a child level variable?”

$$\begin{aligned}\beta_{10j} &= \text{school baseline for child with 0 on level 2 variable} \\ &= \gamma_{000} + \gamma_{001} (\text{LEVEL TWO PREDICTOR})_j + u_{00j}\end{aligned}$$

This equation can answer, “How well does site variable predict the school baseline for a child with a 0 value on a variable?” For example, “How well does site type predict the school baseline for a rural child?”

$$\beta_{01j} =$$

relationship between the influence of a child variable on school baseline = γ_{010}

This fixed effect describes the relationship a child variable and school baseline. The relationship between the child variable and school base line does not vary across school. For example, what is the gender gap on baseline information? In this instance, the gender gap does not vary across schools.

$$\begin{aligned}\beta_{10j} &= \text{school growth rate for a child with 0 on LEVEL 2 VARIABLE} \\ &= Y_{100} + Y_{101} (\text{site variable})_j + u_{10j}\end{aligned}$$

This equation could answer, “How well does the site variable predict the school growth rate for a child with a 0 value on a child variable?”

$$\beta_{11j} =$$

relationships between child not value 0 on LEVEL 2 VARIABLE and school growth rate

$$= Y_{110} + Y_{111} (\text{school variable})_j$$

How well does site variable predict school growth rate for child not value 0 on LEVEL 2 variable?

Checking for model fit. At each stage of building the model, appropriate diagnostic procedures will be run to check for model fit. A chi-square likelihood ratio test will be completed using the log-likelihood statistic, which provides a sum of the probabilities of the predicted and actual outcomes. The test gives an indication of how much variation is unexplained by the model. The lower the value, the better the fit of the model. When comparing two models, the log-likelihood statistics of the second model can be subtracted from the first to provide a chi-square statistic.

Additional tests that are appropriate to the design and population will be run to test model fit. Depending on the results, these tests could be used to discern further which model best fits the data. First, Akaike's information criterion (AIC), which corrects for complexity, will provide an additional statistic that takes into account the number of controls and predictors. Bozdogan's criterion (CAIC), like Akaike's criterion, accounts for complexity but also account for large sample size. The best fitting model will be selected to report in the results section.

Human Subjects

The study will be subject to Internal Review Board (IRB) through Ohio University's IRB review to ensure subjects are not harmed. Additional IRB review is

conducted within the WVDE to determine the justification of entering into a data sharing agreement. The study has gained approval of both Internal Review Boards.

The IRB process designates guidelines regarding confidentiality. All information provided by the WVDE will be kept confidential. Results will be reported with no identifying information provided in aggregate format. To ensure confidentiality throughout the research period, data will be recorded with a code replacing identifiers. Data will be de-identified within 2 weeks of receipt of the files from WVDE and upon the first access of the data. No identifiable data will be shared. The researcher has completed CITI IRB training on Human Subjects compliance.

Chapter 4: Results

The research was designed to explore the follow research questions using data from two distinct WV Department of Education sources:

- Is there a relationship between ELS growth and subgroups of students (i.e., rural/non-rural, minority/non-minority, low-SES/high-SES, low hours of instruction/ high hours of instruction, male/female, native English speaker/non-native English speaker)?
- Is there a relationship between ELS growth and types of sites (i.e. Head Start/public/collaborative)?
- Is there a relationship between ELS growth and site characteristics (i.e. rural/non-rural, teacher credential, assistant teacher credential, teacher employer, level of collaboration, hours of instruction, mean SES, licensed/non-licensed)?
- Are there site characteristics that better predict ELS growth for subgroups of children? For example, are sites with greater hours of instruction associated with greater ELS growth for rural children?

A three-level model was hypothesized to assess the influence of the interactions of site and student variables on ELS baseline scores and growth in the preschool year. At level one were baseline and growth scores on ELS for 16,489 students calculated using three repeated measures of the tool. This total includes minor attrition of 160 missing cases. Second-level units were student demographic characteristics, i.e., Head Start status, low SES, gender, race, native language, and special needs. Level three data were

comprised of demographics of 1071 classrooms, including teacher and assistant teacher educational attainment, hours of instruction, site type, and degree of collaboration.

Hierarchical linear models allow data to be analyzed at multiple levels (assessment baseline and growth, student, site) without violating assumptions of independence. For example, an individual student's assessment results on repeated measures of the same scale provide measures that are not independent from one another. Likewise, students are nested within classrooms and have the same exposure to that classroom; their data are not independent. Multilevel modeling estimates variance associated with group (for example, within classroom) differences in average baseline and growth (intercepts) and group differences in correlations between predictors and the results (slopes) by approaching both or either slopes and intercepts as random effects. Figure 4.1 illustrates the original study design with student data nested in one of 1071 sites and scores nested in 16,489 students.

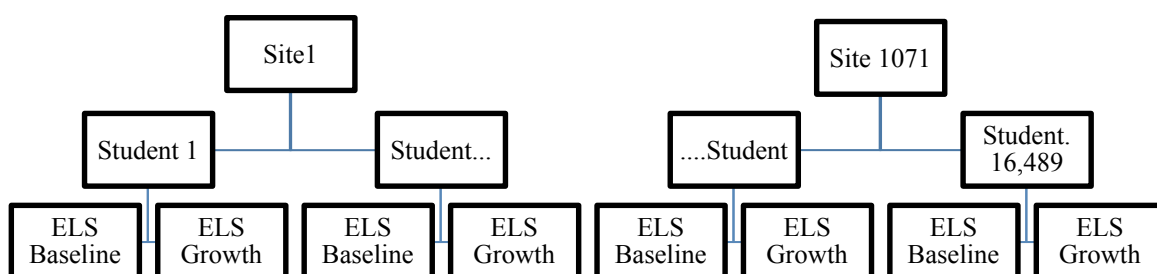


Figure 4.1 Original three-level study design.

The Data

The data arrived in two separate files. The first, “site data,” was provided by the Office of Early Learning while the Office of Research provided a second “student data” file. ELS scores (level 1) and student data (level 2) were merged on the variable “student ID” by the Office of Research before they were sent. Both offices are entities within the West Virginia Department of Education. Variables were provided in both numeric and string formats. The string variables often included overlapping categories due to differences in spelling, capitalization, and punctuation. Table 4.1 summarizes the raw data that were recoded for use in analysis and provides a frequency count for the number of distinct responses provided in the raw (string) data versus the number of distinct responses after the data was recoded. An example of a variable in need of recoding was Teacher Qualification, which initially had 44 distinct responses and was recoded to 6 distinct responses. When needed, data were recoded into meaningful and consistent categories. When necessary for analysis, string variables were converted to numeric variables using SPSS auto-recode.

Table 4.1

Variables Recoded

Variable Name	Description	Type	Measure	# Distinct Responses Raw	# Distinct Responses Recoded
LocationInorOutLEA	Location within or out of public school building	String	Nominal	5	2
NumberofDaysperweek	How many days per week the site meets.	Numeric	Nominal	2	2
HoursperDay	How many hours per day	Numeric	Scale	26	6
LeadTeacherEmployedby	Employer of lead teacher	String	Nominal	5	5
TeacherQualification	What credential does lead teacher hold	String	Nominal	44	6
AssistantEmployedby	Employer of assistant teacher	String	Nominal	7	5
AssistantQualification	What credential does assistant teacher have	String	Nominal	56	8

When appropriate, new variables were created for analysis. For example, using the item scores for the October, February, and May ELS, an overall sum score was calculated on ELS for each student for the three administrations of the assessment. Since

ELS was developed to track individual student growth, no standard form of reporting for mean student data was previously defined. A sum score provided a meaningful way to talk about aggregate student overall performance on ELS. A growth score was created estimating the mean growth between each administration of the assessment. The growth score provided an understandable way to describe the change ELS documents over the preschool year in aggregate.

Matching Datasets

To answer questions 2, 3, and 4, two datasets (student data and site data described above) which were collected by separate entities in the WV Department of Education needed to be merged using a common variable. The common identifier used to link the datasets was a site name/identifier. Upon receipt of the data, I was aware that the site identifier was not identical between datasets and expected to create a new common site identifier column in each based on inference from additional information within the files.

The student information included two columns indicating the site at which the student was placed, identified by the WV Department of Education using a School Code and a Site Name. In the site database, the same information was identified using a Site Name. However, the Site Name columns were not identical. Before a three-level model could be created, a common column of data needed to be created. The matching process presented a problem, which I attempted to resolve by adding additional data to the sets in an attempt to identify sites.

It quickly became evident that multiple classrooms within public schools or childcare centers would present problems in matching the datasets. For example, the student data included multiple sites with the same name- Blennerhasset Elementary-

while the site data distinguished between these two classrooms, Blennerhasset 1 and Blennerhasset 2. In this case, according to the site data, Blennerhasset Elementary 1 was a public site and Blennerhasset Elementary 2 was a Head Start site, a distinction that was important to answering the research questions.

I explored two possible solutions to this problem. In the first proposed solution, I added Head Start identifiers to the student data in an attempt to group Head Start students in classes and then match the Head Start classes to the existing distinctions in the site data. This was not a viable solution because only some students, not all students enrolled in Head Start classrooms, were identified as Head Start students. For example, only five students out of twenty in a class had the Head Start identifier; groups of Head Start students could not be used to create Head Start classes.

My next attempt at a solution was to add a unique classroom identifier to the student data, in the hopes that in combination with the Head Start identifier, classes of students could be created which would allow a common column to be created and matched to the site data. Upon examination of this additional information, I found that Head Start students (as identified in the student dataset) were distributed between both Head Start and public classrooms (as identified by the site dataset), leaving no way to separate the Head Start class from the public class in the student dataset. Ultimately, the problem was that sites were not reporting the data consistently between datasets, making a match between the sets impossible.

Refocused Questions

An advantage to using population data is that multiple analyses can be run without the threat of increased sampling error. With a sample, this practice increases the

chances that a statistically significant result is the product of error, not a real relationship present in the data. Because the data could not be used to answer all of the proposed research questions, a revision of this exploratory study's research questions was made. The revised research questions are:

- What are the characteristics of WV Universal Preschool classrooms (such as types of sites, credentials held by teachers and assistant teachers, hours per day, percent rural in county of enrollment, location of site in or out of LEA)?
- What is the relationship between these characteristics (for example, percent rural in county of enrollment and credentials of teachers and assistant teachers)?
- Is there variation in student baseline and growth scores on Early Learning Scale in WV universal preschool? What is the relationship between ELS baseline and growth scores in the preschool year and student characteristics (SES, Head Start enrollment, gender, race, special education identification)?

Figure 4.2 shows the study as it was redesigned. Note that although no relationship between sites to students and site to ELS scores can be made as originally planned, site characteristics will be examined in a separate analysis. So, site information will be analyzed independently of student and ELS data. A multi-level model will be used to analyze ELS scores and student demographics. ELS scores will be considered nested in 16,489 students.

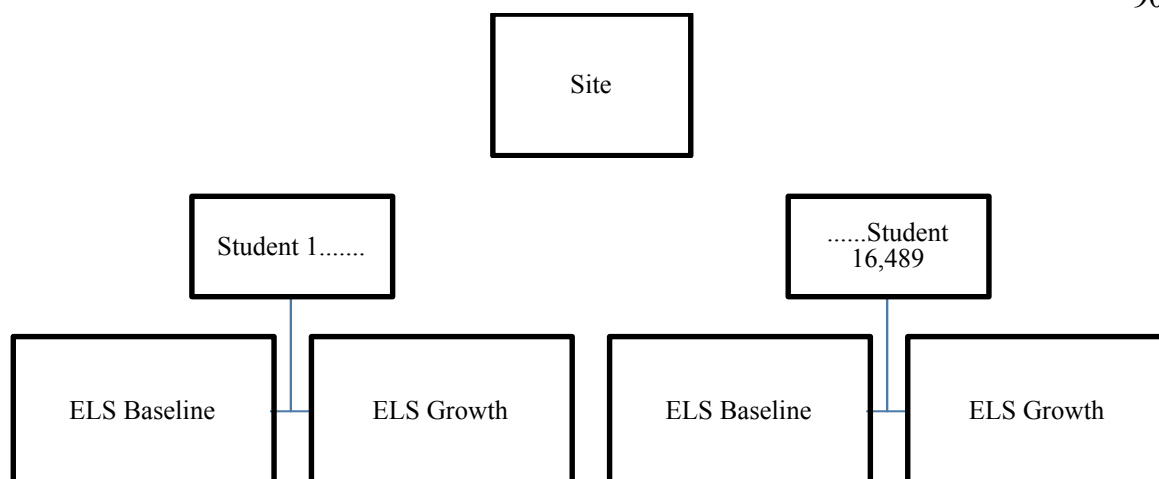


Figure 4.2 Design of the refocused study.

Descriptive Statistics

Descriptive Statistics were computed using the data sets. The following section briefly summarizes the findings from these descriptive analyses. First, descriptive statistics for the dependent variable, ELS are provided. Next, student variables are described followed by site variables.

Dependent variables- ELS. ELS Scores on three repeated measures using the assessment were used as the dependent variable. The assessment is completed in October (Baseline), February, and May. Scores are reported in Table 4.2 by mean overall score on ELS, mean domain score for each of three domains, and mean item score for each of 10 items. Internal consistency of ELS was high at October (Cronbach's $\alpha = .93$), February (Cronbach's $\alpha = .94$), and May (Cronbach's $\alpha = .96$). These results are consistent with the results reported in the scale's technical report (Cronbach's $\alpha = .91$) (Riley-Ayers, Jung, & Frede, 2010).

Table 4.2.

ELS Score Descriptive Statistics by Domain, Item, and Overall at 3 time points

ELS OVERALL MEAN	N	Range	Sum Score Mean ± SD	Step Diff	Baseline Diff
<i>Overall Sum Mean</i>					
October	15209	6-50	25.39±8.35	--	--
February	15821	2.5-50	33.62± 9.14	8.23	8.23
May	16017	2-50	39.28± 9.90	5.66	14.39
<i>Overall Mean</i>					
October	15209	1-5	2.54 ± 0.83	--	--
February	15821	1-5	3.36 ± 0.91	.82	.82
May	16017	1-5	3.92 ± 0.99	.56	1.38
<i>Domain- Math and Science</i>					
Domain- Math and Science	N	Range	Mean ± SD	Step Diff	Baseline Diff
<i>Domain Sum Mean</i>					
October	15208	2-20	8.72±3.42	--	--
February	15818	3-20	12.33±3.92	3.61	3.61
May	16015	3-20	15.0±4.43	2.67	6.28
<i>Domain Mean</i>					
October	15208	1-5	2.18 ± 0.85	--	--
February	15818	1-5	3.08 ± 0.98	.90	.90
May	16015	1-5	3.75 ± 1.10	.67	1.57
<i>Item 1. Number and Numerical Operations</i>					
October	15198	1-5	2.22 ± 1.05	--	--
February	15811	1-5	3.17 ± 1.21	.95	.95
May	16011	1-5	3.84 ± 1.26	.67	1.62

Table 4.2 Continued

<i>Item 2. Classification and Algebraic Thinking</i>					
October	15201	1-5	2.32 ± 1.04	--	--
February	15815	1-5	3.26 ± 1.01	.94	.94
May	16005	1-5	3.92 ± 1.17	.66	1.60
<i>Item 3. Geometry and Measurement</i>					
October	15196	1-5	2.14 ± 0.93	--	--
February	15806	1-5	3.01 ± 1.01	.87	.87
May	16004	1-5	3.68 ± 1.17	.67	1.54
<i>Item 4. Scientific Inquiry</i>					
October	15196	1-5	2.04 ± 0.99	--	--
February	15810	1-5	2.90 ± 1.13	.86	.86
May	16006	1-5	3.57 ± 1.27	.67	1.53
Domain- Social Emotional/ Social Studies	N	Range	Mean ± SD	Step Diff	Baseline Diff
<i>Domain Sum Mean</i>					
October	15208	1-10	6.61±2.08	--	--
February	15817	1.5-10	8.01±1.96	1.4	1.4
May	16014	1-10	8.75±1.81	.74	2.14

Table 4.2 Continued

<i>Domain Mean</i>					
	15208	1-5	3.31 ± 1.04	--	--
October					
	15817	1-5	4.00 ± 0.98	.69	.69
February					
	16014	1-5	4.37 ± 0.90	.37	1.06
May					
<hr/>					
<i>Item 5. Self Regulation</i>					
	15188	1-5	3.28 ± 1.12	--	--
October					
	15806	1-5	3.92 ± 1.04	.64	.64
February					
	16009	1-5	4.28 ± 0.98	.36	1.0
May					
<hr/>					
<i>Item 6. Play</i>					
	15203	1-5	3.34 ± 1.12	--	--
October					
	15812	1-5	4.09 ± 1.05	.75	.75
February					
	16008	1-5	4.47 ± 0.93	.38	1.13
May					
<hr/>					
Domain- Language/ Literacy	N	Range	Mean ± SD	Step Diff	Baseline Diff
<hr/>					
<i>Domain Sum Mean</i>					
	15205	2-20	10.07±3.68	--	--
October					
	15818	1-20	13.28± 4.01	3.21	3.21
February					
	16013	1-20	15.54±4.3	2.26	5.47
May					

Table 4.2 Continued

<i>Domain Mean</i>					
October	15205	1-5	2.52 ± 0.92	--	--
February	15818	1-5	3.32 ± 1.00	.80	.80
May	16013	1-5	3.89 ± 0.90	.57	1.37
<hr/>					
<i>Item 7. Oral Language</i>					
October	15188	1-5	2.87 ± 1.16	--	--
February	15809	1-5	3.62 ± 1.20	.75	.75
May	16004	1-5	4.12 ± 1.17	.50	1.25
<hr/>					
<i>Item 8. Phonological Awareness</i>					
October	15194	1-5	2.16 ± 1.14	--	--
February	15807	1-5	2.97 ± 1.19	.81	.81
May	16004	1-5	3.64 ± 1.32	.67	1.48
<hr/>					
<i>Item 9. Print Awareness</i>					
October	15199	1-5	2.62 ± 1.15	--	--
February	15809	1-5	3.53 ± 1.23	.91	.91
May	16009	1-5	4.06 ± 1.20	.53	1.44

Table 4.2 Continued

Item 10. Writing

October	15198	1-5	2.42 ± 1.00	--	--
February	15814	1-5	3.18 ± 1.09	.76	.76
May	16010	1-5	3.73 ± 1.21	.55	1.31

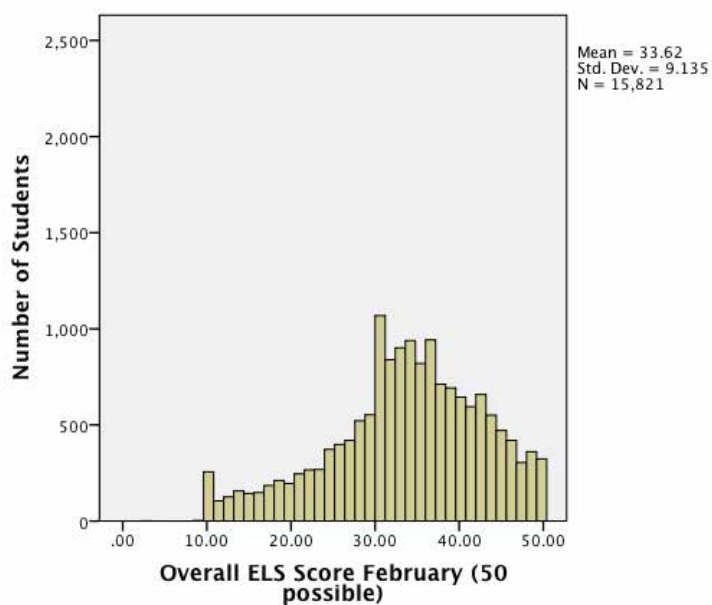
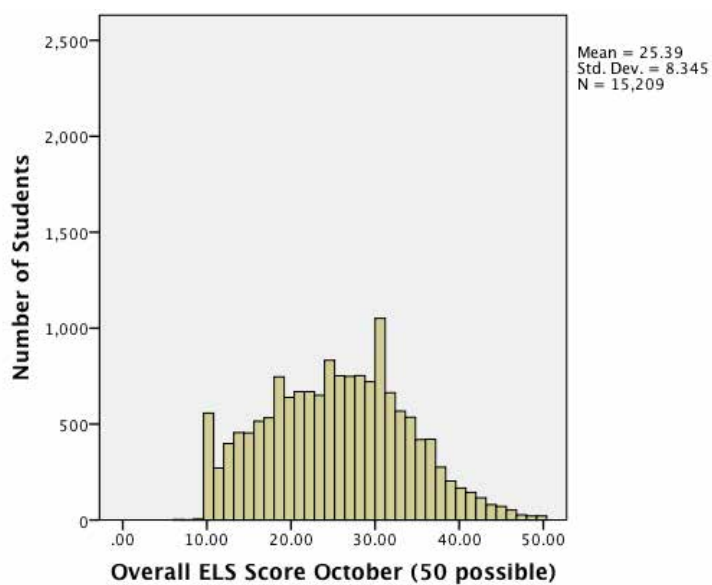
ELS Scores (as summarized in Table 4.2) indicate that student scores rose in the preschool year across Domains, Items, and Overall scores. The difference between the baseline and final assessment sum score means overall was 14.39 points. Lowest baseline Domain sum score mean was in Math and Science (2.18), in which all October Item score means were below 3. This Domain showed the highest difference between baseline and final assessment mean (1.57). The lowest baseline mean Item in Math and Science was Scientific Inquiry (2.04) but this item showed the highest difference between baseline and final assessment mean (1.62).

The highest scoring Domain baseline mean was in Social Emotional/ Social Studies (3.31). The highest Item baseline mean was Play (3.34). Even considering likely ceiling effect for these higher scores, a difference between baseline and final assessment was apparent for both the Social Emotional/ Social Studies Domain (1.06) and for the Play Item (1.13). The smallest difference between baseline and final assessment was on the Self-Regulation Item (1.0).

Figures 4.3 provides histograms for frequency counts on overall ELS scores ranging from 0-50 in October, February, and May respectively. The shape of the histograms change from October to May, with the peak of the curve moving from the low

end of the scale to the high end of the scale with each iteration of the assessment.

October and February scores follow a fairly normal distribution while the ceiling effect in May is apparent with scores clustering at the high end of the scale.



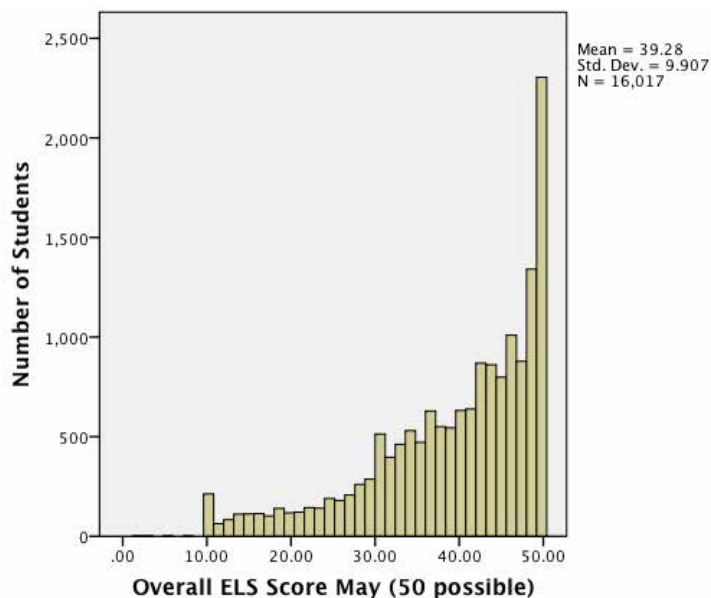
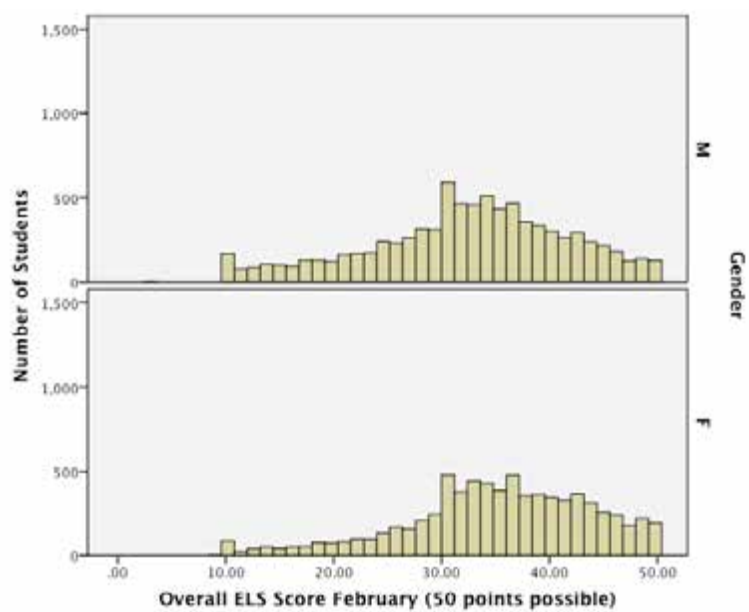
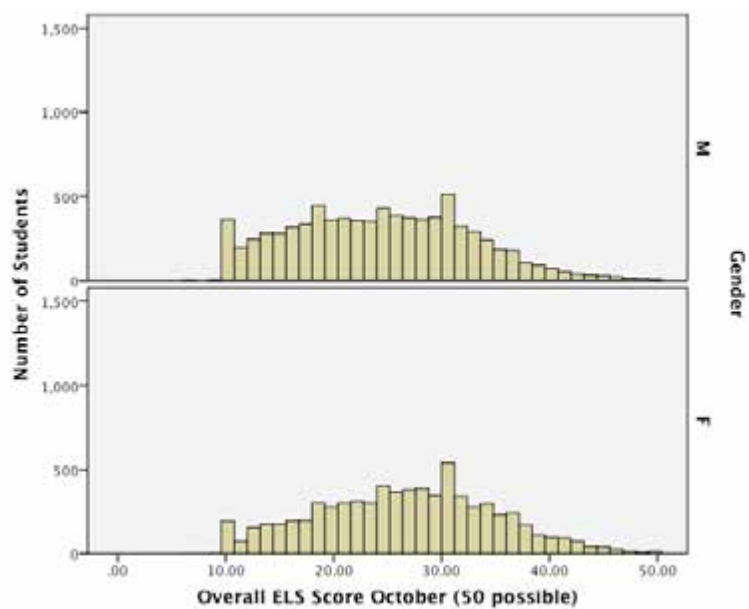


Figure 4.3 Histograms of overall mean scores on ELS October, February, and May.

Figure 4.4 provides histograms of overall mean scores on ELS October, February, and May split by gender. Difference in baseline by gender is visible with boys starting the year with most scores further toward the lower end of the scale. Possible variance in growth rates by gender is also apparent in the shifting shape of the distribution of scores across time. Further analysis of these results in this chapter will explore if differences between boy and girl students' baseline and growth scores are statistically significant and will describe the size of the differences



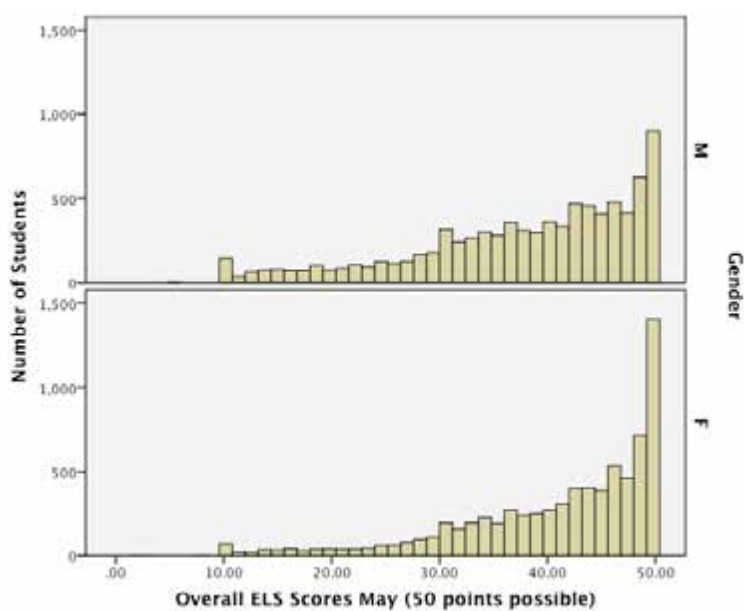
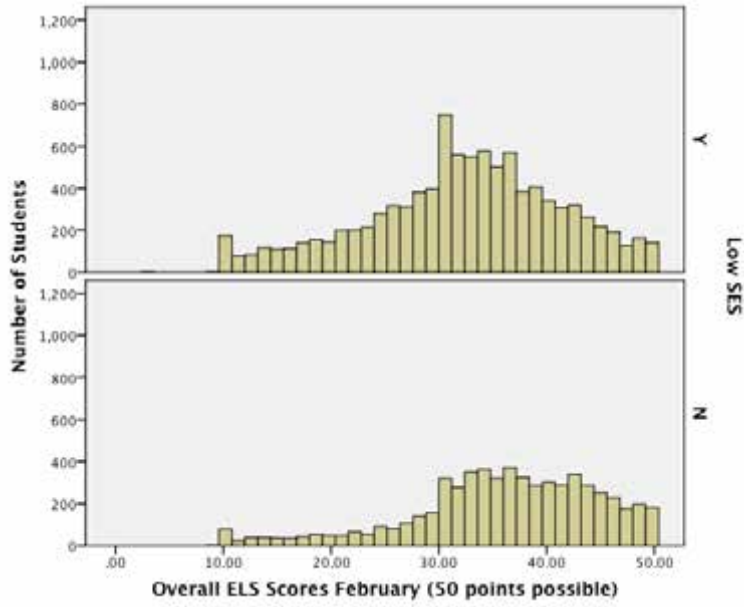
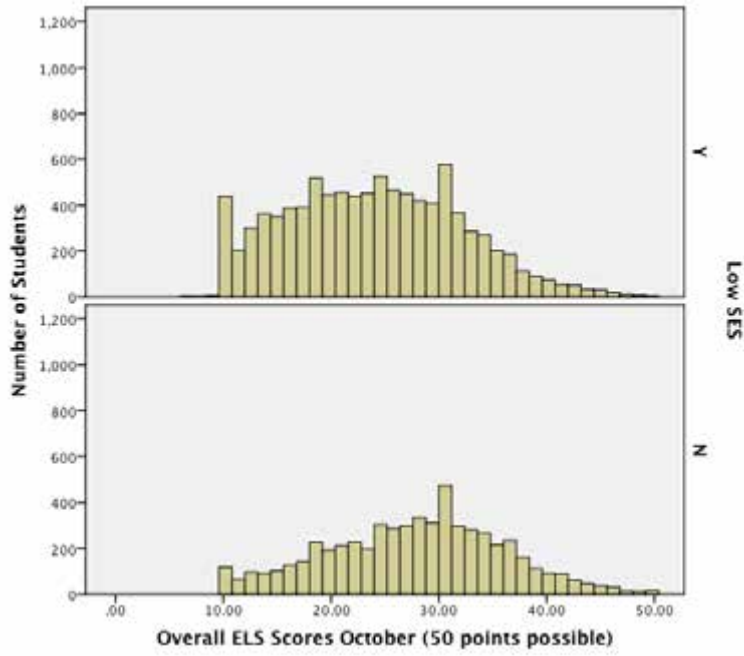


Figure 4.4 Histograms of overall mean scores on ELS October, February, and May split by gender.

Figure 4.5 shows frequency of overall ELS scores in October, February, and May split by SES. Differences in the shape of the distribution of scores between non-low SES and low SES students is apparent. Further analysis of these results in this chapter will explore if differences between low SES and non-low SES students' baseline and growth scores are statistically significant and will describe the size of the differences.



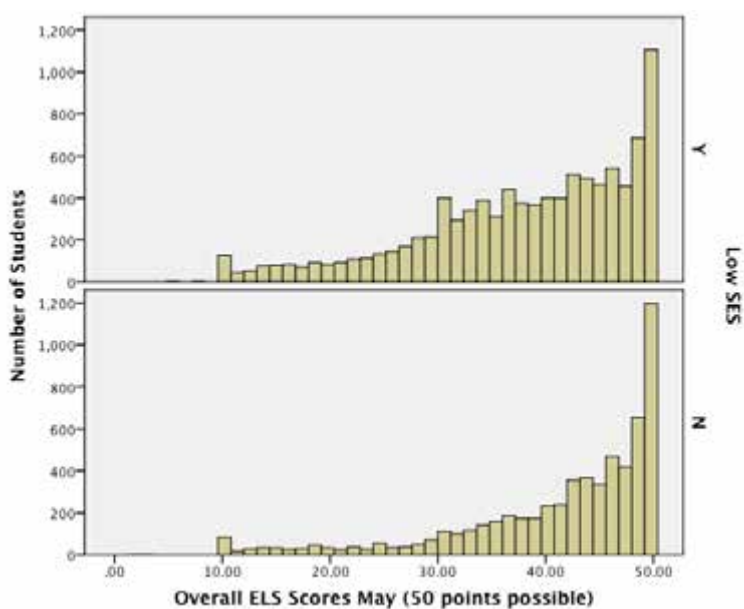


Figure 4.5 Histograms of overall mean scores on ELS October, February, and May split by SES.

Independent Variables

Descriptive statistics for independent variables are provided in the following sections. First, Table 4.3 and the text that follow provide descriptive statistics on the student population in the study. Next, site characteristic descriptive statistics are offered in Table 4.4 and the accompanying text describes the characteristics of WV universal preschool sites. Missing data has been eliminated unless otherwise noted.

Student variables. Gender of enrolled students is slightly more male (53.6%) than female (46.4%). The students are largely Caucasian, with 9.5 percent minority students. Because entitlement to participate in Head Start is determined by family income qualifications, the variables Head Start and Low SES are variables that overlap. Students enrolled in Head Start comprise 21.3 percent of the overall population, while 35.5 percent are considered to have low socio-economic status. To avoid including

overlapping variables, Head Start enrollment was not included in the model. The variable Native Language, which is coded Yes or No in the WVDE dataset, returned results that do not have face validity so this variable was excluded from the model (37.9% Yes). Special needs were identified for 1.3 percent of students. This number is low compared to a 15 percent state average for special needs in students ages 6-21 (ED.Gov, 2014) but considering that many students are first identified as having special needs during the preschool and kindergarten years, this number is believable. Regardless of why the number is low, the variable was not included because there was not enough variance to believe that the variable would contribute to the model. A balance between a simple model and one that accounts for complexity was the goal of these adjustments.

Table 4.3

Level 2 Descriptive Statistics (Student Characteristics)

Variable	N	Percentage
<u>Gender</u>		
Male	9223	53.6
Female	8990	46.4
<u>Race</u>		
White	15583	90.5
African American	722	4.2
Mixed	514	3.0
Other	394	2.3
<u>Head Start</u>		
Yes	3662	21.3
No	13551	78.7
<u>Native Language</u>		
Yes	6517	37.9
No	10696	62.1
<u>Special Needs</u>		
Yes	218	1.3
No	16995	98.7
<u>Low SES</u>		
No	6631	61.5
Yes	10581	35.5

Site variables: Research question 1. Research question 1 is: What are the characteristics of WV Universal Preschool classrooms (such as types of sites, credentials

held by teachers and assistant teachers, hours per day, percent rural in county of enrollment, location of site in or out of LEA)? Site descriptive statistics are provided in Table 4.4 to answer question 1. Most classrooms in WV Universal Preschool have teachers (63.6%) and assistant teachers (53.5%) who are employed by public schools. The majority of teachers are certified (68.8%) while the largest percent of assistant teachers have a credential other than a college level degree or other widely recognized professional credential such as CDA (Child Development Associate) or ACDS (Associate Child Development Specialist) (45.7%). Seventy-eight percent of universal preschool sites offer 6 or more hours a day of instruction while 21.9 percent offer less than 5 hours a day. Most (66.1%) universal preschool sites are in public school buildings but 33.8 percent are not.

Table 4.4

Level 2 Descriptive Statistics (Site Characteristics)

Variable	N=1071 Total	Percentage
<u>Lead Teacher Employed By</u>		
Public School	681	63.6
Head Start	221	20.6
Child Care	164	15.3
Head Start/ Public	1	.1
Missing	4	.4
<u>Assistant Teacher Employed By</u>		
Public School	573	53.5
Head Start	311	29.0
Child Care	178	16.6
Head Start/ Public	5	.5
Missing	4	.4
<u>Teacher Credential</u>		
Certified	737	68.8
Temporary Authorization	104	9.7
Permit	90	8.4
Permanent Authorization	64	6.0
Other	44	4.1
Missing	32	3.0
<u>Assistant Teacher Credential</u>		
Other	489	45.7
ACDS	250	23.3
Associate	111	10.4
Missing	73	6.8

Table 4.4 Continued

Bachelor	70	6.5
CDA	59	5.5
Master	2	.2
<u>Hours Per Day</u>		
3	160	14.9
4	87	8.1
5	63	5.9
6	301	28.1
7	388	36.2
8	72	6.7
<u>Location</u>		
In Public School Building	708	66.1
Out of Public School Building	362	33.8
Missing	1	.1

Census variables. Tables 4.5 and the text below provide descriptive data relevant to the analysis. West Virginia's 55 counties all have a percent rural population greater than 21.46%. Thirteen of 55 counties have 100% rural population.

Table 4.5

Percent Rural Population by County

Percent Rural Population in County	Number of Counties
	N=55
21.46-49.0	15
53.73-72.48	15
78.41-91.06	12
100	13

Further analysis of the data on WV Universal Preschool sites is used in the following section to respond to research question 2.

Research Question 2

Research Question 2 is: What is the relationship between site characteristics (for example, percent rural in county of enrollment and credentials of teachers and assistant teachers)? This question was addressed using SPSS crosstabulations, the results of which are provided in the following sections.

Teacher Credential and Percent Rural Population. Of particular interest in the original study was the relationship between rurality and site characteristics. This section uses census data on percent rural population by county and site teacher credential to explore the relationship between these two variables. The results show no linear relationship between teacher credential and percent rural population by county. Certified teacher is the most common credential (73%) with nearly even distribution across counties by percentile rural population. The least common credential was Missing, which was identified when no response was recorded in the original dataset. The second least

common was coded Other. The original dataset was an open string variable.

Responses to recoded Other included “pending,” “sub- being advertised,” and “?”

Table 4.6

Percentile Rural Population and Teacher Qualification

Lead Teacher Credential	Percentile Group Rural Population (1= lowest)					Total
	Rural Percentile Group 1	Rural Percentile Group 2	Rural Percentile Group 3	Rural Percentile Group 4	Rural Percentile Group 5	
Certified	154	158	149	133	142	736
Missing	0	9	9	5	8	32
Other	5	4	14	8	13	44
Permanent	6	3	20	19	16	64
Authorization						
Permit	20	7	15	33	14	89
Temporary	30	13	28	16	17	104
Authorization						
Total	215	194	235	214	211	1069

Teacher Credential and Teacher Employer. Next, crosstabulation was run on the teacher credential and teacher employer variables to examine possible relationships between these characteristics. Table 4.7 summarizes these results. Distribution of teachers by credential across site types follows a pattern consistent with the policy.

Certified lead teachers are most commonly employed by public sites while those with Temporary Authorization are most likely employed by Head Starts or Child Care Centers. Missing and Other data represents 76/1071 cases (7%). Assistant teachers are subject to different qualifications in Policy 2525 than those required for lead teachers.

Table 4.7

Crosstabulation Teacher Credential * Teacher Employer

Lead Teacher Credential	Lead Teacher Employed by					Total
	Child Care	Head Start	Head Start/ Public Site	Public	Missing	
Certified	73	75	1	588	0	737
Missing	10	14	0	4	4	32
Other	14	20	0	10	0	44
Permanent Authorization	11	41	0	12	0	64
Permit	11	16	0	63	0	90
Temporary Authorization	45	55	0	4	0	104
Total	164	221	1	681	4	1071

Assistant teacher credential and percentile rural population. Table 4.8 provides the results of the crosstabs of assistant teacher credential and percentile rural population. Assistant Teachers largely hold a credential other than ACDS, Associate,

Bachelor, Master's, or CDA. This is notable, as these are the most widely recognized early childhood specific credentials in West Virginia. This column in the original dataset was a string variable. Most responses in the Other category were "Other" although some responses, such as "pending" or "RBA" (Regent's Bachelor's of Arts) were recoded as "other". It is possible that a teacher would select "Other" if the credential was the state paraprofessional certificate, which requires 60 hours of course work in basic skills (reading, writing, and math), general education, classroom management, and child development and, during the 2012-13 school year qualified assistant teachers in preschool classrooms. No specialized coursework related to young children is required of the paraprofessional certificate. Assistant Teachers with "other" credentials are evenly distributed across counties by percentile rural population. Those with Bachelor's degrees are more common in counties with a lower percentile rural population, while those with associate's degrees are slightly more common in counties with the highest percentile rural population. Assistant teachers with ACDS are most common in counties with the lowest percentile rural population.

Table 4.8

*Crosstabulation Assistant Teacher Credential * Percentile Group of Rural Population by County*

Assistant Teacher Credential	Percentile Group Rural Population (1= lowest)					Total
	Rural	Rural	Rural	Rural	Rural	
	Percentile Group 1	Percentile Group 2	Percentile Group 3	Percentile Group 4	Percentile Group 5	
ACDS	68	40	45	54	44	251
Associate	21	5	23	27	35	111
Bachelor	25	16	18	8	3	70
CDA	3	9	17	5	25	59
Master	1	1	0	0	0	2
Missing	2	24	10	20	17	73
Other	95	99	122	100	87	503
Total	215	194	235	214	211	1069

Assistant teacher credential and assistant teacher employer. Table 4.9 summarizes the results of crosstabulation on assistant teacher credential and assistant teacher employer. “Other” is the most commonly held credential and those assistant teachers with “other” credentials are most commonly employed by public sites. ACDS is the second most commonly held credential, with Head Start employing the largest number of ACDS credentialed assistant teachers. Assistant teachers with bachelor’s degrees are most commonly employed by Head Start sites.

Table 4.9

*Crosstabulation Assistant Teacher Credential * Assistant Teacher Employer*

Assistant Teacher Credential	Assistant Teacher Employed by					Total
	Child Care	Head Start	Head Start/ Public Site	Public Site	Missing	
ACDS	56	119	0	77	0	252
Associate	17	51	0	43	0	111
Bachelor	33	23	0	14	0	70
CDA	9	30	0	20	0	59
Master	1	1	0	0	0	2
Missing	7	25	1	37	3	73
Other	55	62	4	382	1	504
Total	178	311	5	573	4	1071

Lead teacher employer and assistant teacher employer. A crosstabulation of lead teacher employer by assistant teacher employer, Table 4.10, provides insight into how sites are collaborating. The most common model of within classroom employment is that both lead and assistant teacher have the same employers. When there is collaboration between employers within sites, the public site most commonly employs the lead teacher and Head Start employs the assistant teacher. Other experimental models are visible in the data, such as when the lead teacher is employed by the public site and

assistant teacher is employed by childcare or a shared employment of the assistant teacher between Head Start and public site.

Table 4.10

Crosstabulation Lead Teacher Employer Assistant Teacher Employer*

Lead Teacher Employed by	Assistant Teacher Employed By					Total
	Child Care	Head Start	Head Start/ Public Site	Public site	Missing	
Child Care	164	0	0	0	0	164
Head Start	2	204	0	15	0	221
Head Start/ Public Site	0	0	0	1	0	1
Public Site	12	107	5	557	0	681
Missing	0	0	0	0	4	4
Total	178	311	5	573	4	1071

Assistant teacher credential and teacher credential. Table 4.11 provides a crosstabulation of the credentials of assistant and lead teachers. These results show the most common combination is credentialed lead teacher and assistant teacher with other credential. This supports the supposition above that assistant teachers in public schools often hold a paraprofessional certificate, which is not an early childhood specific credential. Teachers with a credential other than certification have an assistant teacher with ACDS almost as commonly as they have an assistant teacher with other.

Table 4.11

*Crosstabulation Assistant Teacher Credential *Teacher Credential*

Assistant Teacher Credential	Lead Teacher Credential						Total
	Certified	Missing	Other	Permanent Authorization	Permit	Temporary Authorization	
ACDS	151	1	21	26	26	27	252
Associate	70	3	9	3	10	16	111
Bachelor	42	0	0	2	8	18	70
CDA	34	1	1	4	5	14	59
Master	1	0	0	0	0	1	2
Missing	37	23	0	0	12	1	73
Other	402	4	13	29	29	27	504
Total	737	32	44	64	90	104	1071

Location in public site or outside public site and percentile rural population.

The following section provides results of crosstabulation of location in public school and percentile rural population by county. Table 4.12 summarizes the results. Students in the most rural counties are most likely to be in sites located within public schools. Sites outside of the public schools were most common in the 2nd and 3rd percentile of rural counties.

Table 4.12

Location in Public Site or Outside Public Site and Percentile Rural Population

Location	Percentile Group Rural Population (1= lowest)					Total
	Rural Percentile Group 1	Rural Percentile Group 2	Rural Percentile Group 3	Rural Percentile Group 4	Rural Percentile Group 5	
In	145	119	138	150	155	707
Out	70	75	97	64	56	362
Total	215	194	235	214	211	1069

Hours Per Day and Percentile Rural Population. In Table 4.13 site hours per day are crosstabulated with percentile rural population by county. Most sites offer 6 or 7 hours of preschool per day although hours per day range from 3 to 8. Sites that offer 3, 4, and 5 hours per day are most common in the lower percentiles of rural population by country while those that offer 7 or 8 hours per day are most common in the counties with the highest percentile of rural population by county.

Table 4.13

*Crosstabulation Hours Per Day * Percentile Group of Rural Population by County*

Hours Per Day	Percentile Group Rural Population (1= lowest)					Total
	Rural Percentile Group 1	Rural Percentile Group 2	Rural Percentile Group 3	Rural Percentile Group 4	Rural Percentile Group 5	
3	47	53	49	11	0	160
4	38	11	28	1	9	87
5	22	6	13	2	20	63
6	83	85	54	47	31	300
7	25	39	87	120	116	387
8	0	0	4	33	35	72
Total	215	194	235	214	211	1069

Research Question 3: Multi-level Modeling

Research question 3 was: Is there variation in student baseline and growth scores on Early Learning Scale in WV universal preschool? What is the relationship between ELS baseline and growth scores in the preschool year and student characteristics (such as free and reduced lunch qualification, Head Start enrollment, gender, race, special education identification)?

To answer research question 3, a two level model was built to explore the relationship between student demographic characteristics and ELS growth. ELS data were restructured to allow for modeling student growth, creating 51636 units (3 scores

each for 17,212 students). Missing values were excluded from analysis by list-wise deletion since SPSS does not compute a value like HLM software; statistics are based on cases with valid data for each variable included in the model. Table 4.14 summarizes the analysis of the data.

Table 4.14

Set of Models for Student Data.

Model	1 Null	2 SES	3 SES, Gender	4 SES, Gender, Race
Fixed Effects				
LEVEL 1 (ELS Scores)				
Intercept (Baseline)	25.238350* (.068968)	23.8560739* (.085549)	22.67748* (.105873)	22.694275* (.108714)
Growth	7.197760* (.029868)	7.221322* (.038048)	7.046177* (.047457)	7.068143* (.048721)
LEVEL 2 (Student)				
Non-Low SES Baseline		3.663153* (.138973)	3.701298* (.137509)	3.694372* (.137992)
Non-Low SES Growth		-.074463* (.061564)	-.069910 (.061510)	-.080203 (.061731)
Gender (Female) Baseline			2.493398* (.133651)	2.492713* (.133646)

Table 4.14 Continued

Gender (Female)			.369348*	.369063*
Growth			(.059882)	(.059875)
Race (Non-Caucasian) Baseline				-.036005 (.054939)
Race (Non-Caucasian) Growth				-.048874* (.024752)
Random Effects				
LEVEL 1 (ELS Scores)				
Residual (E)	10.010367	10.013975	10.013210	10.013476
Intercept (RO)	67.971430*	64.503279*	62.922484*	62.915866*
Growth (R1)	8.804993*	8.851031*	8.825308*	8.821832*
Estimation	ml	ml	ml	ml
-2L(l(model))	307113.185	306385.278	305909.844	305904.352
Parameters	6	8	10	12
Model Compared		1 vs 2	2 vs 3	3 vs 4
Δ -2L(l(M1/M2))		727.907	475.434	5.492
<i>p</i>		.000	.000	.000

N = 47,044 assessments nested in 16,489 students * $p > .05$ ml = full maximum likelihood

Series of hierarchical linear models. The ten-item scale had five possible points available for each item. For each student, points were totaled to find a sum score on a possible scale of 50 points. Student growth was computed by calculating the mean difference between each iteration of the assessment. The value reported for Growth is the mean gain for each time the assessment was done. The mean sum baseline score and the mean growth score were used in this analysis.

In total, four models were run using SPSS version 21 following the procedure described in Fields (2009). The analysis began with the null model and added predictors. Of the student variables collected, Head Start, Native Language, and Special Education were eliminated from the analysis. Head Start was removed because the variable was conflated with low socio-economic status. As a prerequisite to qualify for Head Start, students must also have low socio-economic status. Native Language was eliminated because it lacked face validity as described above. Special Education was removed because the variance within this variable was so small it was unlikely to contribute to the model.

The predictors SES, Gender, and Race were sequentially included in the model. The order of inclusion was determined by beginning with the variable most likely to explain variance and adding predictors. As each new predictor was added, the model fit was tested using the likelihood ratio test. The results of the likelihood ratio test reveal that each variable added improved model fit. Each predictor reduced unexplained variance, meaning that with each additional predictor included the model fit was improved. A great deal of variance in ELS baseline and growth is unaccounted for by the model, even with all variables included.

Model 1: The null model. When viewing student Baseline and Growth scores without any predictors, the average Baseline score was 25.238350 and mean Growth score was 7.197760. The null model indicates there is significant variance in student Baseline (67.971430) and Growth (8.804993) scores; further models were run using predictors to explain how each contributed to the variance.

Model 2: SES. First SES was added to the model. The mean score for low SES students was 23.860739 and the mean growth score for low SES students was 7.221322. SES was a statistically significant contributor to both baseline and growth scores. Non-low SES students scored, on average, 3.663153 points higher at baseline but had a growth rate that was .074463 less than low SES students. Adding SES to the model improves model fit because the value of the likelihood ratio test chi square was 827.907, ($p < .001$). There remains unexplained variance in baseline (64.503279) and growth (8.851031).

Model 3: SES and gender. In an effort to explain the remaining variance, gender was added to the model. The mean score for Caucasian, male students at baseline was 22.677489 and mean growth score was 7.046177. Gender explains a significant portion of the variance in ELS baseline and growth scores when accounting for SES. Girls scored, on average, 2.493398 points higher than boys at baseline and grew at a rate .369348 points faster than their male peers when controlling for SES. When accounting for gender, SES remains a significant contributor to ELS baseline scores but is not a significant predictor of growth scores. Model fit was improved when comparing model 3 (SES, gender) to model 2 (SES). The result of the likelihood ratio test chi square is 475.434 ($p < .001$). Still, significant variance remains unaccounted for by the model at both baseline (62.922484) and in growth scores (8.825308).

Model 4 SES, gender, and race. Model 4 included SES, gender, and race in an effort to account for a greater portion of variance. The mean baseline score for Caucasian, male, low-SES students is 22.694275 and the mean growth score is 7.068143. Taking into account SES and gender, race does not explain variance in baseline scores but does explain variance in growth scores (-.048874). In other words, when accounting for SES and gender, students who are non-Caucasian have growth rates on average that are .048874 points lower than Caucasian students. Gender remains a significant predictor for both baseline (2.492713) and growth (.369063) when accounting for SES and race. When accounting for both race and gender, non-low SES students score 3.694372 points higher but SES is no longer a significant predictor of growth.

Summary

This chapter first provided descriptive data, first on ELS scores, then on students, and finally on sites. Next, it provided crosstabulation results to examine relationships between site characteristics. Finally, analysis of variance in ELS baseline and growth scores by student demographics was described. In the next chapter, these results are presented as findings. Connections to the existing literature are explained, limitations are identified, and recommendations based on the results are made.

Chapter 5: Summary and Discussion of Findings

The West Virginia high school class of 2026 was born in 2008, the year the presidential election centered on “hope” and “change,” and Barack Obama won the Presidency. In an election debate that year Barack Obama said:

“What you see consistently are children at a very early age are starting school already behind. That’s why I’ve said that I’m going to put billions of dollars into early childhood education that makes sure that our African-American youth, Latino youth, poor youth of every race, are getting the kind of help that they need so that they know their numbers, their colors, their letters. Every dollar that we spend in early childhood education, we get \$10 back in reduced dropout rates, improved reading scores. That’s the kind of commitment we have to make early on (Obama, 2008).”

Now-president Obama’s statement summarizes the argument made in favor of Universal Preschool, a policy that was adopted in West Virginia in 2002 and slowly brought to full implementation in 2012-2013, the year the graduating class of 2026 were 4 years old. While this campaign promise has yet to be fulfilled, the White House maintains this policy as a priority (The White House, 2014). This dissertation research provides a glimpse at these students’ preschool year, following their scores on ELS from October through May and providing a profile of the classrooms in which these children were taught.

The current research confirms that early disparities exist between groups of young children, even at age 4 before most children begin public school. Specifically, in this population, children of low SES and boys are starting school at a disadvantage when

compared to non-low SES children and girls. Interestingly, race does not account for significant differences in preschool baseline assessment scores in West Virginia Universal PreK when controlling for SES and gender, although a difference in growth scores by race is detected. The study documents that even with universal access to preschool these gaps persist through the year and may grow for non-white students. All groups showed growth through the preschool year in the results of their assessment, but the gains that low-SES and male children made were not greater than the gains of the group as a whole and growth of non-white students was slower than white students; the disparities possibly followed these children into kindergarten. The study's initial design would have provided additional insight into how program qualities, such as hours of instruction and teacher credential, interact with these disadvantages, either to mitigate or exacerbate the differences between groups but data collection issues prevented this level of analysis.

Chapter 4 provided the results of the analysis. This chapter provides a summary of key findings in the research, their relationship to the literature, their implications, and directions for further study. In the following section, limitations of the study are described followed by summary of the four main findings.

Limitations

The study has limitations in both internal and external validity that must be considered when analyzing the results and making recommendations based on them. One important limitation to this study is the inability to generalize to another population. Even generalizing these results over time is not possible since, although these results were analyzed relatively quickly, already, policy and practice have changed making them

less relevant to the current and future cohorts of students in WV Universal PreK.

However, the use of population data provides a rich picture of the population being studied with no threat of sampling error.

Another limitation to this study relates to the use of ELS to measure student growth and development. While the tool is developmentally and individually appropriate and its design reflects best practices in the assessment of preschoolers, use of this assessment data to inform decision making about programs for young children is problematic because of the known issues with assessing young children, especially those under the age of 5, discussed in Chapter 1. Mean overall scores provide a useful data point for discussion of baseline and growth scores in this analysis but further research on the tool is needed to validate the type of use of ELS results in this context. Since the teacher in a classroom completes ELS on multiple occasions, assessor bias is a potential threat to internal validity because of instrumentation. Teachers expect to see students making progress and may judge student performance with this preconception rather than remaining objective. Further, teacher biases about groups of students could threaten the validity of the results. For example, teachers tend to rate girls higher across content areas because their behavior is more compliant than boys' (Cornwell, Mustard, & Van Parys, 2013).

An additional limitation is that the variables selected provide only a proxy for the characteristics they are intended to measure. For example, percentile rural population by county was used to provide information about rural verses non-rural sites; however, this variable does not account for within-county variability in percent rural population. In other instances, variables that are quantifiable, such as teacher credential, were used as a

measure of an aspect of less quantifiable concepts, such as program quality, based on common standards in the field.

Further limitations relate to the statistical analysis of the data. For example, crosstabulations were used to explore the relationships between variables but calculating correlation was not possible because of the types of variables used. Further, analysis of HLM results was interpreted in part based on statistical significance despite the large population size used in the study. Since sample (or population in this case) size inflates statistical power, the potential for Type 1 Error is elevated. Differences in scores by student characteristics should be interpreted considering the size of the difference. For example, the effect size apparent in growth scores of non-white students is statistically significant but very small. It is possible that any difference is magnified by the large population.

Finding 1: Data Collection Problems

Current approaches to data collection on WV Universal Preschool do not support analysis of the impact of interaction between site factors and student characteristics on student growth over the preschool year. Multiple departments at WVDE collect data for distinct purposes and, therefore, variables that are intended to identify the same information do not necessarily match between datasets. However, the data collected as it is can answer important questions about WV Universal Preschool. Analyses of the demographics of the classrooms provide information about variation in teacher preparation, hours of instruction, and site type. Further, analysis of ELS scores paired with student demographic data can provide insight into student characteristics

associated with achievement gaps beginning with the baseline assessment in October of the preschool year and including growth through the preschool and kindergarten year.

This finding is consistent with the void in the literature that this study intended to fill. Namely, not enough is known about how variation in West Virginia's Universal Preschool program interacts with student characteristics to impact student growth through the preschool year. This is true in part because the state's data systems have not been designed to address questions like these. With the ability to easily collect, store, and manipulate data increasing exponentially, it is not surprising that current systems aren't prepared for the type of research that is now possible. Data collection systems have emerged organically over time and have evolved to fulfill their purpose and keep pace with technical advances as needed. An intentionally designed comprehensive data system would allow much greater depth of understanding. Currently, there is growing controversy on how states can and should collect, manage, and disseminate data on public school students, an issue which adds complexity to any discussion of recommended uses of student data.

Connections between statewide systems are being made so that student data can be linked to systems across state lines. Unified P-20 systems are in development to allow for analysis of student learning and growth from the beginning of a child's education through college. Further, linkage between institutions of higher education teacher preparation program graduates to their p-12 student's achievement is beginning to be used to evaluate teacher preparation programs.

Recommendations. In preparation for further growth in data systems and increased interest in using data to understand student achievement and the variables that

influence it, West Virginia State Departments of Education should internally audit the data being collected by units and identify when there are overlapping datasets. A central data system with uniform identifiers should be developed to ensure that all units collecting data on the same variable use the same identifiers to collect data on the same variable. A process should be developed by which new datasets, being created in response to the needs and interests of a unit, could be reviewed and revised to match state system conventions.

Thoughtful data system design must be a high priority for West Virginia and other states as high-stakes decisions about children, their teachers, and their schools are being made based on the analysis of assessments. As test scores are used to dictate children's educational needs, their promotion to new grades, and their admittance into college, richly constructed data systems can provide a better understanding of the complex interactions of factors in developing children so that decisions can be fair and informative. Likewise, as teachers' salaries and promotion are contingent on their students' achievement, functioning data systems at the state level must be built in a way that they can provide the richest answers possible about the interplay of factors effecting student achievement. Schools, districts, institutions of higher education, and state departments of education also would benefit from the development of a comprehensive data system that incorporates as much information as possible to understand the impact of the interaction of students, teacher, school, and community characteristics.

Finding 2: Site Characteristics

WV Universal PreK 2012-13 site level data was explored initially to describe site characteristics and secondarily to examine relationships between site characteristics.

Lead teachers are most commonly certified (68%). Assistant teachers most commonly do not have an early childhood credential (45%). Public schools, as opposed to Head Start and collaborative sites, employ most assistant (53%) and lead teachers (63%) in WV Universal PreK. Most Universal PreK classrooms (66.1%) are inside public school buildings. Most sites (78%) offer six or more hours of instruction.

Sites with more hours per day tended to have higher percentile rural population counties. The type of employer, i.e. public schools, Head Start, or collaborative site, was linked to both teacher and assistant teacher credential. Assistant Teachers with “other” credentials are evenly distributed across counties by percentile rural population. Those with bachelor’s degrees are more common in counties with a lower percentile rural population, while those with associate’s degrees are slightly more common in counties with the highest percentile rural population. Assistant teachers with ACDS are most common in counties with the lowest percentile rural population. A slight relationship between location in or out of public school and rurality was suggested with the most rural places having sites located in public schools. Sites with longer school days were more common in the most rural places.

Byard (2009) noted a shortage of qualified teachers in West Virginia’s PreK workforce. In her estimation 2000 jobs would be created by 2012-2013 but institutions of higher education were graduating only 75 qualified teachers a year to fill the vacancies. With 68% of preschool teachers in the state holding certification, these results reveal a much different picture only 5 years later. WV’s preschool workforce’s credentials are strong not only in relation to the recent past in the state but also relative to other states, although a portion of teachers still lack teacher certification. West Virginia

does not fare as well as Oklahoma (a state with universal access funded through the state funding formula), which has 100 percent certified teachers (Dow, 2014). But the state has a better educated workforce compared to Ohio (a neighboring state with a targeted program) which has 19.6 percent preschool teachers overall with an early childhood license (OERC, 2014). Another of the country's highest poverty states, Mississippi, has no publicly funded program at all (NIEER, 2012).

According to the data, assistant teachers in West Virginia do not have a background in the field of early childhood education. However, policy has been written and will be implemented in 2014-2015 to improve the minimum credentials of the largest portion of this workforce from a paraprofessional certificate to the addition of a set of early childhood specific courses equivalent to a CDA. These requirements will include those already practicing (WVDE, 2013). Hours of instruction in WV Universal PreK will change in 2015-2016 to full day five days a week for all counties (Daily Mail, 2013).

Grace, Zaslow, Brown, Aufseeser, and Bell (2011) recommend that states provide universal access to preschool for all 4-year-olds in response to their analysis of the ECLS-B cohort data, which indicated disparities between rural and non-rural children in early indicators of children's academic success such as vocabulary scores. The current results support this recommendation, since West Virginia has improved equity of access to preschool for the state's 4-year-olds regardless of the percentile rural population by county.

These results indicate that development of policy that dictates high structural quality has proven effective at improving indicators of structural quality in West Virginia preschools. The state's preschoolers have more highly qualified teachers than

preschoolers nationally. They have access more equitably to spaces in preschool than in many states. No clear distinction between rural and non-rural preschoolers' access to preschool can be determined in this data, indicating that opportunity to participate in the program is being delivered equally between rural and non-rural populations. West Virginia has improved structural quality as measured by NIEER considerably and further improvements are already in policy. In 2003, West Virginia's score from NIEER on quality was a 5 on the 10 point scale (NIEER, 2003). In 2012-13, the state scored 8 of 10 possible points (NIEER, 2013). Policy has been developed that will move the program to a score of 10 out of 10 in 2014-2015.

Recommendations. While such gains in structural quality are laudable, West Virginia State Department of Education should broaden focus to include process qualities, such as teacher-child interactions, as the next step for West Virginia's Universal PreK program to continue to document continuous improvement. Use of CLASS and ECERS-R results along with results of local measures of WV Universal PreK program quality should be used to guide districts in providing professional development centered on process quality. Since policy has been effective at improving structural quality in the state, policy should be used to drive improvements in process quality as well when possible. This recommendation is especially important in light of the achievement gaps in ELS documented in this study. For universal preschool in West Virginia to achieve similar returns on investment to those documented in the longitudinal studies described in Chapter 2, the program must promote equity among groups of children and have as its goal improved outcomes for disadvantaged students. The State Department of Education

should pursue process quality as a means to narrow the divide between low-SES and non low-SES students and between boys and girls in the Universal PreK program.

Finding 3: Reliability and Validity of ELS

This study provided preliminary reliability information on ELS, a relatively untested assessment in the literature, when used on a broad scale in a real world setting. As reported in Chapter 4, the internal reliability of ELS was comparative to the results reported in the tool's technical report. Internal reliability, measured using Cronbach's alpha, provides a measure of how well the tool measures the same thing consistently, or how related the items are to one another. ELS was developed to measure student growth across three domains- Math/ Science, Social-Emotional/ Social Studies, and Language Arts/ Literacy.

While high internal validity is presented in Chapter 2 as a strength of ELS, these results indicate that deeper analysis of this characteristic is needed. A high internal validity across the assessment indicates that ELS is measuring the same thing consistently. I re-examined the tool retrospectively in light of these results and found that observations across domains are linked to a child's language ability. For example in Math and Science, both indicators within the Geometry and Measurement strand require use of language, in one case to "identify" and in the other to "compare". ELS's internal reliability may be partially due to the tool's reliance on language and literacy to assess development and growth across domains.

Vygotsky (1994) theorized that language motivates thought and drives development and cognition; domains of learning are inextricably linked to one another. Perhaps these results capture the challenges inherent to measuring development by

domains of learning with an observational tool. However, if the assessment is really measuring language and literacy but not other domains well, it is possible that the differences detected between sub-groups in this research are exaggerated, especially considering girls' advantage over boys and non-low SES students' advantage over low SES students in language and literacy in the literature.

Recommendations. Researchers should continue to study this tool to further understand ELS's reliability and validity with other samples. Concern over the reliability and validity of the instruments used to assess learning must be central to the minds of policymakers, school administrators, teachers, and parents since, increasingly, the stakes are high when it comes to how assessment results are used.

Finding 4: Student Demographics and ELS Baseline and Growth Scores

The analysis examined student demographics associated with achievement gaps in the literature, namely race, gender, and socio-economic status. This section describes the achievement gaps present in the current results, beginning with the gap between low SES and non-low SES students followed by the gap between boys and girls and then with the differences in growth rates between white and non-white students. Recommendations for policy and practice intended to narrow these gaps follow.

In West Virginia's Universal Preschool 2012-2013 year, children from low SES backgrounds began the year scoring on average 3.69 points lower on ELS than their non-low SES peers when controlling for gender and race. This result confirms what has already been documented in the literature. Children of lower SES come to school with less of the needed early literacy, early math and science, and early social skills they need to keep pace with those from non-low SES backgrounds. Further, although WV

Universal Preschool students across the board make big gains in ELS scores through the preschool year, the difference in growth scores between low SES and non-low SES students is not significant; low SES students' scores remain lower throughout the preschool year.

Another disparity is present between boys and girls in the preschool year that is nearly as great as that present between low SES and non-low SES students. Boys began the year scoring on average 2.49 points lower on ELS than their non-low SES and female peers when controlling for SES and race. The literature on the achievement gap between boys and girls is mixed with some studies showing advantages for girls throughout schooling in all domains and other studies documenting advantage for girls in reading and math for boys. This study provides valuable information about the gender gap in preschool since little research has been done on the gender gap in early schooling (Alexander, Entwistle, & Olsen, 2007). When accounting for SES, gender, and race, non-low SES, Caucasian, boys gain about 7 points on a 50 point scale each time they are assessed— so, they move from a mean sum score of about 25 to a mean of nearly 40 on a 50 point scale. Girls make gains a little faster than boys but overall, growth scores are similar, with no difference between groups detected that was greater than a half a point per assessment when considering SES, Race, and Gender. In other words, the gender gap is visible when children begin attending WV Universal Preschool and the gains boys make do not keep pace with girls' gains. Boys begin at a disadvantage that follows them through the preschool year.

Finally, although there is no difference in baseline scores between white and non-white students, growth scores differ significantly (-.048874) when controlling for gender

and SES. These results must be interpreted with care since the effect size is small and statistical significance could be the result of inflated statistical power due to the large population in the study. The difference is less than a half a point on a 50 point scale.

The results of this study converge with the literature that indicates that achievement gaps between low SES and non-low SES students and between boys and girls are persistent, beginning well before children enter school and following them throughout their education. Fryer and Levitt (2004a; 2004b) found that growth rates of black students differ from white students by a standard deviation per year from kindergarten through third grade. Although it is important to view statistical significance in this study with caution because of the large sample size, these results suggest that non-white children's documented poor growth in schools may begin even earlier than kindergarten. While the results of ELS in West Virginia preschools can document that enrolled children are clearly moving forward developmentally, these results indicate that universal preschool alone is not enough to narrow the achievement gaps among preschoolers in the state. More must be done to narrow these divides early in life.

Recommendations. The literature on successful approaches to narrowing achievement gaps support model programs which provide a rich blend of interventions, beginning as early as in utero (Hanson, 2013). Policymakers, parents, researchers and practitioners must consider what conditions exist for children under 4 that differ by SES and gender and provide comprehensive interventions as early as possible. Not only should West Virginia universal PreK be continued, additional supports for young children and their families should be provided beginning from before a child is conceived and extending into as many contexts as possible. School-linked services connecting families

to a wide network of supports ranging from social work to food assistance and counseling might strengthen low-SES children's early experiences. Public support for parenting education may improve low-SES children's early experiences with language. Continued investment in programs to provide help to people experiencing poverty could shield children from the effects of being born poor. Programs promoting the consumption of nutritious food by poor women might prevent developmental problems caused by inadequate nutrition of mothers prior to and during pregnancy. Programs to provide affordable housing to families experiencing homelessness might prevent homeless children from experiencing the destructive effects of chronic stress as their families recover or cope with the causes of their homelessness. Support for social programs should be sought based on a desire for all children, regardless of their background, to have the best education possible. For children to have equitable education, society must address the problem of poverty.

To support boys, non-white, and low-SES students, schools should plan developmentally and individually appropriate environments that approach the strengths of all students as valued and accepted. Differentiated instruction allows all students to grow based on their own needs and abilities. Classrooms should function in a way that allows for differing levels of maturity, activity level, and interest among children, including differences between boys and girls and low SES and non-low SES students. Male teachers should be encouraged to enter early childhood education, offering both a role model and an adult likely to share interests and needs with male students. Other possible ways to mitigate the gaps between low SES and non-low SES students and between boys and girls which should be pursued in West Virginia include maintaining

small schools, increasing teacher quality, preparing teachers for diversity and anti-bias education, and educating teachers on the importance of relationships with children and how to facilitate strong bonds with students.

Future Directions for Further Research

Universal preschool has been introduced and promoted as a program that could mediate the long term effects of poverty by providing high quality early learning experiences, based on convincing research that intervention in early childhood can impact at risk students and, in turn, society. This study has provided confirmation of the early gaps between sub-groups of children. The results reveal that, although all children show overall gains through the preschool year, these gaps persisted through the school year for the 2012-2013 population in West Virginia Universal Preschool. Further analysis of domain specific results on ELS and how those interact with student characteristics should also be considered. Additional investigation of the data produced by the program might provide possible solutions to address this problem for future classes of preschoolers. This section provides recommendations for further research.

Since the 2012-2013 data could not be used as planned, the original questions posed for this research project remain interesting and important, specifically the interactions between site and student characteristics and their impact on the growth documented on ELS. Linking statewide data systems would allow deep exploration of site characteristics relationship to student outcomes. Further, linking these results to state data on quality measures would enrich the information this data could provide. It would be possible to explore how site characteristics are related to quality, how quality measures are linked to ELS scores, and how student characteristics interact with each.

Integration of other data, such as student health data and information on process quality, could help researchers explain other factors impacting student growth in the preschool year and beyond. Longitudinal studies could impart valuable insight into long-term effects of site characteristics and quality ratings.

If data were collected by the West Virginia Department of Education in a way in which datasets could be combined using common identifiers as recommended in this Chapter, a richer and deeper analysis could be used to explore the cross level interactions between sites, students, and student scores. For example, an additional dataset is being collected on program evaluations, including ECERS-R and CLASS, well-established measures of program quality. Further data is collected on health (WVDE, 2013). Incorporation of ECER-S and CLASS scores and child health data could provide an increasingly comprehensive picture of the interacting influences on student growth in preschool. Once those were understood, programs could take steps toward improvements linked to increased student growth on ELS based on local, immediately applicable research.

Since West Virginia has addressed many issues associated with structural quality as measured by NIEER in recent years, a potential focus of future research is to follow the state's process as it continues to improve its preschool program. One direction this research could take is to focus on how evaluation tools with well-established reliability and validity such as CLASS and ECERS-R are being used by districts to improve the publicly funded preschool through ongoing assessment and relevant professional development based on results. A local measure, the WV PreK Observational Walk

Through, also provides an assessment in need of further investigation, both in validating the tool and linking its results to ELS.

Participation and access in West Virginia Universal Preschool is an additional area of interest for future research. The state has a goal of 100% participation in publicly funded preschool; however, not all eligible children are enrolled. Further research could be done to determine the commonalities between families who choose not to participate in the program. Analysis could center on the availability of competing NAEYC accredited centers and their impact on enrollment or a qualitative analysis of parental choices of site types in the state. Additional examination of the participant verses non-participant results in later grades would be of interest, although this type of study would require careful design since random assignment to groups is not possible.

Potential exists for understanding long-term effects of participation in WV Universal Preschool. Longitudinal study of the preschoolers enrolled in WV Universal Preschool would allow greater understanding of the long-term impact of the program to further inform the debate over universal verses targeted preschool programs outlined in Chapter 2. Specifically, this focus would allow greater understanding of how the long-term effects documented by the Perry Preschools, Abecedarian, and Chicago CPC programs compare to the long-term effects of WV Universal PreK.

Further understanding of the assessment used in West Virginia is another direction for further study. Student data in West Virginia could be used to test ELS reliability and validity to improve understanding of the best ways to assess preschool age children in a way that provides states and programs with meaningful data to help them improve their practice.

This study employed quantitative research methodology, with the acknowledgement that this is only one way of understanding the complexities of universal preschool in West Virginia. Many of the recommended directions for research in this Chapter also employ quantitative methods. There is also a need for qualitative studies on WV Universal PreK to illuminate these numbers and help make meaning from them. Research centered on the lived experience of preschoolers in WV Universal PreK would help explain the current results and inspire additional questions for future researchers.

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